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Primary Prevention of Skin Cancer in Australia

Report of the Sun Protection Programs Working Party

National Health and Medical Research Council

NHMRC
Primary Prevention of Skin Cancer in Australia

Report of the Sun Protection Programs Working Party

December 1996
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A REPORT OF THE
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DISCLAIMER

The programs listed in this report were selected on the basis of information made available at the time. It is acknowledged that this may not be a complete list of programs conducted throughout Australia or overseas.
Sun Protection Programs Working Party

Terms of reference:

The terms of reference for the Sun Protection Programs Working Party were to identify, review and assess Australian and international population-based sun protection interventions focusing on children and teenagers, having regard to their effectiveness, cost, cost effectiveness, aggregate and distributive impacts, feasibility of implementation, and precision of evaluation, for the purposes of:

• reviewing and reporting on the state of scientific knowledge;
• identifying gaps in knowledge, research needs and preventive action;
• identifying the special needs of high risk population groups, as well as the needs of the general population;
• review and determination of measurable and qualitative indicators of program performance.
• recommending guidelines for evidence-based best practice;
• advising on the administrative and legislative options to implement recommendations; and
• assessing the implications of recommendations for workforce development.
Executive Summary

Section One:  Introduction

Australia has the highest incidence of skin cancer of any country in the world. Melanoma is now the third most common potentially fatal cancer, after cancer of the prostate and lung in men, and cancer of the breast and colon in women (Jelfs et al., 1996). The principal goal of preventive efforts is to reduce exposure to sunlight through behavioural and environmental changes. The specific behavioural objectives currently promoted include wearing of appropriate clothing, application of sunscreen, use of sunglasses, seeking shade or remaining indoors during the middle of the day. The terms of reference focus on the identification, review and critique of Australian and international population-based sun protection interventions primarily involving children and adolescents. Specifically, this report will: review and report on the state of scientific knowledge; identify gaps in knowledge, research needs and preventable action; identify special needs of both the high risk and general population; review and determine measurable and qualitative indicators of program performance; recommend guidelines for evidence-based best practice; advise on the administrative and legislative options to implement recommendations, and assess the implications of recommendations for public health workforce development.

Section Two:  The Epidemiology of the Adverse Effects of Sunlight

There are three types of skin cancer related to sun exposure: malignant melanoma, basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). Malignant melanoma is the most serious, but occurs less frequently than the other two types of skin cancer. BCC is the most common cancer in Australia, followed by SCC. Most skin cancer in Australia is caused by sun exposure. Childhood sun exposure is particularly important in determining melanoma risk. In adult life, recreational (intermittent) sun exposure appears to be the strongest determinant of melanoma risk followed by total sun exposure and occupational exposure. There is evidence to suggest that sunlight sensitivity modifies the relationship between melanoma and sun exposure.

The epidemiology of BCC appears similar to that of melanoma, with evidence suggesting that childhood exposure and recreational exposure are strongly related to BCC. However, the epidemiology of SCC is different. Cumulative sun exposure, latitude and occupational sun exposure are associated with SCC. The relative contributions of the theories of intermittent exposure and lifetime exposure are part of the current debate.

A number of non-malignant skin conditions, and premature aging are also related to sun exposure. In addition, there is some evidence that sun exposure causes several forms of eye disease.

One of the major implications of the epidemiological data in relation to prevention programs is that strategies to reduce sun exposure among children are more likely to have greater impact on the incidence of skin cancer than are strategies to reduce exposure among adults.

It is recommended that:

1. The NHMRC note that the epidemiological evidence demonstrates the need to continue to focus on the prevention of UV exposure in childhood.
2. Further investigation is required of the natural history and dose response relationship between actual sun exposure and indicators, for example skin features like naevi, which are possible indicators of sun exposure, especially during childhood.

Section Three:  Measuring Sun Exposure and Sun Behaviour

Sun exposure measurements have a wide range of applications, including studies of skin cancer risk, descriptive studies of prevalence of sun-related behaviours, and as dependent variables in predictive models of sun-related behaviours. Types of sun exposure measures dealing with UV exposure include the ambient UV level, time spent outdoors, sun protective behaviours, UV radiation (UVR) of the skin, and personal susceptibility.
Ambient UV level is influenced by a number of factors, including season, time of day, and weather conditions. Measurement of time spent outdoors should include both deliberate sun exposure such as at the beach, or gardening and incidental exposure that arises from ordinary daily activities. The time of day and type of activity are important components of time spent outdoors. Sun protective behaviour not only includes a number of components such as shade, sunscreen and hats, but also measurements of the quality and quantity of each component.

These sun protection behaviours may be classified in terms of active and incidental behaviours. Behaviour may be measured by observation of individual behaviour, diaries, cued recall and uncued retrospective reports of specific instances of behaviour. Such behaviours are promoted or mitigated by the physical and regulatory environment.

The UV dose received on the skin can be estimated by a combination of the ambient UV levels and time spent outdoors, adjusted for the protective benefit attributable to the sun protective behaviours. To do this would require tables similar to the food composition tables used in nutritional epidemiology. There is some evidence that the UV effect depends on a number of personal characteristics, including genotype, tanability of skin, skin type, and number of freckles and moles.

A broader outcomes framework is required for program evaluation, including measures at different levels based on a program logic approach.

It is recommended that:

3. Further research be undertaken to develop more effective population measures of sun exposure, particularly with respect to monitoring sun exposure of children, including infants.

4. Australian cancer prevention research teams initiate a project to establish consensus on the viability of uniform indicators of success in intervention studies, including the development of a comprehensive, sensitive index of behaviour change that accounts for the different recommended primary prevention behaviours. If a consensus on its viability is agreed, work should proceed.

5. Researchers estimate the average exposure to UVR in Australians across various geographic strata and estimate how this relates to probable exposure patterns for people at higher latitudes in other countries where skin cancer is less of a problem (except perhaps among those frequently holidaying in high UV destinations).

6. Further research be undertaken into the relationship between self-report measures of exposure and other more objective measures, for example video recording of behaviours or polysulphone badges attached to body parts.

7. Australian Institute of Health and Welfare (AIHW), in conjunction with groups already active in the field, instigate a national program to monitor both behavioural and structural sun protective measures, building on work already done.

8. Evaluation of sun protection programs be multiphasic, addressing the shorter-term direct effects such as knowledge, attitudes and behaviours; the less direct effects such as a change in naevi and skin damage; and eventually, the long-term effects such as reduction in the incidence of melanoma.

Section Four: Primary Prevention Behaviours

Sun protection behaviours emphasise natural protection such as clothing, hats and staying in the shade. Sunscreens are an adjunct to natural protection and are recommended when these forms of protection are less practical.

Youth has been suggested to be the greatest demographic risk factor for sunburn. Although children have high levels of knowledge about skin cancer and skin protection, children generally have low levels of skin protection when outside in the sun. Similarly, adolescents display low levels of skin protection. Adolescent’s use of skin protective measures appears related to fashion trends and peer pressure.
Generally, males and young people are more exposed to the sun. Males and older people are more likely to wear hats outside, while females and young people are more likely to wear sunscreen. Protective clothing is not appealing to adolescents, but is viewed as more appropriate by older people.

The strength of the relationship between knowledge and skin protective behaviour varies across countries. In general, results in Australia suggest little or no relationship, overseas results have shown some association. This difference may be attributed to the currently higher levels of knowledge in Australia.

**It is recommended that:**

9. Sun protection programs continue to emphasise that sunscreens are an important adjunct, but not a substitute for, other forms of protection such as staying out of the sun in the middle of the day, use of shade and wearing protective clothing.

10. Sun protection programs should include consumer education campaigns on how to correctly use sunscreens.

11. Sun protection programs continue to focus on increasing availability and accessibility of protective measures, reducing barriers to sunscreen use, making sunsafe clothing more acceptable and reducing outdoor activity during hours of high radiation.

**Section Five: Evaluated Intervention Programs**

Very few pre-post evaluated intervention programs have been conducted in Australia. The available case studies provide data on the impact of multi-strategic sun protective programs. The most noted is the ‘SunSmart’ program in Victoria, launched in 1988. The long-term aim of this program is to reduce the morbidity and mortality from skin cancer in Victoria, with short-term aims based on changing attitudes, beliefs and behaviours affecting skin cancer risk, and encouraging early detection of skin cancers. Target settings were schools, media, sporting events, government authorities, general practitioners, community health centres and industry. Over a period of seven years, the SunSmart program has had success in changing attitudes and sun safe behaviours. Recent assessments have not shown continued decreases in reported sunburn.

Other programs include the ‘Me No Fry’ campaign, run since 1990/91 in New South Wales, and since 1994/95 in Western Australia. This campaign is directed specifically at adolescents, and deliberately attempts to fit into the preferred fashions and assumptions of the Australian youth culture. The campaign aimed to increase adolescents’ knowledge, desirability of sun protection, and sun protection behaviours. In NSW, the program has resulted in increased knowledge, favourable sun safe attitudes and behaviours. As in other States and Territories, the amount of change has been observed to level off in the last two years.

An evaluation of interventions aimed at improving sun protection in primary schools was conducted in NSW in 1992–93. An intensive intervention, the ‘SKIN SAFE’ program, aimed to increase knowledge levels, and to develop the attitudes and skills to reduce their risk of skin cancer. Minimal intervention did not result in behaviour change but the intensive intervention resulted in an increase in solar protection.

A number of overseas programs were also reviewed. Results of these programs show similar trends to those found in Australia, but with less success in achieving behaviour change in relation to primary prevention of skin cancer.

**It is recommended that:**

12. Australian schools (secondary and primary) and child care services that have not already done so, should implement policies which facilitate a comprehensive approach to sun protection, including teaching sun protection in the class room, reducing exposure during outdoor activity, involving teachers, parents and the community in sun protection and environmental changes (ie in a manner consistent with the notion of health promoting schools).

13. State governments support the monitoring and publishing of information on the adoption and implementation of sun protection policies and programs by schools, childcare services, community organisations and local services (eg sporting clubs).
14. Studies be funded to further test the benefits of multifaceted comprehensive strategies such as policy development and implementation, intersectoral collaboration, educational strategies, media strategies, and economic incentives in availability of protective products and aids, and further inform the development of best-practice principles. This will involve more extensive evaluation and research on innovative programs as well as more traditional intervention studies. Single approaches, like one classroom lesson, or a pamphlet or even one advertisement in the absence of other strategies are not recommended.

15. Sun protection programs focus on the development of strategies to ensure that changes are sustained in the longer-term, particularly for those subgroups within the population (such as adolescents) who are placing themselves at risk.

16. Research projects be funded to investigate the long-term impact of intervention programs shown to be effective in the short term.

17. Studies be undertaken to ascertain the feasibility of disseminating information from successful sun protection interventions, and of adapting comprehensive programs to new settings.

18. Research in the field of skin cancer be undertaken to address the effect of policies regarding exposure to the sun. This needs to be documented to provide information about the impact of sun safe policies on sun exposure by the individual, group or community.

19. All Government departments (Commonwealth and State) review their programs to determine their contribution to sun safety in their workforce and the community.

20. Sun protection programs continue their intersectoral effort to generate those environmental and structural changes, eg shade creation and rescheduling sporting events, that facilitate protective behaviours.

21. Sun protection program managers place greater priority on program evaluation (at a level relevant to the size of the program), including pre- and post- intervention monitoring (see Recommendation 8).

Section Six: Conclusions

Prevention of exposure in the early stages of life is likely to have a greater impact on the incidence of skin cancer than strategies to reduce exposures in adulthood, though programs targeting adults are also important. Care must be taken in sun protection programs to remind the community of the risk associated with high and intermittent exposure. In terms of health promotion, the occurrence of sunburn provides immediate feedback to the individual about their harmful exposure. On a longer time frame, naevi may provide early biological markers of subsequent risk of melanoma.

Most States and Territories have programs that include broad community education, and local educational and structural change activity.

On the one hand, Australia is among the world leaders in efforts to prevent skin cancer. There have been a number of innovative research studies and comprehensive programs, which set a benchmark for community-wide activity. On the other hand, much more needs to be done. In Australia to date, there has been no national approach to primary prevention for skin cancer. While specific activities or programs in some communities or States and Territories have been well planned and implemented, across the country as a whole the application of programs has been ad hoc and limited in scale. The ‘Slip, Slop, Slap’ programs have focused on the protection of children, either directly or through their parents. Similarly, a number of programs have targeted teenagers and adults. Given the epidemiological evidence of the impact of exposure in childhood, there is a need to continue to focus on preventing exposure to solar radiation in this age group. The Working Party also noted that there are differences across the country in the targets chosen, and the comprehensiveness of effort. Evaluated Australian programs have demonstrated some changes in sun safe attitudes and behaviours. Such campaigns have built upon existing community-based efforts and indicate the need for sustained commitment of effort and investment to achieve the desired community-wide change.
It is recommended that:

22. Health promotion funding bodies ensure that funding of sun protection programs is at a level to ensure meaningful changes in the community, beyond a higher profile for the issue. Further, funding needs to be provided for a sufficient number of years to maintain and improve on the adoption of sun protective strategies in the community. Dedicated funding to enhance program evaluation needs to be considered by funding agencies. The evaluation and research budgets should be supplemented (by governments if necessary) to ensure that achievements and processes are well documented.

23. Australian efforts on skin cancer prevention be coordinated through an intersectoral National Sun Protection Strategy that links Cancer Organisations, State, Territory and Commonwealth health departments and other relevant sectors.

24. Assessment of the feasibility of undertaking an economic evaluation should occur based on our current knowledge of the effectiveness of primary prevention programs. The work must provide insight into models for economic evaluation that can be applied to current and new programs. As this is outside the scope of this report, an economist should be commissioned to conduct this assessment.

25. Commonwealth and State Governments liaise with tertiary institutions and professional organisations, such as medical faculties and colleges, Divisions of General Practice, the Institute of Environmental Health, Schools of Education, Architecture, Town Planning, Nursing and Public Health to incorporate information on sun exposure, sun protective programs, intervention studies and relevant research into vocational education, training and continuing education.

26. The NHMRC update triennially the available information provided in this report, and its recommendations.
Section One

Introduction

Australia has the highest incidence of skin cancer of any country in the world. Melanoma is now the third most common potentially fatal cancer, after cancer of the prostate and lung in men and cancer of the breast and colon in women (Jelfs et al., 1996). The rate has been increasing by about 5 per cent per year. Recent evidence has indicated that melanoma mortality rates have now plateaued at 5.0 per 100 000 person years for males and 2.4 for females and may be declining in recent aged cohorts (Giles et al., 1996). The incidence of melanoma, which rose considerably in the 1980’s, may have plateaued in about 1988 (Jelfs et al., 1996), this being most clear in those aged under 65. Epidemiological evidence suggests that exposure to sunlight is the primary risk factor for melanoma and other skin cancer. Exposure to the sun in childhood and teenage years has been suggested to account for a large proportion of skin cancer risk.

The principal goal of preventive efforts is to reduce exposure to sunlight through behavioural and environmental changes. The specific behavioural objectives currently promoted include wearing of hats, wearing of appropriate clothing, application of sunscreen, use of sunglasses, seeking shade or remaining indoors during the middle of the day.

This review of sun protection programs has been undertaken as part of the NHMRC National Health Advisory Committee’s program, being managed by its Health Advancement Standing Committee (HASC). HASC established a series of working parties to examine community-based interventions. Such interventions involve health promotion, behavioural modification, community development and prevention programs. The focus of the reviews was largely on the effectiveness, cost, overall impact, impacts within specific subgroups of the population, feasibility of implementation, and the provision of advice on the policy and research implications. These reviews of community-based health promotion interventions are expected to contribute significantly to the establishment of evidence-based guidelines for best practice.

The terms of reference for the Sun Protection Programs Working Party focused on the identification, review and critique of Australian and international population-based sun protection interventions primarily involving children and teenagers. The evaluations of these interventions were measured with regards to their effectiveness in changing behaviour, cost effectiveness, feasibility of implementation and precision of evaluation.

The Centre for Health Promotion and Cancer Prevention Research, University of Queensland Medical School was commissioned to write the report with consultation from the Sun Protection Programs Working Party. An outline for the contents of the report was determined by the Sun Protection Programs Working Party.

1.1 Conceptual Framework

Reducing over exposure to ultraviolet radiation by avoiding excessive sun exposure can reduce the risk of a number of diseases including skin cancer. Sun exposure is affected by a wide range of individual sun protection behaviours as well as by societal and natural structures.

Sun protection is one of many public health priorities which in turn is one of a number of society-wide activities for fostering the well-being of the community. Priorities for sun protection need to be developed and pursued in relation to other priorities. In some cases, there is a possibility of conflict eg with outdoor recreation and physical fitness encouraging people outdoors, or with fashion encouraging suntans and non-protective attire.

Some of the activity that affects sun exposure can be brought under the coordination of an organised program, which if it conducts activities in its own right, can be thought of as a comprehensive sun protection program. Programs can serve to disseminate education material, enact structural change that is within their control, and/or advocate change in areas beyond their control.
Sun protection programs should operate within a set of overarching principles that inform theoretical and practical development of all public health initiatives. They should work to ensure:

- equity, access and participation—ensuring the program reaches everyone to whom it is relevant;
- sustainability—ensuring that the program is embedded in the community and is structural and enduring;
- reflection—ensuring that the program is founded on, guided by, and re-evaluated with accurate and comprehensive information; and
- accountability—ensuring that the program meets (or makes progress towards) its goals in a manner that is acceptable to the community and is maximally effective and efficient.

### 1.2 Trends in Melanoma

It is too early to provide definitive data on whether trends in melanoma incidence and mortality have declined, but rising trends of the 1980’s have certainly slowed. The evidence for declines in melanoma is strongest in younger people, where effects of prevention programs are likely to be first felt.

Giles et al. (1996) cautiously noted that the results they reported on trends in melanoma mortality provided indirect evidence that ‘provide encouragement to public health programs designed to decrease exposure to the sun...’ (p.1224). The long lag times between preventive programs producing behavioural change and skin cancer outcomes, means that it is likely to be at least another ten years before we will be able to have any confidence about whether the emerging trends have consolidated and are likely to be attributable, at least in part, to the benefits of the prevention campaigns.

### 1.3 Economic Burden

Limited information is available on the economic burden of skin cancer in Australia. Unpublished Australian Institute of Health & Welfare (AIHW) data estimates that the direct costs of melanoma and other skin cancer are approximately $175 million per year, with the breakdown being $19 million for melanoma, $96 million for non-melanoma and $60 million for benign skin neoplasms (Armstrong, unpublished data, 1996). Information is not available on the indirect costs including, for example, sick leave and foregone earnings.

In its review of the effectiveness of primary prevention programs, this report will consider the effectiveness of strategies that have been and can be implemented by both government, non-government and the community. It is not feasible to extend this report to include an accurate cost-effectiveness analysis, as a precise costing of existing initiatives is not available, and costs for prevention are not limited to health promotion programs, but are borne across the community.

Further, the Working Party has not costed all the recommendations, though in considering the implementation options, the calculation of costs of initiatives is a necessary future step.
Section Two
The Epidemiology of the Adverse Effects of Sunlight

2.1 Introduction
In this section we review the evidence linking exposure to sunlight with a number of adverse health effects. The International Agency for Cancer Research (1992) concluded that there was sufficient evidence that solar radiation causes skin cancer. Sunlight probably causes certain diseases of the eye and there is also some evidence that it affects the immune system. Attention is focused upon activities and patterns of exposure that are known to increase risk of one or more sun-related conditions and that are amenable to change. This section begins with a brief review of sunlight and its component parts, including ultraviolet (UV) radiation.

2.1.1 Sunlight
The sun emits energy in the form of electromagnetic radiation (Figure 2.1). The highest energy radiation, cosmic rays, gamma rays and X-rays, have wavelengths of less than 100 nm. The ultraviolet part of the spectrum extends from wavelengths of 250 nm to 400 nm and visible light from 400 nm to 700 nm. Infrared radiation and radio waves have longer wavelengths and less energy. Radiation at wavelengths less than about 290 nm is blocked by the ozone layer of the stratosphere and does not reach the earth’s surface.

Figure 2.1: Electromagnetic spectrum with enlargement of ultraviolet radiation region

Source: International Agency for Cancer Research (1992)
2.1.2 Ultraviolet radiation

The ultraviolet portion of sunlight is divided into three parts, ultraviolet C (UVC) at wavelengths from 100 to 280 nm, ultraviolet B (UVB) from 280 to 315 nm and ultraviolet A (UVA) from 315 to 400 nm. As was noted above, no radiation in the UVC spectrum reaches the earth’s surface. Even with severe depletion of stratospheric ozone, no UVC will reach the earth (Gies, Australian Radiation Laboratory, personal communication, 1996).

The relative effectiveness of ultraviolet radiation (UVR) of different wavelengths in causing health effects is called the action spectrum. The action spectra for erythema (sunburn) in humans and cancer in experimental mice are similar (de Gruijl, 1995), suggesting that the action spectrum for cancer in humans is likely to be similar. UVB is much more effective at producing erythema or cancer in animals than is UVA—wavelengths of about 340 nm are less than 1/1000 times as likely to produce an effect as wavelengths of about 295 nm (de Gruijl, 1995). Thus, although UVB comprises only about 5 per cent of total solar UVR that reaches the earth (Sliney & Wolbarsht, 1980), it is largely responsible for the adverse health effects of sunlight.

The amount of UVB reaching the earth is affected by a number of factors (Table 2.1).

Table 2.1: Factors affecting UVB radiation at the surface of the earth

<table>
<thead>
<tr>
<th>Geographic latitude</th>
<th>UVB radiation decreases with increasing distance from the equator. It varies more with latitude than does UVA.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of day</td>
<td>UVB radiation is highest in the middle of the day. It varies more during the day than does UVA.</td>
</tr>
<tr>
<td>Season</td>
<td>UVB radiation levels are higher in the summer than in the winter. Seasonal variation in UVB is greater in southern Australia than in northern Australia.</td>
</tr>
<tr>
<td>Clouds</td>
<td>Clouds reduce UV ground irradiance. Light clouds scattered over a blue sky have little effect, but complete light cloud cover prevents about 50 per cent of UVB from reaching the earth’s surface (Diffey, 1990).</td>
</tr>
<tr>
<td>Surface reflection</td>
<td>A person’s UVR exposure will be greater on a reflective surface. Sand reflects about 10–15 per cent of UVB; the sea near the coast is also highly reflective. Grass does not reflect much UVB (Sliney, 1986).</td>
</tr>
<tr>
<td>Altitude</td>
<td>UVB radiation levels increase with altitude.</td>
</tr>
<tr>
<td>Air pollution</td>
<td>Ozone and other pollutants in the atmosphere can reduce UVB radiation at the earth’s surface.</td>
</tr>
<tr>
<td>Stratospheric ozone</td>
<td>Variations in stratospheric ozone by season and latitude can affect UVB radiation. Long-term decreases in stratospheric ozone are expected to increase UVB radiation.</td>
</tr>
</tbody>
</table>


2.2 Skin Cancer

There are three types of skin cancer which are caused by sunlight. Malignant melanoma is a cancer of melanocytes, the cells in the epidermis that produce pigment. It is the least common type, but is more serious than the other two types. About 800 Australians die each year from it. The other two types of skin cancer are basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). Together, they are often referred to as non-melanocytic skin cancer. BCC is the most common cancer in Australia by far, and SCC is the second most common cancer. It has been estimated that about 150 000 non-melanocytic skin cancers are diagnosed each year in Australia (Giles et al., 1988). Although non-melanocytic skin cancers grow slowly and are easily treated, about 200 Australians die each year from them, and they account for the highest health care costs of any neoplasm in Australia (AIHW, personal communication, 1996).
Wherever possible, evidence from Australian studies will be used to illustrate the relationship between sun exposure and skin cancer. Two major case-control studies of melanoma have been conducted in Australia, one in Queensland by Green and colleagues, and another in Western Australia by Holman and colleagues. Population-based studies of non-melanocytic skin cancer have been conducted in Nambour (Queensland), Geraldton (Western Australia) and Maryborough (Victoria) and two national surveys of the incidence have also been conducted. In writing this section, we have drawn extensively on two recent reviews (Armstrong & English, 1996; Kricker et al., 1994). In many studies, strong associations have been observed with measures of ambient sunlight (ie the amount of sunlight occurring at places where people live or work), but much weaker associations have been observed with measures of actual exposure to individuals.

### 2.2.1 Malignant melanoma

Melanoma is sometimes divided into the histological subtypes of superficial spreading melanoma, lentigo maligna melanoma, acral lentiginous melanoma and nodular melanoma. Superficial spreading melanoma is the most common, accounting for more than 50 per cent of cases (Armstrong & English, 1996). Lentigo maligna melanoma (sometimes called Hutchinson’s melanotic freckle melanoma) occurs predominantly on the head and neck, whereas superficial spreading melanoma and nodular melanoma are more common on the trunk and the limbs. There is some dispute about the validity of the histological classification. Reviewing the epidemiology of melanoma is complicated because some investigators have excluded lentigo maligna melanomas while others include them. Regardless of whether the histological classification is meaningful, the exclusion of these melanomas could change the overall anatomic site distribution. Because the relationship between sun exposure and risk of melanoma may be related to anatomic site, differences among studies may be confounded by differences in site distributions.

Observations on the incidence and mortality of melanoma in relation to geographic latitude, migration to sunny climates, anatomic site distribution and ethnic origin, provide persuasive evidence that sun exposure causes melanoma. In Australia and the USA, melanoma incidence increases with increasing proximity to the equator (Scotto & Fears, 1987; Jones et al., 1992). Indeed, observations by Lancaster (1956) regarding the relationship between mortality from melanoma and latitude were among the first indications that melanoma was related to sun exposure. In a similar vein, Holman & Armstrong (1984) found that the subjects who had lived in places with a high annual number of hours of bright sunshine had the highest rates of melanoma.

Migrants who move from areas of low incidence to areas of high incidence with sunny climates such as Australia, Israel and New Zealand, generally have lower rates of melanoma than native-born residents of the host countries (Katz et al., 1982; Cooke & Fraser, 1985; Khat et al., 1992). British immigrants to Australia and New Zealand, have mortality rates about half those of the Australian-born residents (Cooke & Fraser, 1985; Khat et al., 1992); similar differences have been observed in incidence rates in Western Australia (Holman et al., 1980). People who migrated to Australia in the first decade of life had risks about equal to people born in Australia but those who arrived later in life had much lower risks (Holman & Armstrong, 1984). These results suggest that early childhood exposure to the sun is an important aetiological factor for melanoma.

When proper adjustment is made for body surface area, it is apparent that melanomas occur most frequently on body sites that receive the most sun exposure (Green et al., 1993).

Armstrong & Kricker (1993) used data on the anatomic site distribution of melanoma, variation by ethnic origin, latitude of residence and migration from the United Kingdom to Australia to estimate that between 68 per cent and 98 per cent of melanoma was due to sun exposure.

A number of observations, however, are apparently inconsistent with a simple relationship between sun exposure and melanoma. In many populations, melanoma occurs as commonly in women as in men, although men are more likely to work outdoors. It shows a relative peak in incidence in middle life, which is not the pattern to be expected from lifelong exposure to an environmental agent, and it occurs frequently on the back in men and lower limbs in women, sites which are not maximally exposed. Of more significance, perhaps, is the relationship between incidence of melanoma and occupation and socioeconomic status—melanomas are more common in indoor than...
outdoor workers and are also more common in people of high socioeconomic status (Holman et al., 1980; Cooke et al., 1984).

These observations led to the postulation of the ‘intermittent exposure hypothesis’ for the relationship of sunlight to melanoma (Fears et al., 1977; Holman et al., 1980). Briefly, this hypothesis states that:

1. Incidence of melanoma is determined as much (or more) by the pattern of sun exposure as by the total accumulated ‘dose’ of sun exposure.

2. Infrequent (intermittent) exposure of untanned skin to intense sunlight is particularly effective in increasing the risk of melanoma. Thus, there is an initial rise in incidence as frequency of exposure increases, but a fall in incidence as exposure becomes more continuous.

A number of case-control studies and cohort studies have obtained information on individual amounts and patterns of sun exposure. These are discussed below.

There have been inconsistent results relating to ‘total lifetime’ exposure to the sun; some studies have found positive associations with the incidence of melanoma while others have found negative associations (Armstrong & English, 1996). The associations have been quite strong for biological markers of sun exposure. For example, in the Western Australian study, a strong positive association was seen with increasing evidence of solar damage to the skin (Holman & Armstrong, 1984) and in the Queensland study, the risk was highest among people with sun-related tumours on the face (Green & O’Rourke, 1985). However, these markers do not provide any information about the patterns of exposure; it may be, for example, that in Australia extensive solar damage to the skin can occur from an intermittent pattern of exposure.

Consistent with descriptive findings relating to indoor and outdoor work, Holman & Armstrong (1984) found that people who spent the most time outdoors in summer had the lowest risk of melanoma. Fifteen studies have considered occupational exposure to the sun, classified simply as ‘outdoor’ occupation in some studies and according to actual hours outdoors in other studies; their results have been inconsistent, with about half showing lower risks among outdoor workers (Armstrong & English, 1996). Some of the inconsistency probably relates to the failure to account for body site; none of the studies compared risks for sites likely (or unlikely) to be exposed at work.

Intermittent exposure to the sun has usually been equated with recreational exposure. Most studies show convincing trends towards increasing risk of melanoma with increasing recreational exposure to the sun (Armstrong & English, 1996). However, the Queensland study found no consistent association with total time spent at the beach (Green et al., 1985b). The Western Australian study found increased risks for boating and fishing in summer, but only weak associations with sunbathing and the proportion of time outside during the summer that was recreational (Holman et al., 1986). It did find a strong association between risk of melanoma on the back in women and type of bathing suit worn at ages 15–24. Compared with women who wore a one piece suit with a high backline, those who wore a one-piece suit with a low backline had an odds ratio of 4.0 (95 per cent confidence interval 0.6–25) and the relative risk for wearing a two piece bathing suit, or none at all, was 13.0 (2.0–8.4). This finding was not confirmed, however, by Weinstock et al. (1991) who found an odds ratio of 1.8 (95 per cent confidence interval 0.9–3.5) for predominant wearing of a bikini.

Sunburn is perhaps one of the most easily recalled and, therefore, least misclassified measures of intermittent sun exposure. It may also have the advantage of indicating dose received at the level of the basal layer of skin, taking account of both intensity of exposure to the sun and degree of natural protection.

Sunburn has been consistently associated with melanoma (Armstrong & English, 1996). In 16 of 20 relevant studies, a moderate to strong positive relationship between sunburn and melanoma was observed. In one of the studies that did not follow this pattern consistently (Holman et al., 1986), there was quite strong evidence for a relationship between number of blistering sunburns and incidence of melanoma. In another study which did not show an effect, questions were asked about sunburns in recent years (Grob et al., 1990), whereas most of the other studies assessed sunburn in childhood and adolescence.

There is some evidence that the relationship between sun exposure and melanoma is modified by a person’s sensitivity to sunlight. Weinstock et al. (1991) found that risk of melanoma was negatively associated with frequency of exposure in women who tanned readily, but positively associated in women who tanned poorly. Similarly, Nelemans et al. (1993) found much higher relative risks associated with sunbathing, water sports, vacations to sunny places and history of sunburn in those who tanned poorly. White et al. (1994) also found modification of the effect of estimated total sun exposure in adolescence and childhood by cutaneous sensitivity to the sun. However,
the fact that the risk of melanoma did not increase with increasing estimated exposure to the sun even in those who tanned poorly is hard to explain.

There are sources of ultraviolet radiation other than the sun to which people are exposed. These include sunlamps and sunbeds, ultraviolet lamps used for treating various skin conditions, and occupational sources (eg welding arcs). Several recent case-control studies have shown that people who use sunlamps or sunbeds are at increased risk of melanoma (Swerdlow et al., 1988; Walter et al., 1990; Westerdahl et al., 1995; Autier et al., 1995), although some studies have not shown such associations (Elwood et al., 1986; Gallagher et al., 1986; Holly et al., 1995). In those studies which have found positive associations, the relative risks have generally been around 2.0–3.0. The relative risk was almost nine among people who had experienced a skin burning due to sunlamps in one case-control study (Autier et al., 1995).

Early model sunlamps emitted significant amounts of UVB radiation. The radiation emitted by modern sunlamps and sunbeds is almost all UVA radiation, but a small amount of UVB radiation is also emitted (IARC, 1992). It is not possible to determine whether the increased risk associated with sunlamps and sunbeds is due to the predominant UVA radiation, the small amount of UVB radiation or to both. In view of the present uncertainty regarding the carcinogenic effect of UVA radiation, it is prudent to assume that UVA exposure from sunlamps and sunbeds is harmful.

2.2.1.1 Comment

The migrant studies show that sun exposure early in childhood is particularly important in determining risk of melanoma. Whether this is partly due to increased susceptibility of young children is unknown, although there is some evidence from studies of naevi (which are strongly related to risk of melanoma) that the number per unit area of skin does not increase much in children after about ten years of age (English & Armstrong, 1994).

In adult life, recreational sun exposure appears to be a stronger determinant of melanoma risk than either total exposure or occupational exposure. However, the associations (even for recreational exposure) are fairly weak, apart from sunburn. Error in the measurement of exposure is known to weaken associations, and in case-control studies that require subjects to recall their exposure from many years previously, error in measurement is likely to be substantial. Thus, the true associations are likely to be substantially stronger than has been observed. Whether sunburn is indeed a specific risk factor or simply a proxy for intermittent exposure or confounded with sun sensitivity is unknown. Furthermore, its strong relationship with melanoma may be due, in part, to recall bias whereby people with melanoma are more likely to recall past episodes of burning.

The observations, if correct, have profound implications for the design of programs to reduce sun exposure. If the pattern of exposure changes to a more intermittent one, the risk of melanoma may increase even though amount of exposure has been reduced.

Evidence from very recent studies suggests that the relationship between risk of melanoma and sun exposure is modified by constitutional sensitivity to sunlight. Those who tan poorly appear to have an increased risk of melanoma with increasing levels of exposure, compared to those who tan well. There is less evidence of increasing risk with increasing exposure, and in some studies the risk decreases with increasing exposure.

2.2.2 Non-melanocytic skin cancer

The incidence of non-melanocytic skin cancer, like melanoma, increases with increasing proximity to the equator. In Australia, the incidence rate north of 29° S is some four times higher for BCC and almost ten times greater for squamous cell carcinoma SCC compared with south of 37° S (Marks et al., 1993). Migrants to Australia from the United Kingdom have incidence rates about half those of native-born Australians (Marks et al., 1993). The risk of BCC in those who migrate to Australia before the age of 10 years is about the same as in people born in Australia but substantially lower for people migrating later in life (Kricker et al., 1991). Measures of ambient sun exposure, such as hours of bright sunshine and total global radiance at places of residence are related to risk of BCC (Kricker et al., 1995a) and SCC (Kricker, 1992).

SCC favours anatomic sites that are usually exposed to the sun. Over a five-year period of observation in Geraldton, 41 per cent of SCC that occurred in males and 27 per cent in females were on the head and neck (unpublished observations). BCC also favours usually exposed sites, but a greater proportion of (BCCs) and SCCs occur on the trunk (Kricker et al., 1990). High quality data on individual’s habits of sun exposure from case-control studies of non-melanocytic skin cancer are limited. Total sun exposure accumulated over a lifetime and exposure accumulated on working days showed little association with risk of BCC in the case-control study from Geraldton (Kricker et
al., 1995a). When total lifetime exposure to the site of the BCC was considered, the risk initially increased with increasing exposure, but thereafter fell with increasing exposure. The trunk was the only site for which people with the greatest hours of exposure had the highest risks of BCC. Results from the Geraldton study regarding SCC are less conclusive because of small numbers, but again showed no evidence of association between total exposure or exposure on working days and risk of SCC (Kricker, 1992). In their study from Maryborough, Marks et al. (1989) found that outdoor workers had a relative risk of 1.6 for BCC (p=0.03) and a relative risk of 1.7 (p=0.11) for SCC. In the Nambour study, Green & Battistutta (1990) found that the risk of BCC was 1.3 (95 per cent confidence interval 0.6–2.8) times higher in people who worked ‘mainly outdoors’ than in people who worked ‘mainly indoors’, whereas the risk of SCC was 5.5 times higher in outdoor workers.

Among traditional fishermen (watermen) in Maryland, total lifetime exposure to the sun was not associated with BCC but it was with SCC (Vitasa et al., 1990). Gallagher et al. (1995a,b) found no association between occupational exposure or total exposure to the sun and BCC in Alberta, but a strong association between SCC and occupational exposure in the past ten years. However, they did not find an association between total cumulative sun exposure and SCC.

Recreational sun exposure was associated with increased risk of both BCC and SCC in the Geraldton study (Kricker et al., 1995b; Kricker, 1992). The risk of BCC was also high among people who had received almost all their weekly exposure at the weekend between ages 15 to 19 years (Kricker et al., 1995b). Green & Battistutta (1995) found no association between recreational activity (defined as mainly indoors, indoors and outdoors, or mainly outdoors) and BCC, but increased risks for SCC, for those whose leisure time was spent mainly outdoors. Gallagher et al. (1995a,b) found increased risks for BCC associated with high levels of recreational exposure before age 20, but little association with mean exposure per year over the whole of life and no consistent evidence of any association between recreational exposure and risk of SCC.

A weak association between number of painful sunburns to the anatomic site and BCC was seen in the Geraldton study (Kricker et al., 1995b). No association was found in the Nambour study (Green & Battistutta, 1990). A strong association with SCC was observed in the Geraldton study and there was also an association with SCC in the Nambour study. Quite strong associations have been seen in some overseas studies (Kricker et al., 1994).

2.2.2.1 Comment

It was long considered that non-melanocytic skin cancer was caused by cumulative exposure to the sun. The evidence reviewed above indicates that for BCC at least, such a belief may be ill-founded. The epidemiology of BCC appears to be similar to that of melanoma.

It shows little or no association with total lifetime exposure to the sun, or with occupational exposure, but appears to be related, albeit inconsistently, to recreational exposure. The Canadian study and the Geraldton study provide evidence that recreational exposure before age 20 is an important determinant of BCC risk. These data are consistent with the observations of migrants, which show that exposure early in life is strongly associated with BCC.

The picture for SCC is somewhat different. Its anatomic site distribution indicates that cumulative sun exposure plays a stronger role than for BCC. The latitude gradient is also stronger than for BCC, indicating that the exposure-response relationship is stronger than for BCC. There have been few large, high quality epidemiological studies of SCC, so there are only limited data on the association with measures of individual exposure. What little evidence is available, while inconsistent, does provide some support for the hypothesis that SCC is associated with occupational exposure.

2.3 Non-malignant Skin Conditions

A number of non-malignant skin conditions are also linked to sunlight. These include solar keratoses, lentigines and naevi. Loss of elasticity of the skin, sometimes referred to as premature aging or photoaging, is also related to sunlight (Cockerell et al., 1961; Marshall, 1965). Comparison of photoaging for people with different complexions (Kligman, 1974; Mitchell, 1968; Marshall, 1965) and for body sites with different levels of sun exposure (Gilchrest 1983, 1979; Mera et al., 1987), confirmed this association. In some animal studies, UVA radiation has been shown to cause premature aging (Bissett et al., 1989; Kligman & Sayre, 1991). If true, these observations suggest that while skin cancer might be prevented by avoiding UVB exposure, avoidance of UVA exposure is necessary to prevent premature aging.
Melanocytic naevi (moles) are strongly related to the risk of melanoma. Whether naevi are precursors to melanoma, or simply markers of risk is contentious. However, the relationship is so strong that naevi are likely to be useful intermediate, biological markers of the risk of melanoma. In terms of evaluating sun protection measures, their usefulness depends on whether they are caused by sun exposure.

In children, sun exposure appears to increase the prevalence of naevi. In Australia, the mean number of naevi on children aged 6 to 15 years increased with falling latitude (Kelly et al., 1994). More directly, number of naevi has been shown to be related to measures of sun exposure in individual children in several studies (Coombs et al., 1992; Harrison et al., 1994; Gallagher et al., 1990; Pope et al., 1992). Markers of intense, intermittent exposure, such as sunburn and holidays in sunny places have shown the strongest relationships.

Sun exposure is also related to the prevalence of naevi in adults, but in an apparently more complex manner. Migrants to Australia and New Zealand have fewer naevi than do the native-born (Cooke et al., 1985; Armstrong et al., 1986). Positive associations between numbers of naevi and measures of sun exposure were found in Western Australia (Armstrong et al., 1986) and presence of more than 50 naevi was associated with the number of sunburns before 20 years of age in a European study (Garbe et al., 1994). However, the number of naevi has been found to be negatively associated with total sun exposure (Kopf et al., 1978), and the density of naevi has been found to be higher on intermittently exposed skin and least on chronically exposed skin (Augustsson et al., 1994). Thus, naevi may be less appropriate as endpoints to evaluate sun protection programs in adults.

2.4 Ocular Disease

A number of diseases of the eye have been associated with sunlight. These include pterygium (a growth of the conjunctiva that extends onto the cornea), cataracts, macular degeneration of the retina and ocular melanoma. However, for most conditions, the evidence is weaker than for skin cancer. Assessment of the relationship with sun exposure has often been based upon ambient exposure.

2.4.1 Cornea

Pterygium is widely believed to be caused by sun exposure, but there are few epidemiological studies in which individual measurements of exposure have been made. In the Watermen study referred to earlier (Vitasa et al., 1990) lifetime estimates of UVB radiation to the eye were calculated from time spent outdoors and use of hats and glasses (Taylor et al., 1989). A positive dose-response relationship was observed. In Australia, Moran and Hollows (1984) demonstrated a latitude gradient similar to that seen for skin cancer and MacKenzie et al. (1992) found that people who worked outdoors on reflective surfaces were at high risk, as were people who had lived the early part of their lives at low latitudes. Pterygia are common in Aborigines (Moran & Hollows, 1984).

2.4.2 Lens

Cataracts have long been thought to be caused by sun exposure, but the epidemiological evidence is weak and at least one reviewer has questioned the validity of the hypothesis (Harding, 1994). This subject has been reviewed extensively (Dolin, 1994; Taylor, 1994-95; Eaton, 1994-95; Wolff, 1994).

In the United States, surgery rates for cataract are inversely related to latitude (Javitt & Taylor, 1994–95). Positive associations were found in the Watermen study (Taylor et al., 1988) for cortical cataracts but not for nuclear cataracts. A weak association between an index of UVB exposure and cortical lens opacities was seen in men but not women in the Beaver Dam Eye Study (Cruickshanks et al., 1992). There was no association with nuclear sclerosis or posterior subcapsular opacities. A positive association was seen between a sunlight exposure index and cortical cataracts in a third study (Rosmini et al., 1994).

2.4.3 Retina

The lens absorbs almost all UVB radiation (Taylor, 1989), so only a small amount strikes the retina. Less UVA radiation is absorbed by the lens, particularly in early childhood.

There is limited evidence that macular degeneration is associated with sun exposure. In the Watermen study, macular degeneration was associated with increased levels of exposure to visible light, but not with increased exposure to UVA or UVB (Taylor et al., 1992). Several measures of sun exposure were positively associated with
prevalence of macular degeneration in the Beaver Dam Eye Study (Cruickshanks et al., 1993), including total time spent outdoors and amount of leisure time outdoors.

There is no latitude gradient among white populations of the incidence of ocular neoplasms, about 80 per cent of which are likely to be melanomas. Four case-control studies of ocular melanoma have been conducted (Gallagher et al., 1985; Tucker et al., 1985; Holly et al., 1990; Seddon et al., 1990). The first included all ocular melanomas while the last three were restricted to uveal melanomas. Although positive associations were present with some outdoor activities in one or more of the studies, the results are inconsistent and difficult to interpret.

2.4.3.1 Comment

Although there are few high quality studies of sun exposure and eye disease, there is limited evidence that sun exposure does cause several forms of ocular disease. Although no study to date has considered the pattern of exposure, there is no reason to believe that pattern of exposure is likely to be of the same importance for the eye as it is for the skin where tanning and skin thickening are protective mechanisms.

2.5 Effects on the Immune System

Animal experiments show that UVR can alter immune function (see Kripke, 1990), but there are few epidemiological data for humans. Recurrent infections due to lesions resulting from Herpes simplex viruses 1 and 2 can be induced by UVB radiation (Wheeler, 1975) and can be prevented by sunscreens (Rooney et al., 1991).

2.6 Conclusion

Most skin cancer in Australia is caused by sun exposure. When considering the effects of sunlight in Australia it is worth recalling that the majority of Australians are descended from migrants who originated in places far from the equator where the energy from sunlight is much lower than in most parts of Australia. London, for example, is at 51° north latitude, whereas the most southerly Australian mainland capital, Melbourne, is at 37° latitude and Brisbane is at 28°. Hobart is at a similar latitude to Rome in the northern hemisphere and Perth is at about the same latitude as Cairo.

The epidemiological evidence indicates that early childhood exposure is particularly important for skin cancer. An intermittent pattern of exposure is important for melanoma and possibly also for BCC, while for SCC total accumulated exposure may be the main determinant. Certain eye diseases are also probably related to cumulative sun exposure. In designing strategies to prevent skin cancer, in particular, the complexities of these relationships need to be taken into account.

2.7 Implications for Prevention

• The epidemiological evidence implicates childhood exposure as an important cause of skin cancer. Exposure in adult life appears to be less important; few epidemiological studies have found strong associations between skin cancer and exposure. However, randomised trials in adults have shown that the use of sunscreens has an immediate effect on solar keratoses, which are strongly related to non-melanocytic skin cancer.

Thus, the epidemiological evidence suggests that strategies to reduce sun exposure in children are likely to have greater impacts on the incidence of skin cancer than are strategies to reduce exposure in adults. Accordingly, children should be the principal target of prevention programs. However, where possible, programs should also be directed at adults, partly because there is some evidence of late effects of sun exposure, but also because whole-community approaches are likely to be more effective.

• The epidemiological evidence suggests that exposure in the first decade of life is important in determining the lifelong risk of skin cancer. However, the data on the relative importance of childhood and adolescent exposure are derived largely from studies of migrants and cannot be taken to be definitive. However, exposure during childhood or adulthood should both be considered important.
• For many cancers, there is often a long time between exposure to a causative agent and their diagnosis. Smoking-related cancers, for example, occur most frequently in the elderly although most smokers commence smoking in adolescence and early adult life. Sun exposure and skin cancer follows this pattern.

• Because naevi are strongly related to risk of melanoma, and because they develop during childhood and adolescence, they may be useful as early biological markers of subsequent risk. Evidence that they are related to sun exposure is accumulating. If they are, they may be used to monitor future population risks of melanoma and to evaluate specific interventions directed at children. However, more evidence in the relationship between sun exposure and naevi is required before we rely heavily on them to evaluate prevention programs.

• The incidence of melanoma in males and females in Australia is similar. Thus, equal effort should be expended on prevention of melanoma in males and females. Males have a much higher mortality from melanoma than do females. These data indicate that early detection of melanoma in males needs to be targeted.

• The available evidence suggests, paradoxically, that use of sunscreens is associated with an increased risk of melanoma. However, these data are subject to substantial bias. At present, little can be concluded about the value of sunscreen to prevent cancer. However, randomised trials of sunscreen have shown that they can reduce the number of solar keratoses. Furthermore, they are also effective in preventing sunburn. Although sunscreens have a role in photoprotection, it is clear that this role is a secondary one to other forms of natural protection.

• Most skin cancer is due to sun exposure. Thus, we can confidently predict that keeping people out of the sun will prevent skin cancer. However, because of the complexity of relationship between sun exposure and melanoma in particular, focus should be on activities likely to give rise to intense, intermittent exposure to the sun.

2.8 Recommendations

It is recommended that:

1. The NHMRC note that the epidemiological evidence demonstrates the need to continue to focus on the prevention of UV exposure in childhood.

2. Further investigation is required of the natural history and dose response relationship between actual sun exposure and indicators, for example skin features like naevi, which are possible indicators of sun exposure, especially during childhood.
Acute pain management: information for consumers

Primary prevention of skin cancer in Australia
Section Three
Measuring Sun Exposure and Sun Behaviour

Along with measures of the occurrence of disease, measures of exposure to the sun and sun protection behaviours are the key outcomes for the evaluation of any primary prevention program. There are no universally accepted measures of these outcomes, or any of their components, nor is there any agreement on how to interpret measures made in different settings and locations. For example, a given absolute sun protection may be of more benefit to those living in a less harsh or lower risk environment. It is not currently known how much behaviour change is required before the majority of skin cancers are likely to have been prevented. This may mean that different levels of sun protection are accepted in different risk contexts. For example, it is likely to be the case that people living closer to the equator need to take more precautions on the whole. The evidence presented in this report suggests that, at least for hat wearing, they do take more precautions. The purpose of this section is to outline some of the issues involved, and to give a preliminary framework for the development of these measures.

The path of ultraviolet radiation (UVR) leaving the sun and striking a person’s body is influenced by a number of factors both physical and behavioural (see Table 3.1). Furthermore, the health effects of exposure are mediated both by the nature of the exposure and by a range of biological factors.

In principle, exposure can be changed through changing personal behaviours that affect exposure (including choices of protective aids). Structural changes can also affect UVR exposure directly (eg by reducing the depletion of ozone in the upper atmosphere) or indirectly (eg through provision of shade structures which will only be effective if people actually use them).

**Figure 3.1: UV exposure and its effects**

<table>
<thead>
<tr>
<th>Ambient UV level</th>
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</thead>
<tbody>
<tr>
<td>Modulated by time spent outdoors and sun protective behaviours</td>
</tr>
<tr>
<td>Determine UV exposure (dose to the skin)</td>
</tr>
<tr>
<td>Mediates biological effects of exposure (including skin cancer)</td>
</tr>
</tbody>
</table>

### 3.1 What Measures Do We Need?

In considering ‘measurement’, it is important to distinguish between measures of the radiation related to the environment, namely: measures of sun protection, that is, behavioural or other efforts to reduce sun exposure; measures of UVR exposure, that is, of the dose radiation received; and measures of biological effects, eg sunburn. All four kinds of measures are needed to assess the effectiveness of sun protection behaviour in reducing sun exposure.
3.1.1 Applications

There are three key tasks:

1. To document the distribution of sun protection practices, exposure levels, and/or biological effects throughout the population. Here, equivalent validity across the various sociodemographic groups of interest is critical.

2. To document changes over time in populations. This requires repeated sampling of populations with the same measures, and for the measures not to be subject to context effects.

3. To demonstrate causal links between interventions and change (or relative change) in UVR related outcomes. Ideally, this is done with the use of randomised controlled trials (RCTs) using measures that are robust to context effects. This is rarely possible. As a result, consideration should be given to the balance of evidence from all available sources, weighted according to quality and consistency. This includes demonstration of change, or rate of change associated with an intervention; demonstration of the causal power of component parts of the community-wide campaign; documentation of change in cognitive determinants targeted by the campaign, and attributions of influence to the campaign by the target population.

In behavioural, epidemiological or evaluative studies, the focus will usually be on the time spent outdoors and on sun protective behaviours. Sometimes these will involve component behaviours such as sunscreen use, at other times an aggregate behavioural index will be required. In assessing exposure, sun-related behaviours (e.g., sunscreen use) might also be required. However, in this case, it may be more important to know where and how well it was applied. Clearly, the characteristics that we require of a measure will depend on the particular application.

3.2 Sun Exposure Measures

3.2.1 Conceptualising measurement of sun exposure

In measuring sun exposure we need to consider four, conceptually different aspects of exposure:

- the total amount of exposure—also sometimes called total accumulative exposure, cumulative exposure, lifetime exposure, etc.;
- the period over which this exposure accumulated—it may be ‘lifetime’ or the period may be restricted to one which is considered more relevant to the purpose of the measurement, e.g., childhood;
- the pattern of exposure over time—the way in which the amount of exposure is distributed in the period over which it is being measured. For example, it may be intermittent (large amounts of exposure accumulating over short periods of time infrequently) or continuous (continuous accumulation with relatively little day-to-day variation in increments of exposure). The intermittent pattern may, for example, show variation on a weekly cycle (e.g., high exposure on weekends, low exposure during the working week) or a yearly cycle (e.g., high exposure during an annual summer holiday, little exposure at other times of the year); and
- the pattern of exposure by body site (e.g., the face and back of hands typically have the highest exposures).

For each of these fundamental measurement concepts there will be proxy measures that reflect the fundamental measurement with greater or lesser degrees of fidelity. For example, sunburn is often taken as a proxy for an intermittent pattern of exposure. Clearly, however, it also includes elements of total amount of exposure and also sensitivity of a person’s skin to UVR. A person’s current or usual frequency of sun exposure may be used as a proxy for total lifetime exposure or exposure over some recent period of time. Its accuracy as a measure of exposure over any period in the past will depend on the stability of the person’s exposure behaviour.

Other important factors that will have to be taken into account when considering the biological effects of sun exposure are those which determine how much UVR reaches the target tissue in a given period of time outdoors and the degree of natural protection that the tissue has against the effects of UV. These include:

- ambient UVR levels;
- the availability and use of shade in the local environment;
- external protection of the target tissue (clothing, sunscreens, etc.); and
- sensitivity to the sun of the individual’s skin or other target tissue.
3.2.2 Measuring sun exposure in different subgroups

It is unclear if instruments developed for a particular population subgroup can be used in a different subgroup. An obvious example is the extent to which a complex diary or even self-report might be used for younger children. Other subgroups of interest include urban and rural groups, and coastal and inland residents. Instruments developed for assessing recreational exposure may be quite inappropriate for assessing occupational exposure.

3.2.3 Ambient UVR level

This represents the severity of the hazard to which the person is potentially exposed. A number of factors influence the actual ambient UVR level, including:

- altitude and latitude (ozone depletion and air pollution);
- temporal factors, such as season and time of day;
- current weather conditions, such as cloud cover; and
- proximal environment, such as reflection and natural shade.

Further details are given in Section 2 of this report (see Table 2.1).

A network of fixed UVR monitors exists in Australia (Gies et al., 1994). These monitors provide an accurate measure of UVR reaching the ground where they are located. However, because UV levels are affected by factors like cloud cover and the reflective nature of the proximal environment, actual UVR levels may vary considerably even in locations that are close together. Hill et al. (1992) have found a relationship between UVR levels as measured at one site in Melbourne, and sunburn levels reported across the entire metropolitan area. This suggests that such monitoring sites have measurement utility for estimating exposure at a population level, especially when combined with behavioural data.

3.2.4 Personal UVR exposure

UVR exposure to the body varies by site in interaction with activity, orientation, sun protection measures, and the nature of the ambient UVR. There is now good evidence that exposure levels to different parts of the body vary greatly, independent of any sun protection measures (Holman et al., 1983). This variation is influenced by patterns of body orientation, for example orientation to the sun and function of activity engaged in (Herlihy et al., 1994). Exposure to unprotected skin is essentially a compound function of the direction and amount of UVR and the orientation of parts of the body to that UVR. This natural variation in exposure risk is made greater by usual patterns of protective behaviours eg clothing use.

There are two kinds of personal UV monitors: polysulphone badges, and electronic monitors which can be linked to data loggers (Diffey, 1989; Diffey & Saunders, 1995). The use of multiple polysulphone badges on individuals has shown that the potential UVR dose available at different sites of the body varies considerably. Studies using continuous monitors have also indicated that the potential exposure on a given site can vary on a moment-to-moment basis as an individual moves freely within outdoor environments. These methods can be used to measure potential exposure at meter sites and to compute activity-related exposure algorithms for body parts. Together, these can be used to estimate exposure patterns once ambient UVR levels, activity patterns and sun protection measures (eg sunscreen and clothing use) are known.

For estimation of long-term exposure, indirect measures are needed as direct observation and precise estimation are not possible. The indirect measures used include latitude and altitude, the outdoor-indoor profile of the person’s occupation, estimates of tendency to spend recreational activity outdoors and reported history of sunbathing or of sunburn.
3.3 Behavioural Influences on Sun Exposure

When we talk about sun protection behaviour, we are talking about a complexity of different types of behaviour. These include:

- active behaviours such as applying sunscreens, changing attire, moving into the shade, wearing sunglasses; and
- incidental behaviours, such as wearing clothes, having sunscreen on (these are background components of ongoing behaviour).

Behaviours that affect sun exposure vary in purpose ranging from those where exposure regulation is the prime purpose (e.g., application of sunscreens for sunbathing), through to those where it is an acknowledged part (e.g., wearing a hat on a picnic), to those where it is entirely incidental (e.g., clothing use for modesty).

A range of environmental factors influence individual sun protection behaviour, in some cases independent of intention to reduce UV exposure. For example, on mild sunny summer days in southern Australia, the air temperature may be such that it feels cold in the shade and much more pleasant in the sun, leading to greater sun exposure. By contrast, on a hot day comfort in the sun will be less and comfort in the shade greater, leading to greater sun protection. The finding of a curvilinear relationship between ambient temperature and risk of sunburn (Hill et al., 1992) could thus be due to factors that are independent of attempts to regulate UVR exposure. Motive (or reason for action) will affect the relationship between the availability and avoidability of sun protection possibilities and their use. For example, if UVR exposure is not an issue, then putting shade in a person’s path will result in them using it, but the person will not go out of their way to seek it.

There can be complex variations within specific active behaviours, including:

- the choice of materials in clothing as well as its design;
- the size of the brim of a hat;
- the sun protection factor of the sunscreen used and its regular re-application; and
- distribution and quality of shade which is influenced by such factors as reflection, the amount of diffuse sunlight and the blocking factor of the cover.

3.3.1 Measures of sun protection behaviour

Major types of measures are briefly described. More detailed discussion of these kinds of measures is available in Hill & Borland (1996).

1. **Observation of individual behaviour**: The observation can be via use of trained human observers (Diffey & Saunders, 1995) or be mediated by video camera or photographs (Borland & Theobald, 1990). It is only possible in some public situations, but is an objective and potentially very accurate form of measurement. To the extent that the observation is unobtrusive, it could be assumed to have no impact on the behaviour being observed, but where it is not unobtrusive, there is potential for reactive effects. Generally, it is likely to be difficult to collect more than small samples of data from any given individual.

2. **Diaries and cued recall**: These methods involve getting the person to record or report on their sun protection behaviour in various contexts. Such methods have been used successfully in descriptive and intervention studies (Cockburn et al., 1992; Girgis et al., 1993; Girgis et al., 1994). In principle, these reports are likely to be most accurate when they are made during or immediately after a period of behaviour. However, it is often difficult to guarantee that this happens. These methods are subject to reactive effects; for example, in intervention studies where the intervention groups are likely to know what they are supposed to be doing.

3. **Uncued retrospective reports of specific instances of behaviour**: These methods include interviewing people about their activities, over relatively short periods of time (e.g., outdoor activity in the day or two previously), and getting recall of behaviours undertaken and protection strategies that are used (Hill et al., 1992, 1993). The major problem with these methods is that they are subject to memory loss and recall biases because some sun protection behaviours are not highly salient. Comparison of observation data with percentages of reports of more salient observable sun protection practices, albeit within different studies, suggest that the reporting of behaviours is probably reasonably accurate, at least for observable behaviour.
4. **Reports of usual behaviour:** Sun protection behaviours are very much situation specific and often contingent on other protective strategies that are available. At least with younger people, reports of usual behaviour tend to overestimate observed behaviour (Bennetts, Borland & Swerissen, 1991) and such measures are probably best thought of as indices of behavioural tendency of what people think they do. For sun protection these are probably the weakest of all indices of behaviour.

### 3.4 The Physical and Regulatory Environment

Sun protection is affected by aspects of the physical environment. The availability of useable shade in parks, along footpaths and in other places where people congregate, influences shade use. The availability of indoor venues and indoor alternatives to outdoor activities influences the likelihood of spending time outside. It is important to better understand when and how people use structures and how this impacts on sun protection behaviour. Some steps have been taken to quantify sun protective aspects of outdoor environments (Scholfield et al., 1991), but much more work is needed.

Rules and regulation can also affect sun protection. These can range from: ‘no hat, no play’ rules at schools; governmental regulation governing the sale of sunscreens; policy governing the sale of sunscreens; to policy decision to resource shade provision. Encouraging appropriate regulation is an important tool of health promotion, but for sun protection at least, the effects of such activities have not often been systematically studied. Systematic attempts to document these policies or to document their impact on practices also has not occurred. A start has been made in some areas with attempts to document practices and policies in schools (Scholfield et al., 1991; Clarke, 1994) and in local government (Montague, Borland & Whitty, 1995a).

#### 3.4.1 Time spent outdoors

The most important behavioural influence on UVR exposure is time spent outdoors, so measuring of this is of critical importance. People go outside for different reasons: to spend extended time outdoors; to move between indoor settings; and to do tasks, for example, hanging washing on the line. It is likely that people’s awareness of the importance of sun protection will vary as a function of their reasons for being outside and the anticipated length of that period of exposure. For example, if people are going to spend a day at a sporting venue, they may be more likely to take protective actions than if they think they are only going out for two or three minutes. Being outside is observable in some (public) contexts, but it is often not possible to observe those people who are not outside.

### 3.5 UVR on the Skin

Ambient UV levels can be combined with an estimate of time spent outdoors, adjusted for the protective benefit attributable to the exhibited sun protective behaviours, to estimate the UV dose received by the skin. To do this it will be necessary to develop what might be called ‘Sun Protective Tables’ analogous to the food composition tables in nutritional epidemiology. These tables would provide adjustments/factors indicating the protective effects of the various protective measures such as the sun protection factor of sunscreens and various clothing materials, hats, etc. Some of this radiophysical research is currently underway.

### 3.6 Personal Sensitivity

Here the aim is to take into account the variation in the effect of a given dose of UV to the skin. For example, there is some epidemiologic evidence that the effect of a given dose of UV depends on a number of personal characteristics such as a person’s ability to tan, propensity to sunburn, skin, hair and eye colour, past exposure and existing skin damage, number of acquired naevi (moles) and level of tan.
3.7 Implications for Prevention

A comprehensive program of sun exposure reduction would be one which looked towards and coordinated changes on all fronts, but in a manner that assessed the relative costs and benefits of change in relation to risk reduction. It would also choose strategies known to be effective (where possible) and evaluate the effectiveness of the methods used.

The lack of measures in some areas: A systematic approach to the problem of exposure reduction requires extensive monitoring of determinants over time. In Australia at present there is very little national monitoring. There is a national grid of fixed UVR monitors but they are small in number. A range of measures have been developed which have potential to act as monitoring tools for sun protection or sun exposure, but most are not used for regular surveys. There is no national monitoring of sun protection behaviours, although in some States and Territories the sun survey protocol developed by Hill et al., (Girgis et al., 1993; Hill et al., 1993) has been applied with some regularity for those aged 14 years and above. The national secondary schools survey has a component which monitors reported usual sun behaviours, but there is no national data available on primary or pre-school children. Collecting data to demonstrate whether children and adolescents are still overexposed to UVR is a high priority. There is a need for a program of national monitoring and work to ensure the validity of the measures used.

Such a program should include the following:

- a review of all existing instruments in terms of their target group, validity and reliability, and the feasibility of their use;
- discussion of relevant issues for the development of suitable measures;
- an assessment of the adequacy of existing measurements and identification of gaps;
- systematic development of a suite of standard measures of established validity and reliability for relevant population subgroups and activities; and
- identification of the possible implications of using imperfect standard measures.

This research program will require input from epidemiologists, radiophysicists, behavioural and social scientists, and the range of professionals involved in the built and natural environments. The focus should be on:

- methods for collecting the required data;
- methods for the construction of aggregate indices where required;
- techniques for validating and verifying the reliability of measures;
- assessment of comparability with existing data; and
- mechanisms to promote the use of standard measurements.

3.8 A Broader Outcomes Framework for Primary Prevention Programs

Sun protection needs to be conceived from a broad outcomes framework. This broader framework includes other structural or environmental measures, such as sun safe policies in schools and the workplace, and the organisation of outdoor activities. However, it should be noted that this broader framework does not occur without cost. These opportunity costs include, but are not limited to, those incurred by the person, society or environment. These costs to society need to be monitored and analysed to determine overall benefit.

Such a broader framework includes measures at different levels based on a program logic approach, for example, in the New South Wales Health Promotion Strategic Plan (1995) ‘Skin Cancer Control in New South Wales’, an extract of which is provided in Appendix A. The New South Wales document was developed in relation to a strategic planning process and it forms the basis for a broader structure of outcome measures for primary prevention which could be used to extend beyond the research program proposed in this section. Other examples are to be found in Section 5.
3.9 Recommendations

It is recommended that:

3. Further research be undertaken to develop more effective population measures of sun exposure, particularly with respect to monitoring sun exposure of children, including infants.

4. Australian cancer prevention research teams initiate a project to establish consensus on the viability of uniform indicators of success in intervention studies, including the development of a comprehensive, sensitive index of behaviour change that accounts for the different recommended primary prevention behaviours. If a consensus on its viability is agreed, work should proceed.

5. Researchers estimate the average exposure to UVR in Australians across various geographic strata and estimate how this relates to probable exposure patterns for people at higher latitudes in other countries where skin cancer is less of a problem (except perhaps among those frequently holidaying in high UV destinations).

6. Further research be undertaken into the relationship between self-report measures of exposure and other more objective measures, for example video recording of behaviours or polysulphone badges attached to body parts.

7. Australian Institute of Health and Welfare (AIHW), in conjunction with groups already active in the field, instigate a national program to monitor both behavioural and structural sun protective measures, building on work already done.

8. Evaluation of sun protection programs be multiphasic, addressing the shorter term direct effects such as knowledge, attitudes and behaviours; the less direct effects such as a change in naevi and skin damage; and eventually, the long-term effects such as reduction in the incidence of melanoma.
Section Four
Primary Prevention Behaviours

4.1 Introduction

‘While an inherited pale skin renders some people more susceptible to skin cancer, the development of skin cancer is largely behaviour determined.’ (Stern et al., 1986, p538)

Primary prevention is concerned with the identification of risk factors and reducing or removing them so that the disease does not develop. The epidemiological literature emphasises the considerable influence of ultraviolet radiation on the incidence and mortality of melanoma in Australia. Therefore, the priority for primary prevention in Australia should be to focus on reducing the risk associated with those factors, most notably sun exposure. Primary prevention of skin cancer is the attempt to reduce a person’s exposure to the known risk factors of skin cancer through environmental changes, social changes and behavioural modification to increase personal protection, such as wearing hats, using sunscreen and staying in the shade.

4.2 Sun Protective Behaviours

In recognition of the high rates of skin cancer, the National Health Goals and Targets for Australia (Commonwealth Department of Human Services and Health, 1994) recommends a reduction in exposure to sunlight for all, especially those people at high risk of skin cancer. Included in this group are those people whose skin burns and never tans, those who have a large number of acquired melanocytic naevi and freckles, those who have dysplastic naevi, and those who have solar keratoses (see Section 2). Those who have more than one of these characteristics are at even greater risk.

4.2.1 Sunscreens

The Australian Cancer Society (1993) recommends that ‘natural’ protection is the best form of protection. This includes creating shade by planting trees or constructing other canopies and rescheduling work practices and sporting times and other similar activities. They suggest that sunscreens should be an adjunct to natural protection, and not a substitute for it.

Sunscreens do offer an alternative means of protection for situations where clothing may not be desirable or appropriate. Sunscreens are given a Sun Protection Factor (SPF) to indicate the degree to which they protect against sunburn. The SPF relates specifically to the increase in the dose of UVR necessary to induce sunburn when skin is protected by sunscreen compared with the dose necessary for unprotected skin. Sunscreens absorb UVR and in some cases also physically reflect radiation. Stenberg and Larko (1985) examined the effectiveness of sunscreen as a method of primary prevention for skin cancer. They found that when subjects applied sunscreen to themselves, there was considerable variation in the thickness and therefore the effectiveness of the sunscreen. On average, the sunscreen provided only about half the protection as indicated by the SPF on the container. Stenberg and Larko suggested that cost may be a barrier to sunscreen use and contributes to reducing the effectiveness of sunscreen as a protective measure against skin cancer. They found that subjects used twice as much sunscreen when it was provided free of charge, compared to reported usage rates of purchased sunscreen. Additionally, thin application of sunscreen or minimisation of the areas of application may also be used as a strategy to minimise cost and will increase the risk of sunburn in a context where the person may not be aware that they are inadequately protected.

Stenberg and Larko (1985) recommended that skin protective clothing should be the first choice of protection and that sunscreen should be applied only to those areas not covered by clothing.
4.2.1.1 Epidemiological reasons

The current very high incidence and mortality rates of skin cancer in Australia have been attributed to population exposure to sunshine in general. They have not occurred as a result of exposure to only specific subgroups of the solar spectrum.

Laboratory based research has centred on which specific wavelengths within the solar spectrum might be responsible for the induction of tumours. For SCC, this has been shown in experimental animals in the laboratory to be within the UVB spectrum. For BCC and melanoma, it is not entirely clear, as there are no satisfactory laboratory animal models.

In humans, the UV ray spectrum has been implicated as the major component of the solar spectrum responsible for each of the three common types of skin cancer. UVB has been suggested as the major problem, with some possible contribution from UVA. Nevertheless, the exact contribution of each of the wavelengths and whether or not the remaining solar spectrum is important in either initiating or promoting the effects of the UV spectrum in humans is not entirely clear.

Although sunscreens are tested for protection against burning, they are usually not tested for their capacity to prevent UVR carcinogenesis. Gallagher (1988) tested two sunscreens and found that neither protected totally against UVR. He concluded that there was a need for more rigorous testing of sunscreens to answer such questions as how much protection they provided against skin cancer, the possible effect of the sunscreen ingredients on the skin, and changes that might occur to sunscreen over periods of time (shelf-life) and whether this would change their protective benefits or cause any problems.

In a number of epidemiological studies, use of sunscreens, particularly recent use, has been associated with increased risks of melanoma (eg Autier et al., 1995) and non-melanocytic skin cancer (Kricker et al., 1995b; Hunter et al., 1990). However, in the Geraldton study, the risk of BCC was also increased in people who wore hats in the 10 years before diagnosis, suggesting that the association is an artefact resulting from people at high risk taking action to protect themselves from the sun.

This type of confounding is extremely difficult to overcome in case-control and cohort studies, and it is unlikely that such studies will be able to estimate the effectiveness of protective devices and behaviours. For that, randomised trials are necessary. While no randomised trials of skin cancer prevention by use of sunscreens have been reported yet, two trials have shown that sunscreens can prevent solar keratoses (Naylor et al., 1995; Thompson et al., 1993), which are strongly associated with risk of non-melanocytic skin cancer.

For these reasons, the public health approach to skin cancer control has always been to reduce exposure to the total spectrum until we know in more detail which specific components are the offenders. Sunscreens block out only a proportion of this spectrum, particularly within the UV range. The extent to which they do so varies across the wavelengths even within the UV range.

Therefore, natural protection including avoidance of the sun around the middle of the day, the use of clothing, hats and seeking shade from a variety of shade producing structures are recommended. They filter out the whole of sunlight because these are physical barriers to sunlight. Natural protection therefore has been recommended as the first approach to primary prevention of skin cancer.

Sunscreens block out only a proportion of the wavelengths within the UV spectrum and have been recommended as an adjunct to natural protection. They are to be used only when there is difficulty in providing physical barriers to sunlight.

4.2.1.2 Behavioural reasons

With physical barriers, such as clothing, it is easy to determine whether the physical barrier is in place and whether or not it remains there after time. That is because they are visible barriers. This ability to see the product in place does not exist with most sunscreens.

SPF numbers are a laboratory grading worked out on a specific amount of the product being applied to a specific area of skin. This is very rarely, if ever, replicated in practical use in the community. There are now data showing that frequently in practice the amount applied by the public is not the same as that which is used in the laboratory. It has also been shown that the products are not applied evenly over all areas requiring protection. It is not uncommon for areas of skin to be completely missed during the initial application. This does not become apparent until 12 to 24 hours later when sunburn appears in the area missed. The fact that sunscreen is not covering an area satisfactorily is not apparent, as there is no measure of how much or what area is covered when these products are applied. They cannot be seen on the skin.
Perspiration, frequently touching the skin, rubbing of hats or clothing can also remove sunscreen which initially had been applied satisfactorily. There is no way that an individual can determine whether or not the sunscreen that might have been initially applied adequately is still present and has not been removed to any extent two hours later.

For all these reasons, sunscreens are not seen as a primary resource for photoprotection.

Cost may be a barrier to sunscreen use, particularly given the recommended two hourly re-application of sunscreen when out in the sun. As sunscreens do not attract sales tax, opportunities by government to reduce the cost of sunscreen are not available to consumers.

4.2.1.3 Medical reasons

The long-term application of sunscreen does have some theoretical concerns. These products contain a wide variety of both organic and inorganic chemicals. The long-term safety data related to application of these products are not available in many instances. Many of them have only been developed within the last 20 years. Recent data have shown that at least 15 per cent of people who used a commonly dispensed sunscreen in Australia developed an inflammatory reaction within one or two months of applying it regularly. This is an acute and short-term response which would be sufficient to prevent its use. For this reason and the fact that we don’t have long-term safety data, the logical approach is to use these products in conjunction with other methods of photoprotection such as the use of hats, clothing and shade apparatus and avoiding the sun in the middle of the day.

4.2.2 Clothing

In considering clothing as a form of natural protection, it has been demonstrated that the protective effect of textiles can vary, depending on a range of factors including fabric construction, fibre type, colour, presence of additives and whether or not the clothing is wet (Pailthorpe, 1994; Gies, Roy, Elliot and Wang., 1994).

The tighter the weave of the fabric, the less UVR is transmitted to the skin (Welsh & Diffey, 1981). Fabric protection will vary depending on fibre types, e.g. bleached cotton and viscose provide less protection than do fibres such as lycra. However, more UVR transmission occurs when a fabric is stretched (Australian Radiation Laboratory, 1994a). Fabric dyes also influence a fabric’s protective ability, specifically, the darker the colour, the more protective it is. UV absorbing additives can increase protection afforded by a fabric, so long as it is ‘fast’ to washing and sunlight (Pailthorpe, 1994). Jetvic (1990) demonstrated in vivo that the protective effect of fabrics is significantly reduced when wet.

Given the variability in protection offered by different fabrics, the Ultraviolet Protection Factor (UPF) rating scheme has been developed by the Australian Radiation Laboratory to describe the relative amount of protection. Fabrics are rated in a similar manner to sunscreens, however, the range extends from 10 to 50+ for fabrics compared to 2–15+ for sunscreens. A UPF 15+ shirt provides the same protection as a SPF 15+ sunscreen properly applied (Australian Radiation Laboratory, 1994b). As a consequence, a label informing consumers of the sun protection capability of a particular garment can now be attached to clothing.

4.2.3 Other forms of personal protection

The efficacy of other forms of personal protection varies according to their design. According to the Australian Radiation Laboratory (1994b), wearing a hat with a brim of about 8 cm reduces the solar radiation dose to the face by one-third. Baseball style caps provide less protection. Legionnaire caps provide good protection to the face, ears and neck. Sunglasses sold in Australia must comply with Australian Standard AS 1067 ensuring the lens is protective. Sideshields on sunglasses reduce the amount of UVR entering the eyes from the side. It has been demonstrated that wearing sunglasses reduces the amount of UVR to the eyes by 80 per cent and if a wide-brimmed hat is also worn, the UVR to the face is reduced by 65 per cent (Gies, Roy & Elliot., 1992).

4.2.4 Shade

Shade structures and trees can reduce the level of direct exposure to UVR. Various shade and roofing materials have differing protective properties. Shade cloth, for example, acts as a physical barrier and its UPF factor varies from 2 to as high as 20 (that is, more than 95 per cent UVR is absorbed). Most awning materials, transparent and opaque plastic sheeting and umbrella materials have UPF ratings of 50+. The protection afforded by window glass varies depending on tinting and glass type. For example, car side windows have a UPF rating of 12, while car windscreens (laminated) have a UPF rating of 50+ (Australian Radiation Laboratory, 1994b).
The total level of protection is also strongly influenced by the level of indirect exposure/reflection from the surrounding surfaces in the environment (Gies, Roy & Elliot, 1992). For example, grass has a mean reflectance of 1.1 per cent, while concrete and beach sand have a reflectance of 6.6 per cent and 9.4 per cent respectively (Department of Architecture, 1995).

### 4.3 Primary Prevention Surveys

A large number of studies have investigated the primary prevention activities of population groups and specific target groups in Australia and overseas. A summary of these studies can be found in the tables attached.

Children in both Australia and overseas, whilst spending considerable time in the sun, have been found to use inadequate levels of sun protection. Parental sun protection behaviour was found to be one of the main influences on young children’s behaviour.

Adolescents tended to spend more time in the sun and were influenced more than other age groups. Although their knowledge of sun protection issues was high, their use of sun protection methods was low. The type of sun protection favoured by adolescents depended on their perceptions of acceptability and fashion. Males were less likely than females to protect themselves from the sun.

Although the use of sun protection measures by adults is relatively low, there is evidence to suggest that their behaviour and attitudes are improving. As with adolescents, adult females’ use of sun protection methods is greater than that of males, although males are more likely to wear hats and females more likely to wear sunscreen.

While information from surveys on protection behaviours is available for adults, secondary school children and primary school children, little data is available on the sun protection behaviours of young children and their parents and caretakers.

The majority of the studies described in this section rely on self-reported behaviour. Self-report is commonly acknowledged as a limitation of many attempts to evaluate primary prevention (Hill et al., 1992; Bennetts et al., 1991; Borland et al., 1990). However, Hill et al. (1990) found that self-report is correlated with actual behaviour. Similarly, Girgis et al. (1993) indicated that self-report by primary school students was generally a valid measure of solar protective behaviour, a finding replicated by Girgis et al. (1994) in a study of outdoor workers. Furthermore, intentions have been correlated with usual behaviour, and this relationship has also been used to legitimise the use of self-reports versus objective measures of exposure, by arguing that increased levels of reported usual behaviour are likely to translate into some actual behavioural change (Borland, 1990). However, it has been suggested that self-report may overestimate actual protective behaviour (Bennetts et al., 1991). In a study of beachgoers, Bennetts et al. (1991) also found consistencies between self-reported and observed behaviour for those using skin protection, but inconsistencies for those not using skin protection.

### 4.4 Recommendations

It is recommended that:

9. Sun protection programs continue to emphasise that sunscreens are an important adjunct, but not a substitute, for other forms of protection such as staying out of the sun in the middle of the day, use of shade and wearing protective clothing.

10. Sun protection programs should include consumer education campaigns on how to correctly use sunscreens.

11. Sun protection programs continue to focus on increasing availability and accessibility of protective measures, reducing barriers to sunscreen use, making sun-safe clothing more acceptable and modifying outdoor activity during hours of high radiation.
### Table 4.1: Children—Australia

<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Objective</th>
<th>Participants</th>
<th>Findings</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bennetts et al.,</td>
<td>To measure sun protection behaviour at the beach during summer.</td>
<td>50 children and 68 parents in Victoria.</td>
<td>• Most parents and children inadequately covered.</td>
<td>• Self-report may overestimate actual behaviour.</td>
</tr>
<tr>
<td>(1991)</td>
<td></td>
<td></td>
<td>• Children’s cover influenced by parents’ level of cover and child’s tan level.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Children better protected than their parents.</td>
<td></td>
</tr>
<tr>
<td>Foot et al.,</td>
<td>Explore the prevalence and predictors of solar protection behaviour.</td>
<td>670 people (children and adults) at beaches in Newcastle district, NSW.</td>
<td>• Significantly greater proportion of 0–9 year olds were better protected than 11–14 year olds.</td>
<td>• Need for interventions to target potentially high risk groups, including</td>
</tr>
<tr>
<td>(1993)</td>
<td></td>
<td></td>
<td>• No gender difference in the use of sun protection measures by children under 15 years old.</td>
<td>school-aged children.</td>
</tr>
<tr>
<td>Schofield et al.,</td>
<td>Investigate solar protection issues for schools.</td>
<td>Principals (n=40) and direct observation of students in primary schools (n=20) in NSW.</td>
<td>• Minimal level of solar protection in schools.</td>
<td>• Structural and environmental change is needed to maximise opportunities for solar protection in schools.</td>
</tr>
<tr>
<td>(1991)</td>
<td></td>
<td></td>
<td>• Considerable levels of time spent out in the sun.</td>
<td></td>
</tr>
</tbody>
</table>
### Table 4.2: Children—Overseas

<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Objective</th>
<th>Participants</th>
<th>Findings</th>
<th>Implications</th>
</tr>
</thead>
</table>
| Grob et al., (1993) | Study sunbathing habits in children (and adolescents). | 150 children (3 year olds) in Marseilles, France. | • Adequate sun protection measures used by 63 per cent of children.  
• One-third of children were highly overexposed.  
• Good sun protection habits of parents were predictors of acceptable sun exposure in children. | • Primary target of campaigns should be parents, since they not only control children, but serve as examples. |
| Jarrett et al., (1993) | Look at practices of mothers in protecting children from sun, and the incidence of sunburn among these children. | 200 mothers attending Sunderland Hospital, England. Information on 416 children obtained. | • 68% of children aged less than 10 were exposed to the sun at least once over past year without a shirt.  
• 55% of children aged less than 10 used sunscreen at least once in last year.  
• 65% of children aged less than 10 wore a hat in past year. | • Need for more public education about the dangers of sunlight, particularly children. |
### Table 4.3: Adolescents—Australia

<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Objective</th>
<th>Participants</th>
<th>Findings</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadstock et al., (1992a)</td>
<td>Explore the relationship between level of suntan and perceptions of healthiness and attractiveness.</td>
<td>191 secondary school students in Year 9, Victoria.</td>
<td>• Perceptions of both healthiness and attractiveness were affected by level of suntan. • Gender affected perceptions of attractiveness but not healthiness.</td>
<td>• Student’s attitude to suntans is a barrier to skin cancer control campaigns designed to encourage reduced exposure to the sun.</td>
</tr>
<tr>
<td>Broadstock et al., (1996)</td>
<td>Measure knowledge, beliefs and attitudes of self-reported usual behaviour about suntanning and sun protection.</td>
<td>5 004 students from 72 secondary schools in Victoria.</td>
<td>• 66% reported being sunburnt during previous summer. • Females scored higher knowledge than males. • Knowledge levels increased with age. • Reported behaviour best among 12 year olds, declining with age to around 15.</td>
<td>• More research required to understand the relationship between knowledge and attitude and behaviour in adolescence.</td>
</tr>
<tr>
<td>Cockburn et al., (1989)</td>
<td>Determine the prevalence of the use of sun protection measures in adolescents.</td>
<td>3 002 students in Years 9 and 10 from 26 secondary schools in New South Wales.</td>
<td>• 40% of students defined as being adequately protected. • Male students less likely than females to use sun protection methods.</td>
<td>• Interventions are likely to be effective if they are targeted at modifying specific beliefs, peer images and parental influences.</td>
</tr>
<tr>
<td>Fisher et al., (1996)</td>
<td>Measure knowledge, attitudes and behaviours in relation to the sun.</td>
<td>3 655 students in Years 7, 9 and 11 from 55 schools in Queensland.</td>
<td>• Significant associations between reported sun protective behaviour (hat and sunscreen use) and grade, gender, day of week and mother’s sun protective behaviour.</td>
<td>• A range of innovative strategies will be needed to reinforce positive sun protective behaviour acquired at primary school.</td>
</tr>
<tr>
<td>Gillespie et al., (1993)</td>
<td>Measure knowledge, attitudes and behaviours in relation to sun protection.</td>
<td>3 655 students in Years 7 to 11 attending 55 schools in Queensland</td>
<td>• All students had a high knowledge of sun protection. • Most students perceive their risk of skin cancer to be as high as it was. • Little resistance to hats and sunscreen use, more resistance to use of clothing.</td>
<td>• Interventions need to appeal to adolescents’ interest in their appearance and conforming to the peer group.</td>
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### Table 4.3: Adolescents—Australia (continued)

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<tr>
<th>Authors (Year)</th>
<th>Objective</th>
<th>Participants</th>
<th>Findings</th>
<th>Implications</th>
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</table>
| Lowe et al., (1993)     | Study sun-related attitudes and beliefs.        | 3,655 students in Years 7 to 11 attending 55 representative schools in Queensland. | • Knowledge of risk factors and role of sun protective measures was high.  
• Potential barriers included desire to be tanned, perceived peer attitudes and difficulties with use of particular sun protection methods.  
• Barriers more prominent among males and older students.                                                                 | • Educational interventions may need to focus on specific health-related issues and not on general self-esteem or self-improvement issues. |
| Pratt & Borland, (1994) | To find predictors of adolescents’ sun protective behaviour. | 92 adolescents aged 15–20 years at the beach (in Victoria) during summer. | • Most adolescents had inadequate protection from sun.  
• Dark current tan levels and intention to sunbake were predictors of low levels of sun protection.  
• Reported behaviour best among 12 year olds, declining with age to around 15.                                                                 | • Adolescents are not adequately modifying their behaviour to match the degree of risk to which they are exposing themselves. |
| Schofield et al., (1991) | Investigate solar protection issues for schools. | Principals (n=37) and direct observation of students in secondary schools (n=20) in NSW. | • As found in primary schools (above), there was minimal level of solar protection in secondary schools.  
• Considerable levels of time spent in sun.                                                                 | • Structural and environmental change is needed to maximise opportunities for solar protection in schools. |
### Table 4.4: Adolescents—Overseas

<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Objective</th>
<th>Participants</th>
<th>Findings</th>
<th>Implications</th>
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</table>
| Banks et al., (1992)   | Measure levels of sunscreen use and beliefs about sun protection.          | 220 paediatric patients aged 12–19 years from Virginia, United States. | • Although 81% spent most weekends in the sun, 9% always, and 33% never, used sunscreen.  
• Females more likely to use sunscreen.                                                                                                           | • The absence of sunscreen use for those at high risk may be symptomatic of risk taking behaviour in adolescents.                                                                                               |
| Grob et al., (1993)    | Study sunbathing habits in adolescents (and children).                    | 200 adolescents from secondary schools in Marseilles, France. | • Adequate sun protection measure used by only 38% of adolescents.  
• Predictive variables were sun protection habits of the father and sunbathing only to obtain a tan.  
• Many were reasonably well-informed, but considered the risk of sun exposure exaggerated by the media.                                                                 | • The public’s obsession with tanning must be overcome.  
• Parents act as role model for adolescent sun protective behaviour, and hence should be targeted by campaigns.                                                                                          |
| McGee & Williams, (1992) | Examine adolescents sun behaviours, attitudes and use of sun protective measures. | 345 students aged 13–15 years from 20 schools in New Zealand. | • High awareness of the danger of melanoma.  
• Significant proportion with positive attitudes towards tanning and high levels of sun exposure without adequate sun protection.  
• Exposure to information correlated with melanoma awareness which predicted the use of sun protection measures.                                                                 | • Continued efforts need to be directed at adolescents to increase the acceptability and use of sun protection measures.                                                                                      |
| Vail-Smith & Felts, (1993) | Assess knowledge, attitudes and behaviours regarding intentional sun exposure. | 296 Caucasian students at a public University in southeastern United States. | • Frequent sunbathers more likely to be female and reported fewer self-perceived risk factors, and less likely to use sunscreen.  
• Concern with attractiveness appears to be a major motivation for frequent intentional sun exposure.                                                                 | • Educational strategies that stress only health outcomes may be less effective than those that also stress the detrimental cumulative effect of suntanning.                                                |
| Wichstrom, (1994)      | Explore levels and predictors of sun protective behaviour.                | 15 169 students aged 16–18 from across Norway. | • Although 90% used sunscreen, only 25% used adequate SPF, and 50% re-applied while bathing.  
• Females sunbathed more often and longer than males.                                                                                           | • Important that primary prevention programs are gender appropriate.                                                                                                                                       |
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<th>Authors (Year)</th>
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<th>Participants</th>
<th>Findings</th>
<th>Implications</th>
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<tbody>
<tr>
<td>Baade et al., (1996)</td>
<td>Describe changes in skin protection attitudes and outdoor behaviours.</td>
<td>4 016 people interviewed by telephone in summer during 1988/89 and 1991/92.</td>
<td>• Significant improvements in some skin protection attitudes.</td>
<td>• The reduction of sunburn should be a primary focus of skin protection campaigns.</td>
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<td></td>
<td>• Significant improvements in time spent outside, hat and sunscreen use, use of shade and overall skin protection.</td>
<td>• The generalisability of this and similar studies may be limited due to environmental and climatic differences.</td>
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<td></td>
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<td>• Recent sunburn experience remained unchanged.</td>
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<tr>
<td>Bennetts et al., (1991)</td>
<td>Measure the observed and self-reported sun protection of parents (and children) at the beach.</td>
<td>68 parents at the beach during summer in Victoria.</td>
<td>• Most parents were inadequately covered against the sun.</td>
<td>• There is a need for parents to increase the use of sun protection on the beach.</td>
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<td>• Parents thought that it was important to protect their skin against the sun.</td>
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<tr>
<td>Borland &amp; Theobald, (1990)</td>
<td>Quantify aspects of sun protection behaviour at a major sporting event using photographs.</td>
<td>863 individuals photographed in sections of the crowd at the Australian Open Tennis Championships.</td>
<td>• A high percentage of people were wearing hats, shirts and had their legs covered.</td>
<td>• For this activity, people were generally protecting themselves from the sun.</td>
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<td>• Most people were using at least moderate levels of sun protection.</td>
<td>• Photographs can provide a useful method to monitor trends in sun protection.</td>
</tr>
<tr>
<td>Broadstock, (1991)</td>
<td>Study sun protection methods of spectators at a cricket match.</td>
<td>246 spectators at the Melbourne Cricket Ground, Boxing Day, 1990.</td>
<td>• 71% were wearing hats, 34% wearing hats that provided maximum sun protection.</td>
<td>• Most spectators are “covering up”; there is more room for improvement.</td>
</tr>
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<td>• Over half were wearing sunscreen.</td>
<td>• Females’ sun protection measures were more appropriate.</td>
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<td>• Most were wearing shirts that covered their shoulders.</td>
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### Table 4.5: Adults—Australia (continued)

<table>
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<tr>
<th>Authors (Year)</th>
<th>Objective</th>
<th>Participants</th>
<th>Findings</th>
<th>Implications</th>
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</table>
| Chapman et al., (1992) | Rate the sun protective example provided by fashion magazines.           | 3 971 photographs from midsummer editions of six Australian fashion magazines, 1982–83 to 1990–91. | • An increase in the proportion of light tans.  
• Increase in proportion of models wearing hats.  
• Three quarters of outdoor photos were taken in unshaded settings.  
• Female models more likely to wear hats in unshaded settings. | • There is an indication that suntans are now being perceived as less fashionable |
| Cody & Lee, (1990)   | Investigated knowledge, behaviours and health beliefs regarding skin cancers. | 312 Australian University students.                                            | • Skin type, previous experience with skin cancer, and perceived barriers, were significant predictors of knowledge, intention and behaviour.  
• Skin protection intentions increased significantly after viewing one of two videos. | • Video presentations had a positive impact on knowledge and intentions relating to skin cancer prevention. |
| Foot et al., (1993)  | Explore the prevalence and predictors of solar protection behaviour.      | 670 beachgoers sampled from six beaches in Newcastle.                         | • Nearly half of the sample were using a high level of solar protection.  
• Sunscreen was applied to at least one part of the body by 69% of the sample.  
• Marital status and skin self-examination over the last 12 months were predictors of overall level of solar protection. | • Need for information on appropriate or most effective modes of sun protection.  
• There is a need for interventions to target potentially high-risk groups. |
| Hill et al., (1984)  | Determine specific beliefs related to intention to engage in skin cancer precautions. | 150 adult volunteers contacted through places of employment in Victoria.     | • Important sex differences, as well as similarities, were discovered in the beliefs related to the precautionary intentions.  
• Certain beliefs appear to be targets for factual based approaches, others require a more indirect approach. | • Guidelines for a segmented health strategy are suggested.  
• More indirect strategies could be tried to increase the use of skin protective behaviour. |
### Primary prevention of skin cancer in Australia

#### Table 4.5: Adults—Australia (continued)

<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Objective</th>
<th>Participants</th>
<th>Findings</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hill et al., (1992)</td>
<td>Determine the independent contribution of behavioural factors to the occurrence of sunburn.</td>
<td>1,655 adults in Melbourne, Victoria surveyed during summer, 1987/88.</td>
<td>• UV radiation, temperature, sensitive skin, type youth and being male were independently associated with sunburn. • After controlling for all other predictors, body exposure index made a strong independent contribution to the explanation of sunburn.</td>
<td>• Behavioural change strategies to prevent malignant melanoma of the skin are warranted.</td>
</tr>
<tr>
<td>Hill et al., (1993)</td>
<td>Determine trends in exposure to sunlight.</td>
<td>4,428 adult residents in Melbourne, Victoria during the three summers of 1987/88–1989/90.</td>
<td>• Reduction in reported sunburn. • Substantial attitudinal shifts. • Hats and sunscreen use increased.</td>
<td>• Sun exposure of populations can change fairly rapidly, and that well conducted health promotion campaigns can contribute to such change.</td>
</tr>
<tr>
<td>Pincus et al., (1991)</td>
<td>Assess the prevalence of sunscreens in an environment of high UV exposure.</td>
<td>243 individuals on beaches in southeast Queensland during March, 1989.</td>
<td>• Nearly three quarters of the sample applied sunscreen, half of whom used maximum SPF sunscreen. • Major reasons for use were to avoid skin cancer and to avoid sunburn.</td>
<td>• More subtle aspects of efficacious sunscreen use in education campaigns may be required.</td>
</tr>
<tr>
<td>Whiteman et al., (1994)</td>
<td>Determine the prevalence and determinants of sun protection practices.</td>
<td>105 non-Aboriginal people attending a weekend market in Darwin, Northern Territory.</td>
<td>• Sunscreen and hat use were low. • Hat and sunscreen use was higher amongst those with a history of skin cancer. • Long-term residents of Northern Territory were less likely to apply sunscreen.</td>
<td>• Sun protection practices of visitors to Northern Territory are less than optimal. • Precautions against sun exposure amongst residents of Northern Territory could be greatly improved.</td>
</tr>
<tr>
<td>Authors (Year)</td>
<td>Objective</td>
<td>Participants</td>
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<tr>
<td>Berwick et al., (1992)</td>
<td>Examine the associations among attitudes, knowledge and behaviour of skin cancer screenees.</td>
<td>214 individuals who attended a skin cancer screening clinic in Connecticut, 1988.</td>
<td>• Attitudes towards tanning were not correlated with knowledge or behaviour.</td>
<td>• More targeted education in the domain of knowledge would benefit males and those over the age of 59.</td>
</tr>
<tr>
<td>Campbell &amp; Birdsell, (1994)</td>
<td>Measure sun-related knowledge beliefs, occupational and recreational exposure and protective behaviours.</td>
<td>3,843 adults aged 35–64 years in Alberta, Canada.</td>
<td>• Less than half were likely to routinely use sun avoidance, protective clothing, hats or sunscreen.</td>
<td>• Clear need for modification of public’s belief and sun protection behaviours.</td>
</tr>
<tr>
<td>Keesling &amp; Friedman, (1987)</td>
<td>Empirically examine psychosocial factors in sunbathing and sunscreen use.</td>
<td>120 beachgoers in California.</td>
<td>• Sunbathing related to risk taking, knowledge of skin cancer, relaxed mood, peers and attempts to maintain positive physical appearance.</td>
<td>• Beliefs, attitudes and norms of high risk groups regarding sunscreen use should be investigated to design interventions to decrease skin cancer incidence.</td>
</tr>
<tr>
<td>Johnson &amp; Lockingbill, (1984)</td>
<td>Evaluate sun exposure habits and beliefs, and the use of sunscreen.</td>
<td>489 medical clinic outpatients in Pennsylvania, during 1982.</td>
<td>• Men, and those aged over 30, had the greatest level of sun exposure.</td>
<td>• These is still a need for educational efforts, those in the pre-contemplative and contemplative phases of behaviour can be recruited to take action.</td>
</tr>
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Section Five
Evaluated Intervention Programs

5.1 Australia

Australian States and Territories have implemented a range of skin cancer prevention programs focusing on different sectors of the community, and the aim of a substantial proportion of these programs has been to improve sun protective behaviours amongst young children and teenagers. In this section, the scope of programs implemented in Australia in recent years is reviewed. A number of those programs which had established a comprehensive evaluation strategy were selected as case studies. The Australian case studies, and a selection of interventions conducted overseas were used to provide information on the impact and effect of skin cancer prevention intervention programs.

The Working Party sought information from all State governments and State-based cancer societies to establish both the scope and impact of these programs on the community. A list of the primary prevention programs conducted in each State, based on the information provided by these sources, can be found in Appendix B. As this list demonstrates, not all programs have been evaluated, and even fewer have published their results in peer review journals. Therefore, the Working Party found it necessary to use a case study approach in order to gain insight into the impact and effect of these programs.

5.1.1 Scope of Australian programs

Most States and Territories have implemented media-based sun protection campaigns focusing on the general community, specifically adults and young people. While such campaigns may have reached parents, few campaigns have been directed specifically toward advising parents about the protection of young children. State campaigns have been supplemented with local activity to varying degrees.

The NHMRC (1997) has identified that school health programs need to focus on curriculum, school environment, health services, and partnerships between schools, community, parents and private or government organisations. These factors need to be integrated with supportive school policy structures.

With respect to sun protection, all States (except Northern Territory, for which information was not provided) have worked with schools to develop sun protection policies. Schofield et al. (1991) reported that such policies are better established in primary, rather than secondary schools. Further, despite policies being established in 64 per cent of primary schools, one of the most important features of such a policy—the ‘no hat, no play’ policy—was observed in only 13 per cent of schools surveyed. Development of curriculum, and promoting the construction of shade structures are some of the strategies pursued in local programs.

It is recognised that effective health promotion in schools should be comprehensive in concept and content, and not focused only on single issues (Effective School Health Promotion: Towards health promoting schools, NHMRC, 1996). On that basis, sun protection programs in schools should be linked with other school health initiatives.

The issue of sun protection has been included in the national child care accreditation guidelines (National Child Care Accreditation Council, 1993) in New South Wales and Queensland. Programs exist in a number of States and Territories, for example, New South Wales and Queensland, which work with child care centres in promoting a comprehensive response to prevention of UV exposure of children in this setting. Through sponsorships and the development of guidelines, sports clubs have been included in some campaigns. Some States and Territories have also pursued the prevention of exposure to solar radiation at work (Borland et al., 1991; Girgis et al., 1994). However, these programs are not reviewed in this report as they operate within the context of occupational health and safety legislation, and do not target children or young people.
Several States and Territories have presented a comprehensive strategic approach to their sun protection programs. For example, New South Wales Health and the Cancer Council of New South Wales (1995) have developed a strategic plan for ‘Skin Cancer Control in New South Wales’ which provides a model for planning of community-based interventions at the State level, including a comprehensive monitoring and evaluation scheme. Queensland is currently pursuing a whole-of-government policy approach, through a consultative process built around the ‘Discussion Paper Towards a Policy on the Prevention and Early Detection of Skin Cancer’ (Queensland Health, 1995b).

5.2 Case Study 1: Slip! Slop! Slap! and SunSmart: the Anti Cancer Council of Victoria’s Skin Cancer Control Program

Some of the material in this section is adapted from the SunSmart Program’s 1996–1999 application to the Victorian Health Promotion Foundation; Montague and Sinclair, 1995.

The Anti-Cancer Council of Victoria (ACCV) has run a skin cancer control program since 1980. It began with the Slip! Slop! Slap! Campaign, and was followed by the SunSmart Campaign which was launched in 1988 with substantial funding from the Victorian Health Promotion Foundation.

The long-term aim of the SunSmart Campaign is a reduction in the incidence of morbidity and mortality from skin cancer in Victoria. The short-term objectives are based on changing attitudes, beliefs and behaviours which affect individual skin cancer risk, modifying the environment to facilitate skin protection, and encouraging early detection of skin cancers. (This last objective is not reviewed here).

SunSmart is a multifaceted public education campaign. It works to impact on many routes of influence which are amenable to change through individual and/or community action. SunSmart is also an evidence-based health promotion program. Wherever possible, decisions about the form and content of the program are influenced by available empirical evidence and community consultation processes. A systematic evaluation and research strategy is in place to ensure that as much information as possible is available on process, impact and outcome measures of the campaign’s effectiveness. Research has also been used to refine communication strategies including the major advertisements and publications.

5.2.1 Outline of the SunSmart Campaign (Sinclair et al., 1994)

The SunSmart program targets the whole population and contains special strategies to target five subgroups identified as being at greater risk for possible skin cancers: those who for genetic or biological reasons are at greater risk particularly of melanoma, for example, fair skin, red hair, blue eyes; children; those pursuing high risk activities which are likely to lead to over exposure such as water sports, gardening and attending sporting events; young men; and older adults (for early detection).

SunSmart was designed to target seven key settings: schools, media, sporting events, State, Territory and Local Government authorities, general practitioners, community health centres and industry. These were divided into four sub-programs: a media strategy and public education program, a community support program, a schools program and a sponsorship program.

5.2.1.1 Media strategy and public education program

The media and public education sub-program involves advertising and community announcements on television and radio and a comprehensive public relations program. It highlights high risk activities and encourages community involvement for long-term change. The mass media messages have been designed to be maximally attractive to young adults from lower socio-economic sector areas and often to young males. However, the messages have been successful at reaching a broad cross-section of the population. The use of mass media is a vital part of the ACCV’s skin cancer control strategy. SunSmart’s operating definition of mass media covers paid advertising (TV, radio, print, outdoor) promotions, advocacy, public relations, information services and point of sale. Mass media helps keep skin cancer control on the public agenda and defines it as an issue for everyone. The other programs are designed to build on this by meeting additional needs of identified targets.
5.2.1.2 Community support program

Community programs are built by the support and enthusiasm of local community health centres, local government and work places. In early years, the community program was based almost entirely on resource and information dissemination. More recently, considerable effort has gone into bringing about sustainable changes through policy and structural development at the local level, and into training health and community workers on how to run programs (Whitty, 1995). In 1994, over 1 500 organisations were involved in SunSmart’s Community Support Program. The program also works with industries, that is the fashion industry that produces sun protection items such as sunscreen, hats and clothing, to encourage production of better resources.

5.2.1.3 Schools program

SunSmart provides training and curriculum resources to educators which enable them to implement SunSmart programs in institutions from pre-schools to universities. Schools are encouraged to develop and follow a SunSmart policy, or at least practice SunSmart activities in three areas: making structural changes to reduce the sun exposure of the school population, providing skin cancer prevention lessons in the curriculum and encouraging sun protection behaviours for staff and students.

5.2.1.4 Sponsorship program

Sponsorships, including art or sport sponsorships, are used to extend the image of SunSmart and to reinforce the media impact of the program. For example, evidence that water-based activities place those involved at high risk for sun exposure has led to sponsorship of the Royal Life Saving Society, the Surf Life Saving Association, Swimming Victoria and Diving Victoria.

5.2.2 Key achievements by SunSmart

5.2.2.1 Structural and environmental change

5.2.2.1.1 Government policy change

The Anti-Cancer Council has worked with State Cancer Councils and other bodies with regard to such things as labelling requirements (ie SPF limits) and standards for sunscreens and fabrics. They have also looked at the development of standards on sun protection policy and practices for the Federal Government’s National Child care Accreditation Council. This involves reviewing standards for quality improvement and accreditation in child care centres.

5.2.2.1.2 Workplace change

The Anti-Cancer Council has worked with employer and worker organisations towards the development of guidelines on sun exposure and outdoor work. This has resulted in national guidelines produced by the ACTU and Worksafe Victoria, and in distribution of a booklet on sun protection for workers in seven community languages by the then Victorian Occupational Health and Safety Commission.

Skin cancer control strategies have been adopted by government and corporate bodies including Telstra, the Victorian Police, Australia Post, the State Electricity Commission, and a significant number of local government authorities.

5.2.2.1.3 Local government policy and practice

The work of the SunSmart program with local government is having a significant effect on the awareness, policy development and sun protection practices. The number of local councils with a shade policy in relation to their parks and gardens has risen from only 20 per cent in 1990 to 39 per cent in 1993. Fifty per cent of councils had a policy for sun protection for outdoor staff in 1993, compared to only 29 per cent in 1990. Forty-seven per cent had a policy or set of procedures which dealt with sun protection in programs for children in 1993, compared with only 22 per cent in 1990.

In 1993, 57 per cent of councils had increased their level of shade provision at council controlled facilities such as parks, gardens, pre-schools, kindergartens, swimming and wading pools, spectator areas at sports grounds, public seats, bus stops and footpaths (Montague, et al., 1995a).

Access to, provision of, and education about sun protection issues and items has improved at local government levels. In particular, changes have been noted in relation to outdoor staff, children’s programs, and health education programs...
run by council staff and in conjunction with other agencies (Borland, et al., 1994; Montague et al., 1995a). The data on council demand for resources and the participation by staff in educational workshops, indicate that up to early 1994 around half the local councils in Victoria had some type of active contact with the SunSmart program each year.

5.2.2.1.4 Schools and pre-schools

Seventy-seven per cent of council run children’s holiday programs now have a policy in place, compared with 64 per cent in 1990. The proportion of day care programs with a policy has risen from 59 per cent in 1990 to 72 per cent in 1993; of child care programs, from 70 per cent to 89 per cent; and of kindergartens, from 67 per cent to 75 per cent over the years.

In 1993, all the councils reported that their pre-school policy specifically included encouragement of the use of individual sun protection items such as hats, T-shirts and SPF15+ sunscreen, compared to only 90 per cent of councils in 1990. In 1993, two-thirds of the councils claimed that their policy included the scheduling of activities to limit the time spent outdoors between 11am and 3pm. This compares favourably with just over half the councils who reported this in 1990.

In 1990, the then Department of Education issued a memorandum (Memo 389, March 1990) recommending that schools support the Anti-Cancer Council sun protection program through curriculum and school environment changes. It also suggested that schools use Anti-Cancer Council resources. Estimated proportions of schools that order SunSmart teaching materials have gone up from around 57 per cent in 1991, to 80 per cent in 1992 (Fletcher, et al., 1994; Sinclair, et al., 1994b). With the development and release of three major curriculum resources targeted at Victorian Certificate Education students, primary schools and child care centres, there has been a very large increase in resource provision over the 1994/95 campaign period.

The 1992 survey of Victorian primary schools showed that all schools recommended hat wearing in Terms 1 and 4, and it was compulsory in 19 per cent of schools. Half the schools provided sunscreen for student use, 30 per cent had considered making timetable changes so that outdoor activities could be minimised between 11am and 3pm in Terms 1 and 4, 56 per cent had curriculum guidelines which recommended sun protection, and 17 per cent had a written school sun protection policy (Segan & Borland, 1994; Murphy, 1994).

In Victorian primary schools in 1994, surveys indicated that a culture of SunSmart behaviour in primary schools had become strong. Forty-five per cent of schools had considered making timetable changes so that outdoor activities could be minimised between 11am and 3pm in Terms 1 and 4; 56 per cent had curriculum guidelines which recommended sun protection, and 36 per cent of primary schools reported having a written SunSmart policy (Dixon & Borland, 1995).

In 1990, teacher surveys in secondary schools showed that although only 9 per cent of secondary schools had a policy statement on sun protection, 45 per cent of schools had a sun protection component in their health education program, and some 72 per cent wanted support from the Anti-Cancer Council for the development of SunSmart policy and practices. Hat wearing was rarely compulsory and the provision of shade was generally judged to be inadequate. The majority of schools had taken steps over the previous three years to increase the amount of shade available (Clarke, 1994).

5.2.2.1.5 Access to sun protection items

The Anti-Cancer Council has entered the market as a retailer of affordable protective items such as sunscreen, hats and clothing. It has promoted use of council-endorsed sunscreens and sought to improve access to other low priced sunscreens by encouraging lifesavers to sell them on beaches. Cheaper generic brands of 15+ sunscreen are now available through retail chains. The ACCV helped promote the introduction of Lycra body swimsuits which have now become very popular, particularly for young children.

The market share of sunscreen with a high sun protection factor has markedly increased over the last eight years. In 1987, only 29 per cent of the market consisted of sunscreen with an SPF of 15 or 15+; in 1992 this had risen to 65 per cent of the pharmacy sales and 76 per cent of grocery store sales. The volume of sunscreen sales has also increased. Where volume is measured in units of 100 grams = 1000 millilitres, sales increased from 5 051 to 7 132.6 units between 1987 and 1991. In 1993, the directors of all major sunscreen manufacturers in Australia were interviewed. The results of these interviews suggested that sunscreen manufacturers were aware that consumers’ views were influenced by Anti-Cancer Council programs and, consequently, they promoted their products in a manner which was consistent with the SunSmart message.

The Anti-Cancer Council has supported the sale of sunscreen through supermarkets as a way of decreasing prices and improving consumer access. Research shows the supermarket sector has a much larger share of the sunscreen market than does the pharmacy sector, with its 33 per cent market share in 1986/87 increasing to 50 per cent in 1990/91.
Organisers of major sporting events have been encouraged to sell hats and sunscreen and to provide shaded areas, and now do so routinely. Hat wearing is now the norm at events such as the Australian Open Tennis Championships (Borland & Theobald, 1990).

5.2.2.1.6 Media coverage
While it is not easy to calculate the full extent of media coverage concerned with sun protection issues and SunSmart messages, some estimates can be made. In earlier years of the SunSmart campaign, the media budget exceeded $300 000; but since the 1992/3 campaign, the budget has declined, and more recently it has been in the vicinity of $100 000. In the earlier years of the campaign, SunSmart messages reached most Victorians on a number of occasions.

In each campaign, the paid media budget had been supplemented by varying levels of community service announcement support exceeding $100 000 in the best year. As well as this, mentions of the campaign through news bulletins, interviews and other public relations activities were conducted. For example, in 1990/91 more than 520 relevant articles appeared in the print media, and more than 80 radio interviews and news items were recorded (Davidson 1995). This level of activity has been more than sustained. In 1994/95, a total of 650 articles appeared and a new high of 100 radio interviews was recorded. Television weather reporters have been very supportive of the campaign, with sun protection messages and UVR reports being broadcast on a nightly basis during daylight saving time on several TV channels.

5.2.2.1.7 Activity by community organisations and professional groups
The community program area of SunSmart responds each year to between 1 500 and 2 000 requests from health professionals for help or resources. In addition, there are more than 1 500 borrowings of relevant material each year from the ACCV resource centre with around a third of these from new borrowers. Medical and paramedical workers make extensive use of Anti-Cancer Council resources.

Community organisations have also made great use of ACCV resources. Some policy implementation and behavioural change, in accord with better sun protection practices, have been achieved through sponsorships. An example of this is lifesavers wearing T-shirts, protective hats, SPF15+ sunscreen, and frequently using special shade shelters on beaches (Sweeney, 1995).

5.2.2.2 Change in knowledge, attitudes, beliefs and behaviour
One limitation of much of the research on individual sun protection behaviour is that it relies on self-report of usual behaviour. However, Hill et al., (1990) found that reported usual behaviour and reports of specific instances of behaviour were correlated. Also, usual behaviour is correlated with behavioural intentions (Borland et al., 1990). These results suggest it is reasonable to assume that increased levels of reported sun protection, documented below, are likely to represent some level of actual behaviour change.

5.2.2.2.1 Awareness of the Program
There has been a continuous and steady increase in awareness of the campaign. In 1989, only 46 per cent of respondents to the annual post-campaign survey had heard of the term ‘SunSmart’, compared to 81 per cent in 1995. Young people are still more aware of the program and are more accurate in their recall of its message than are older people. However, the gap between older and younger people’s awareness is smaller than it was seven years ago.

5.2.2.2.2 Knowledge of the link between skin cancer and UVR
Close to 100 per cent of people are aware that skin cancer is a dangerous disease. Also, over 90 per cent know that skin cancer is linked to UVR exposure and in 1995, 80 per cent agreed with the statement that ‘I need to do more to protect myself from the sun because of the hole in the ozone layer’ (Source: Anti-Cancer Council of Victoria Sun Surveys).

5.2.2.2.3 Attitudes and beliefs about suntans
Research has shown that positive attitudes to tanning are inversely linked to sun protection attitudes. Behaviour-change models suggest that changes should be seen initially in beliefs and attitudes, as people prepare to change their habits. As shown in Table 5.1, since 1988, the proportion of people who like to get a suntan has decreased by 26 per cent, and fewer people want deeper levels of tan.
Table 5.1:  Preference for a tan by year of survey

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<tbody>
<tr>
<td>Do you like to get a suntan or not?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answer—No</td>
<td>39</td>
<td>43</td>
<td>51</td>
<td>57</td>
<td>65</td>
</tr>
<tr>
<td>How deep a tan do you like to get (% of total respondents)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>9</td>
<td>6</td>
<td>10</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Moderate</td>
<td>32</td>
<td>32</td>
<td>25</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>Dark</td>
<td>14</td>
<td>12</td>
<td>10</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Very dark</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>


Table 5.2 sets out a group of key statements of belief about suntans and gives a picture of the percentage of people agreeing with each item for the baseline (ie pre-SunSmart) summer of 1987–88, and over the next seven years. For each statement there has been continued change favourable to the adoption of SunSmart behaviour and unfavourable to suntanning.

Table 5.2:  Agreement with beliefs about tanning by year of survey

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</thead>
<tbody>
<tr>
<td>Friends think suntan is a good idea</td>
<td>69</td>
<td>63</td>
<td>52</td>
<td>48</td>
<td>38</td>
</tr>
<tr>
<td>A suntanned person looks more healthy</td>
<td>66</td>
<td>59</td>
<td>53</td>
<td>50</td>
<td>49</td>
</tr>
<tr>
<td>It is easier to enjoy summer once you get a suntan</td>
<td>62</td>
<td>54</td>
<td>43</td>
<td>37</td>
<td>30</td>
</tr>
<tr>
<td>A suntanned person is more healthy</td>
<td>17</td>
<td>13</td>
<td>9</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>


5.2.2.2.4  Use of artificial tan products
Victorian population surveys in 1993 (Purchase & Borland, 1994) and 1995 (Cappiello, Dixon & Borland., 1995) show the use of artificial tanning procedures to be about 9 or 10 per cent with the overwhelming majority of users being women, giving prevalence estimates for women of 19 per cent and 16 per cent in the two surveys. In 1993, users were more likely to report sunburn, but this was not the case in 1995. In 1995, users reported higher sunscreen use.

In 1993, a question was also asked about tan accelerators and 8 per cent reported that they had used them (13 per cent of women, 4 per cent of men). This was not related to sunburn.

There is no clear evidence to suggest these behaviours are having any adverse impact on sun exposure.

5.2.2.2.5  Sun protection behaviour
The Sun Survey (see Table 5.3) shows that more and more people are taking steps to protect themselves against sun damage.

Primary prevention of skin cancer in Australia
Table 5.3: Sun protection measures between 11am and 3pm on the previous Sunday

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Wore a wide brimmed hat</td>
<td>9</td>
<td>15</td>
<td>16</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>between 11am and 3pm on Sunday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used sunscreen</td>
<td>19</td>
<td>25</td>
<td>24</td>
<td>27</td>
<td>34</td>
</tr>
<tr>
<td>between 11am and 3pm on Sunday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chose to stay out of the sun</td>
<td>n/a</td>
<td>n/a</td>
<td>30</td>
<td>33</td>
<td>41</td>
</tr>
<tr>
<td>between 11am and 3pm on Sunday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


The Sun Survey (see Table 5.3) shows an increase in the proportion of people who report seeking shade, using hat and sunscreen, covering up and choosing not to go out in the sun between 11am and 3pm. Although all groups report increases in a variety of sun protection measures, there are some differences in reported behaviour by different groups. For example, (i) people over 30 are more likely to use a range of sun protection measures than are young people, (ii) women are more likely to put on sunscreen, to seek shade and stay out of the sun, and men are more likely to wear a hat, (iii) country residents are less likely than city residents to stay out of the sun in the middle of the day, (iv) there is no indication that education level is related to sun protection (Montague et al., 1995b; Cappiello et al., 1995).

5.2.2.2.6 Young people

As a high risk group, young people have shown some interesting trends in the annual post-campaign survey in behaviour and attitude change. Awareness of the program is high, with consistently high levels of accurate reporting of the campaign messages. Sun protection behaviour has increased, attitudes to sun exposure and suntanning have altered, but sunburn incidence, extent and severity have not significantly changed since the initial effect. Table 5.4 shows that 12 to 17 year old school students sampled in Victoria have become more negative in their attitudes to suntans, although these are still not as negative as the total population figures given in Table 5.1.

Virtually all Victorian secondary school students are aware of the issue of sun protection, are likely to receive education approximately three times during their schooling, and become increasingly knowledgeable as they proceed through school. Their attitudes to sun protection methods are generally positive, and those most likely to burn have the most positive attitudes to sun protective behaviours (Broadstock et al., 1996).

No data have been collected directly from pre-school or primary school children. Reports by parents of children under age 16 have indicated that over 90 per cent had tried to get someone else, including children, to protect themselves from the sun (Segan & Borland, 1994).

Table 5.4: Preference for a suntan by school students in 1990 and 1993

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>1993</th>
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</thead>
<tbody>
<tr>
<td>Do you like to get a sun tan?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answer—No</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>How deep a tan do you like to get</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(% of total respondents)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>Moderate</td>
<td>46</td>
<td>38</td>
</tr>
<tr>
<td>Dark</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>Very dark</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>


Primary prevention of skin cancer in Australia
5.2.2.7 Experience of sunburn
For research purposes, sunburn is defined initially as ‘any reddening of the skin after being outside.’ This is then broken down into: ‘red but not tender’, ‘red and tender’, or ‘red, tender and blistered’.

Since 1988, the Sun Survey has collected data on people’s experience over the previous weekend, and since 1991, the post-campaign survey has looked at people’s experience over the previous summer.

As shown in Table 5.5, the downward trend in sunburn in the first two years of the SunSmart Program, compared to a baseline in 1987/88, has not continued. Sunburn in 1994/95 is significantly lower than 1987/88, but not different to subsequent years, so it would be hasty to conclude that there has been a deterioration or reversal of trend. It does, however, suggest that sunburn rates have plateaued. However, the ratio of mild to more severe burns has increased.

Table 5.5: Adjusted percentage sunburnt on previous weekend
(any reddening of the skin)

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>15</td>
<td>13</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Women</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

(a) Adjusted for UV, temperature, month of summer, skin type and age.
Source: Sun Survey data.

5.2.2.8 Making extra sun protection efforts
The proportion of people who claim to be making extra efforts to protect their skin from the sun throughout the summer has risen from 49 per cent in 1989 to 65 per cent in 1995.

A recent detailed analysis (Dixon & Borland, 1995) was performed on data from those questioned during the annual post-campaign survey between 1992 and 1995. The results showed that there were only minor differences in awareness, attitudes and sun protection behaviour between groups classified in terms of English or non-English speaking background, socioeconomic status, education level, and rural or metropolitan residence. The main factors affecting sun exposure and sun protection behaviour are sex, age and skin type. Sun exposure and sun protection was reported less by males as well as those in the 14-29 age group, while sun protection was more evident among those who reported their skin didn’t tan easily.

5.2.2.9 Links between the campaign and sun protection behaviour
There is converging evidence consistent with the conclusion that the Slip! Slop! Slap! and SunSmart campaigns have contributed significantly to the changes in sun protection behaviour documented here. There is a widely held belief in the community that the SunSmart campaign has been the main influence on the sun protection behaviour of Victorians. In 1994, 91 per cent of respondents interviewed agreed that the SunSmart campaign was the main reason people are now more likely to protect themselves from the sun. Also, respondents who had seen or heard the phrase SunSmart (46 per cent compared with 27 per cent who had not), were more likely to report they would protect themselves less often if it wasn’t for sun protection advertising. This finding suggests that these people see the advertising as encouraging them to do what they know they should, that is, protect themselves from the sun (Capiello et al., 1995).

5.2.3 Implications for prevention
- The protection of young children (under age 12) must be a priority and the available evidence, although poor, suggests that this is the area where sun protection efforts are most systematic. The vast majority of parents are actively ensuring their young children do not get overexposed (Segan & Borland, 1994) and many child care centres and primary schools have implemented sun protection policies (Montaque et al., 1995a; CBRC,
unpublished data). However, there are no data on actual behaviour of young children and collection of such data must be a priority. Even with high levels of apparent action, more can be done; enforced policies need to be put in place where they do not already exist and some parents need extra reminders. Unless sun protection is seen as an activity for everybody, gains in early childhood will be lost as children become more independent. Except for help with policy development, limited targeting is needed because people interpret population focused warnings in this area as being of most relevance to children. This may be because facts about the susceptibility of young skin to sun exposure are well demonstrated.

• In Victoria, more work is needed in secondary schools. Currently, children move from largely SunSmart primary schools to secondary schools where sun protection is often not a policy issue. Other areas where improvement could be made is in the provision of shade over focused outdoor activities (eg basketball).

• In deciding priorities and their cost effectiveness, we need to be aware that we do not know which strategies will achieve further progress given our successes to date in generating public concern and improved behaviour.

• School activity needs to continue to integrate curriculum and structural strategies, a model that is integral to the notion of health-promoting schools.

• SunSmart has been designed to be multi-faceted and this seems to have been successful. Education has resulted in a population motivated to protect themselves, but not at too much cost to enjoyment of an outdoor lifestyle. Providing shade allows people to improve their protection while doing what they want to do. Similarly, scheduling outdoor activity away from the 11am to 3pm period whenever possible allows people to do things they want to while minimising exposure. This minimises the need for reliance on personal protection.

• Integration of sun protection into the Australian lifestyle in the long-term will require environmental contexts that facilitate protection and continuing motivation of the public to undertake other important health promoting activities, such as sport and exercise.

• Change in sun safe behaviour clearly needs to be ‘life-long’. At this point in time, we do not know what will be needed to sustain adequate sun protection in the long-term. This may vary geographically (ie due to ambient UV levels).

5.3 Case Study 2: ME NO FRY Campaign

5.3.1 Background

The Me No Fry (MNF) campaign was first implemented in New South Wales in the summer of 1990/91 and has run every summer since then. In 1994/95 and 1995/96, the campaign was also implemented in Western Australia. The campaign uses a combination of social marketing strategies, including mass media advertising, sponsorship by sporting bodies, local activities, the endorsement of role models and policy changes to get the MNF message across.

The MNF campaign is directed specifically at an adolescent target group and hence, has attempted to fit into rather than challenge the preferred fashions and assumptions of the Australian youth culture. Adolescence is a time at which most people strive to appear fashionable and attractive to their peers, seeking to conform to dominant norms and values. The messages of MNF were developed with this in mind, aiming for a ‘hip’ ambience.

5.3.2 Aims and objectives of MNF

MNF is a campaign to promote the adoption of sun protection behaviours among young people aged 11 to 16 years. The main objective of the MNF campaign was to change a sun worship culture to a sun protection culture. To achieve this objective, the following broad aims were addressed by the campaign:

• to associate MNF with youth culture and fashion;
• to achieve extensive media exposure of MNF;
• to generate support for and promotion of MNF by all sections of media that influence young people;
• to associate MNF with activities and events that occur in situations of sun exposure; and
• to enlist support from those who influence young people in the form of role modelling and advocacy for sun protection behaviours.

More specifically, the campaign attempted to:
• increase knowledge of the health consequences of sun exposure;
• increase knowledge of individual behaviour required to provide sun protection;
• increase knowledge of short-term consequences of sun protection for physical appearance;
• increase the desirability and fashionability of sun protection;
• increase the association of MNF with fashionable clothing that provides sun protection;
• reduce the association of being tanned with being an ‘outdoors person’;
• raise the profile of sun protection as a community issue; and
• increase the sun protection behaviours among 11–16 year olds.

5.3.3 Campaign strategies

The campaign strategies included:
• mass media—print media, including posters, flyers, newsletters, stickers and magazine advertorials, radio, electronic media;
• sponsorship—including the Bodyboarding Association, the Surf Life-Saving Association and the Sydney Olympic Soccer Team;
• public relations—launch events, news coverage, celebrity involvement, media endorsement;
• area and regional Health Promotion Unit MNF activities; and
• construction of shade shelters.

5.3.4 Evaluation of the MNF campaign

The impact of the campaign on adolescents’ knowledge, attitudes and sun protection behaviour was assessed by undertaking surveys of randomly selected samples of adolescents in high schools. Sun protection was assessed by completion of a self-report diary of protection used on the previous weekend, with the level of sun protection being determined using a coding schedule (Foot et al., 1993; Girgis et al., 1993; Girgis et al., 1994).

In Western Australia, the campaign was introduced in 1994/95, and an evaluation indicated no significant changes in knowledge, attitudes and sun protection behaviour following the first year of the campaign. In New South Wales, evaluations have been undertaken since 1991/92. The following is a brief report of the findings of these evaluations. For more detailed information about evaluations and their results, a number of evaluation reports have been produced (Sanson-Fisher, 1992, 1993, 1994, 1995).

5.3.4.1 Exposure of adolescents to sun protection messages

A large percentage of the target group was exposed to messages about sun protection in the four years of the MNF evaluation, as indicated in Table 5.6. There was a significant increase across the first three time periods in the proportion of the sample who identified such messages as being associated with the MNF campaign. Almost all of the sample who had heard advertising in the 1993/94 period identified it as MNF (18 per cent increase from the 1991/92 period), indicating an improvement in the ability of this campaign to reach the identified target group. However, there was a significant 10 per cent decrease in the proportion who identified the advertising as MNF following the most recent campaign. This finding may reflect the greater exposure of this target group to sun protection campaigns other than the MNF campaign, eg the UVOD (UV overdose) campaign which was introduced in the 1994/95 summer period. The widest coverage of the MNF campaign was achieved through advertising on television, on posters and on the radio.
Table 5.6: Percentage of the sample who were exposed to any advertising related to sun protection, and who identified it as MNF in 1991/92, 1992/93, 1993/94 and 1994/95

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<tbody>
<tr>
<td>Saw/heard advertising about sun protection recently</td>
<td>89 %</td>
<td>93 %</td>
<td>92 %</td>
<td>86 %</td>
</tr>
<tr>
<td>Identified it as MNF slogan</td>
<td>80 %</td>
<td>95 %</td>
<td>98 %</td>
<td>88 %</td>
</tr>
</tbody>
</table>

5.3.4.2 Effects of the campaign on knowledge

A total knowledge score was calculated for each participant in each of the evaluation periods. The proportion of the target group who answered 66 per cent (ie two-thirds) or more of the knowledge items correctly significantly increased from 55 per cent in 1991/92 to 80 per cent in 1992/93, but a slight deterioration was evident in 1993/94 and 1994/95 (73 per cent and 76 per cent with 66 per cent or more correct answers, respectively). This suggests that the overall knowledge of this target group is high but may have reached a ceiling where further increases in knowledge may be difficult to achieve.

Knowledge about specific issues, such as the number of Australians who die of skin cancer, and of the association between skin colour and the likelihood for developing cancer remains poor across the years. Furthermore, there was significant deterioration in knowledge regarding how common skin cancer is in Australia and about the length of time an average Australian can stay unprotected in the sun without burning. It is evident that future campaigns should focus on specific items of knowledge where there has clearly been no improvement.

5.3.4.3 Effects of the campaign on attitudes

A total attitudes score was calculated for each person. The highest score (5) was given if the person gave the ‘desirable’ response, and the lowest score (1) was given if the response was the ‘undesirable’ response. The results indicate a significant reduction in the proportion of the sample who scored in the bottom third of the attitude scores from 16 per cent in 1991/92 to only 1 per cent in 1992/93 and 1993/94 and to 2 per cent in 1994/95. There was also a significant improvement in the proportion of adolescents with very positive attitudes (top third of attitudes scores) from 42 per cent in 1991/92 to 57 per cent and 58 per cent in 1992/93 and 1993/94, respectively. However, this was not maintained following the campaign in 1994/95, with a reduction to 51 per cent. These results suggest that while significant improvements have been observed in attitudes, the level of positive attitudes remains relatively low, with less than two-thirds of the target group recorded as having highly positive attitudes about sun protection and skin cancer issues.

With respect to comparison across the years of responses to individual items, significant deterioration of desirable attitudes occurred in five items relating to the use of sun protection, reflecting a possible decrease in the desire to use hats, sun protective clothes and zinc. Furthermore, there has been a progressive increase since 1992/93 in the proportion of the sample who indicated that covering up in the sun is too much hassle. This suggests that further efforts are required to make sun protective gear (eg hats, clothing, sunscreen) more accessible and desirable for this target group, in an effort to reduce the perceived ‘hassle’ factor in using it.

The data suggests that there may have been a significant decrease in parental efforts to encourage sun protection, with reductions of 8 per cent and 7 per cent respectively in the proportion of adolescents reporting that their parents tell them to protect their skin from the sun, and that their parents always take sunscreen along on family outings and use it. This decline is of concern given the potential for parents to have an important influence on their children’s behaviour both by role modelling and by actively encouraging the desired behaviour. Future campaigns may consider focusing on this dimension.

There is an apparent decrease in adolescents’ perceptions of the severity of skin cancer and their likelihood of developing it, as reflected by deterioration in four of the attitude items. This is also of concern given the increasing rates of skin cancer in Australia.
5.3.4.4 Effects of the campaign on sunburn/suntan

These issues have only been assessed since 1993/94. In 1994/95, 40 per cent of the sample indicated that they had a sore or tender sunburn during the summer, compared to 49 per cent who reported this in 1993/94, suggesting an improvement in behaviour which resulted in sunburn.

There has been no change since 1993/94 in the proportion of the target group who indicated they would try to get a medium to dark tan next summer. Significantly more adolescents indicated they would not even think about tanning next summer (20 per cent in 1994/95 compared to 14 per cent in 1993/94). Although there were no measurable changes in attitudes relating to tanning, it appears that intentions regarding tanning may be improving over time. However, the significant decrease in the proportion of the target group indicating that they will try to protect themselves from the sun as much as possible, suggests that more effort is warranted to reduce the ‘hassle’ involved with sun protection by this target group.

5.3.4.5 Effects of the campaign on sun protection

The percentage of participants who were using a high level of sun protection during exposure periods (ie when outdoors and when it was not raining) is summarised in Table 5.7. Sun protection was defined as adequate if a protection score of 12 or more out of a maximum of 16 was obtained from the diary measure.

The reported results indicate that the campaign was associated with a number of improvements in the levels of sun protection in subsets of the target group. The most notable trend in the data across the four time periods is a progressive improvement in the sun protection levels of female adolescents, with a 10 per cent increase in the proportion of females aged 14–16 years who used adequate sun protection in 1994/95 compared to the previous year; and a 7 per cent increase in the overall proportion of females who used adequate sun protection in 1994/95 compared to the previous year.

The proportion of adolescents rated as ‘highly protected’ increased annually from 39 per cent in 1991/92 when the campaign started, to 57 per cent in 1994/95, suggesting the important contribution of this campaign in increasing protection amongst adolescents. However, the overall level of sun protection remains less than optimal, reinforcing the need for further efforts to target this group.

5.3.5 Implications for prevention

• While the ‘Me No Fry’ program has focused on 11 to 16 year old adolescents, there is certainly a need for programs to begin targeting much younger children. The ideal is to make sun protection a normal part of life for youth and this is most likely to occur if they learn to apply it habitually from an early age.

• Further work is needed to facilitate sun protection in different settings, so that it is not associated only with being outdoors in recreational settings. Hence, a focus on schools and pre-schools is important. However, more effort is required in the area of policy implementation in schools and sporting clubs, where youth in particular spend a large proportion of their time.

• The results of the MNF evaluations suggest that males and females have responded at different levels to the messages. Furthermore, consideration of the barriers to using protection suggests that these may be different for males and females. It may be appropriate to tailor some of the sun protection messages specifically for the different genders, especially with respect to making sun protection items, such as hats, more ‘trendy’ for the female adolescents. The evidence suggests that there is already a high use of hats (caps) by male adolescents. The use of appropriate role models may be a useful strategy for promoting sun protection in this group.

• The cancer organisations have always promoted sunscreen as an adjunct to other forms of sun protection such as hats, clothing and shade; hence the value of promoting shade and/or staying out of the sun. This is particularly important in public and recreational settings, such as parks, swimming pools, sports fields, etc. Various activities to encourage provision of shade by local councils are currently underway. More efforts are required in these areas to facilitate sun protection at the community as well as at the individual level.

• Activities such as the National Skin Cancer Action Campaign (formerly National Skin Cancer Awareness Week) are a good way of focusing media attention on sun protection issues. However, it is important that this be recognised as a focus for promotions, rather than as the week for undertaking the sun protection programs. As suggested earlier, the greatest benefits are likely to be achieved if sun protection is seen as appropriate in a range of settings and throughout the year.
Table 5.7: Percentage of adolescents with exposure periods who used a high level of protection in 1991/92, 1992/93, 1993/94 and 1994/95, ie score of 12/16

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<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>11–13 years:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>53</td>
<td>59</td>
<td>63</td>
<td>62</td>
</tr>
<tr>
<td>Female</td>
<td>45</td>
<td>49</td>
<td>51</td>
<td>56</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>55</td>
<td>57</td>
<td>59</td>
</tr>
<tr>
<td>14–16 years:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>42</td>
<td>46</td>
<td>58</td>
<td>57</td>
</tr>
<tr>
<td>Female</td>
<td>23</td>
<td>39^1</td>
<td>44^1.6</td>
<td>54^1.4</td>
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<tr>
<td>Total</td>
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<td>56</td>
</tr>
<tr>
<td>Combined age groups:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>48</td>
<td>52</td>
<td>60^9</td>
<td>59</td>
</tr>
<tr>
<td>Female</td>
<td>36</td>
<td>43</td>
<td>48^10,11</td>
<td>55^13</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>47^12</td>
<td>54^13</td>
<td>57</td>
</tr>
</tbody>
</table>

1 Significant difference between males & females 11–13 years in 1993/94 (Z = 4.39).
3 Significant difference from 1992/93 to 1993/94 (Z = 4.71).
4 Significant difference from 1991/92 to 1992/93 (Z = 3.44).
5 Significant difference from 1992/93 to 1993/94 (Z = 4.43).
6 Significant difference from 1992/93 to 1993/94 (Z = 5.41).
8 Significant difference from 1992/93 to 1993/94 (Z = 5.35).
9 Significant difference from 1992/93 to 1993/94 (Z = 4.20).
10 Significant difference from 1991/92 to 1993/94 (Z = 3.67).
11 Significant difference between males & females (Z = 6.38).
14 Significant difference from 1993/94 to 1994/95 (Z = 3.02).
15 Significant difference from 1993/94 to 1994/95 (Z = 2.86).

5.4 Case Study 3: Evaluation of Interventions to Improve Solar Protection in Primary Schools (Girgis et al., 1993)

A study was undertaken in New South Wales to: (a) develop an accurate and valid self-report diary to assess the prevalence of solar protection behaviours in school children aged 9 to 11 years; (b) assess the differential effectiveness of two interventions aimed at changing the knowledge, attitudes, and solar protection behaviours of this age group, compared to a control group; and (c) identify predictors of use of a high level of solar protection.

The study was conducted using a randomised control trial with 648 students from Years 5 and 6 from 11 government schools in the Hunter Region of New South Wales. The students’ ages ranged from 9 to 11 years. There were two intervention (intensive and standard) groups, and a control group. Each selected school was randomly allocated to one of the treatment groups. Student numbers in each group were n=247 (intensive intervention), n=180 (standard intervention) and n=185 (control).
The intensive intervention consisted of the SKIN SAFE program, developed by the New South Wales Cancer Council in collaboration with the New South Wales Department of School Education. One aim of this program was to assist children to increase knowledge levels, and to develop the attitudes and skills to reduce their risk of skin cancer. The program was run over a four week period as part of the school curriculum. The standard intervention consisted of a 30 minute lecture by a New South Wales Cancer Council education officer that was delivered to all classes in this treatment group. Students in the control group received no intervention.

A written questionnaire was used to assess students’ knowledge and attitudes regarding skin cancer and solar protection issues. Solar protective behaviour was assessed using a solar protection diary, which was developed and validated during a pilot study. Information was collected at pre-test, and two post-test periods (four weeks and eight months after pre-test).

Students in the intensive intervention group were significantly more likely to have used a high level of solar protection at both post-test periods than were the control and standard intervention groups. There was no significant difference between the level of solar protection in the standard intervention and control groups. This suggests that the minimal intervention was not effective in changing students’ solar protection behaviour.

Significant predictors of high solar protection levels at both post-test periods were intervention group status (higher in intensive intervention), and baseline level of solar protection (higher when baseline level of solar protection was high). Students with an increased number of opportunities to protect themselves were less likely to do so at the second post-test period.

5.4.1 Implications for prevention

- As for Case study 2.
- Given that the history of sun safe behaviours is related to further increases in preventive activities, sun protection should be encouraged at a very young age in order to facilitate continued protection as children get older.
- Intensive and comprehensive interventions may be more effective in improving sun protection practices. School communities (including staff, students and parents) should be encouraged to implement comprehensive approaches to health education, including sun protection. A number of initiatives may be important.
  - The potential effectiveness of the model of the health-promoting school is currently being evaluated in New South Wales in a grant funded by the NHMRC. This model has the potential to empower the schools to tailor policies and practices to meet their specific needs.
  - The Department of School Education in New South Wales has developed a memorandum for schools, which includes guidelines to assist them to implement the student welfare policy. Such endorsement of sun protection policies as part of an overall welfare policy in schools should be encouraged and facilitated.
  - Agencies producing resources for schools should consider providing some level of training to optimise the uptake and use of resources by teachers.

5.5 Projects Recently Completed: Skin Cancer and Teenagers (SCAT) Project

5.5.1 Introduction

The Skin Cancer and Teenagers (SCAT) Project is an intersectoral intervention which provides some guidelines for rigorous evaluation of primary prevention interventions. Preliminary studies with primary and secondary school students showed that knowledge of skin cancer and necessary preventive measures was extremely high, even among the youngest students. However, skin protection behaviours were not uniformly practised (Lowe et al., 1993) leading to concerns about the need to educate young people about over exposure to the sun. The project involved Central and Regional Education Department personnel, University of Queensland researchers, the Queensland Cancer Fund, and Central and Regional Health Department personnel.
The project was originally funded by Queensland Health as a two and a half year school-based intervention study which tracked Year 8 students in 1992 through to the beginning of Year 10. Subsequently, an extension to the original project of equal duration was funded by the NHMRC through the Public Health Research and Development Project Grant Scheme. The projects were designed to track the entire secondary school career of the 1992 cohort through to the end of 1996. Only the original project, funded by Queensland Health, is reported here. The aims of the study were to:

- Determine the short-term (three months post-intervention) effect of an educational intervention on the use of sunscreen, hats and other protective clothing, shade and avoidance of sun during peak hours by students; and
- Assess the impact of the intervention on specific knowledge, self-awareness, self-image, self-efficacy and interpersonal decision making skills.

### 5.5.2 Methods

The study was based on a matched design involving 26 State government high schools of which 13 were randomly allocated to an intervention group and 13 to a control group. A total of 3,341 students participated in the study. Schools were matched according to geographic location, size, and socioeconomic status. The evaluation format adopted a pre- and post-test design. Students entering their first year of high school (Year 8, approximately 13 years old) in 1992 constituted the cohort which was tracked into the beginning of Year 10.

The primary theoretical influence was drawn from the Health Belief Model, Social Cognitive Theory and Stages of Change, although aspects of a range of other behavioural theories and evaluation research were included. The lesson program incorporated the concepts of severity, susceptibility, consequences, barriers and benefits, self-efficacy, modelling, reinforcement, and the stages from pre-contemplation to maintenance. In addition, characteristics of youth and the school environment were considered important to the development of the resources.

The intervention consisted of two skin cancer prevention lessons to be introduced sequentially in the first two years of high school (grades 8 and 9) when the average student age is 13 to 14 years.

- **Grade 8 Teaching Module:** The grade 8 teaching resource focused on cognitive strategies designed to capitalise on the habits reinforced in primary schools, largely as a result of the ‘no hat, no play’ policies.

- **Grade 9 Teaching Module:** The preliminary research pointed out the increasing role of peer pressure and interests in personal image during grade 9. As a result, the focus was on personal self-image and the role of the mass media in favouring certain images.

The intervention modules were delivered by the regular classroom teachers (n=39) following inservice training workshops. Long-term behavioural evaluation data (intervention and control schools) and short-term impact data (intervention schools only) were collected throughout the study, concluding early in the cohort’s Year 10. The focus of these measures was on the long-term objectives of the study in the areas of behavioural intentions and change, and attitudinal shifts; few knowledge based items were included in these measures.

The outcome surveys were administered twice each year, prior to the term 4 intervention and at the start of the next school year.

Process measures included: (a) in-class observer feedback obtained through the use of independent observers who sat in on a random number of pre-assigned classes across all intervention schools; (b) school background surveys completed by the heads of the department in each intervention school and by the project coordinator in the control schools which included information on the general background of each school and the level of sun safety policy development and implementation; and (c) outdoor class activity observations conducted by teacher aids or other teaching staff in intervention and control schools at the beginning of term 4 each year. The purpose of this was to provide an indicator of sun safety behaviour in relation to outdoor physical education classes.

In the interest of maintaining the integrity of the study, a range of confounding variables were considered throughout the study. These included the operation of concurrent skin cancer prevention initiatives within communities. In order to minimise this effect, the research team entered into an agreement with the key organisations for skin cancer prevention, being Queensland Health and the Queensland Cancer Fund, which highlighted the importance of maintaining a State-wide focus for any campaigns. In addition, networks were set up to identify any research projects which may affect the study.
To address the possibility that the weather may provide an important intervening variable, weather reports were obtained. These reports contained information regarding temperature, cloud cover and rainfall, and were obtained from the participants, and also from the Bureau of Meteorology where possible.

The impact variables consisted of short-term knowledge and attitude items which were investigated separately. In order to analyse the outcome variables which were primarily related to sun protection behaviour, students were asked about their use of hats, sunscreen, shade and long sleeves for specific periods of the day (before 9am, 9am–12 noon, 12 noon–2pm, 2pm–4pm and after 4pm). Two days in particular were targeted, Sunday and Monday, to assess behaviour both on weekends and at school. From these responses, a Sun Protection Behavioural Index (SPBI) for the weekend and one for school was created for each student with a possible scale of 0 (bad sun protection behaviour) to 100 (excellent sun protection behaviour). Repeated measures analysis was performed on the mean SPBI for Year 9 and Year 10 with ‘schools’ as the unit of measurement.

5.5.3 Results (to date)

Overall, intervention lessons for Year 8 and Year 9 were well received. Teachers commented that the lessons were able to accommodate a range of student ability and were well pitched to student level. Compliance was high for both the Year 8 and Year 9 intervention lessons. Each in-class observer used a checklist to monitor the teaching of each component of the lesson.

In terms of impact evaluation, intervention and control groups were compared on a number of knowledge and attitude items (which were specific to the Year 8 intervention) at baseline (Year 8, September 1992) and appeared similar in terms of the variables of interest. However, the intervention group performed consistently better than the control group following the Year 8 intervention. Similarly, those in the intervention group performed considerably better than those in the control group following the Year 9 intervention. Looking specifically at the intervention group before and after the Year 9 intervention (a within group comparison), a significant improvement was found.

The Sun Protection Behavioural Index (SPBI) was calculated for Sunday (weekend behaviour) and Monday (behaviour at school) separately. An increase in the SPBI indicates improvement in sun protection behaviour. Preliminary analysis of outcomes showed a potential behavioural effect, predominantly between students moving from Year 8 to Year 9.

5.6 Projects in Progress: Cancer Action in Rural Towns (CART) Project

The CART project, a research project which is jointly funded by the NHMRC and the New South Wales Cancer Council, is being undertaken by the Cancer Education Research Program (CERP) team in Newcastle, New South Wales. The primary aim of this project is to explore the effectiveness of a community action program designed to increase community rates of preventive and screening behaviours relating to breast, cervical, smoking-related and skin cancers. Twenty rural New South Wales communities have been selected for inclusion in the study and randomly assigned within pairs to either control or intervention groups. The intervention program involves working through Cancer Council facilitators who are allocated to each of the intervention towns, to encourage communities themselves to initiate and control the intervention process and to utilise existing networks in order to promote long-term structural changes.

The intervention, which is two years in duration, was due for completion at the end of 1996. The effectiveness of the community action program in improving the rates of sun protection in the intervention towns compared with the control towns will be assessed by comparing baseline versus post-intervention levels of sun protection, assessed in a number of ways:

- **School based surveys**—surveys of adolescents in high schools will be undertaken to determine changes in the levels of sun protection and related knowledge and attitudes; and

- **Direct observation**—changes in weekend sun protection behaviour of community members will be assessed by direct observation at outdoor recreational areas such as parks, swimming areas and sports fields.

Post-test data collection is scheduled to be undertaken during January to March 1997.
5.7 International

5.7.1 Overview

In Australia and overseas, the majority of primary prevention interventions have been effective in increasing knowledge or awareness (Borland, 1990; Girgis, 1993; Mermelstein & Reisenberg, 1992), and changes in attitudes are not unusual across studies, although attitudes towards tanning appear to be particularly resistant in overseas studies. The (social) benefits of a tan appear to outweigh the perceived costs (Miller et al., 1990). Among the few evaluated interventions, modest levels of behaviour change have been reported (Borland et al., 1991; Girgis et al., 1994; Lombard et al., 1991; Taylor et al., 1982). Most of these studies claim behaviour change in the very short term, but in Australia, longer-term behaviour changes are now evident (see Table 5.3). Self-reported changes in protective behaviours are more commonly reported than objective measures (Buller & Buller, 1991; Cameron & McGuire, 1990; Ramstack et al., 1986).

Knowledge-based methods have had limited success in changing attitudes and behaviour related to adolescent tanning (Arthey & Clarke, 1995). Adolescents have high knowledge levels, especially in Australia (Lowe et al., 1993), but this knowledge tends not to translate into comparable levels of protective behaviour (Cockburn et al., 1989). Level of knowledge of skin cancer or sun protection is not a strong predictor of intention to get a tan, nor of actual suntan level attained (Arthey et al., 1993). Knowledge has been associated with increases in self-reports of sun protection, but may be an artefact of social desirability rather than true increases in sun safe behaviour (Bennetts et al., 1991).

Perceptions of the negative consequences of sun exposure are considered too far in the future to invoke appropriate behaviour change in the general community. In general, the community, especially young people, tends to attribute greater salience to short-term risks compared to long-term risks (Svenson, 1984). Skin cancer prevention messages may be more effective if promoted in terms of a reduced time-frame (less than 10–15 years) for consequences, with increased urgency regarding the short-term dangers and more immediate rewards for covering up. Studies of sun exposure in different health contexts suggest that the size of the reward appears to be less important than its immediacy (McReynolds et al., 1983).

Studies conducted overseas have implications for the development of Australian programs, in particular, the selected studies reviewed below. More detailed information on some of these programs is available in reviews by Arthey and Clarke (1995), Loescher et al. (1996) and Morris and Elwood (1995).

In summary, there have been a number of international studies that have evaluated intervention programs designed to improve the sun protection behaviours, knowledge and/or attitudes of the target audience. These programs, often aimed at a specific subgroup of the population, have used a variety of media to convey their message. Some programs are designed to influence whole communities through mass media, while others rely on a single lecture or video presentation.

The reported success of these international programs is varied. Significant improvements in behaviour and attitudes have been reported following the majority of intervention programs. However, the evaluation of some programs is restricted by difficulties in the study design, for example, lack of a control group or follow-up assessment. A summary of the intervention programs conducted overseas is presented in the following tables.
### Table 5.8 International intervention studies

<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Sample and settingy</th>
<th>Med</th>
<th>Cat</th>
<th>Mod</th>
<th>DCM</th>
<th>Mea</th>
<th>Design</th>
<th>Intervention</th>
<th>Findings/Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boldeman et al., (1991)</td>
<td>Staff of 674 nursery schools in Sweden.</td>
<td>PL</td>
<td>G</td>
<td>D</td>
<td>M</td>
<td>K</td>
<td>Post-test only.</td>
<td>Lectures, mailed material.</td>
<td>• Face to face more effective in increasing sun awareness than mailed information alone.</td>
</tr>
<tr>
<td>Bolognia et al., (1991)</td>
<td>275 mothers of healthy newborns in Yale, USA.</td>
<td>P</td>
<td>G</td>
<td>D</td>
<td>T</td>
<td>B</td>
<td>Control, low/high level intervention (longitudinal).</td>
<td>Brochures, sunscreen, hats.</td>
<td>• Both interventions reduced amount of time newborns and mothers in sun, and the amount of unprotected time in the sun.</td>
</tr>
</tbody>
</table>
| Buller et al., (1994) | Students in grades 4–6 from Arizona, Pre (n=162), post (n=124) and follow-up (n=137). | OP | G | D | Q | ABK | Control/ intervention, pre, post and follow-up (longitudinal). | School curriculum over 5 weeks in 50 minute sessions. | • Knowledge and attitudinal change.  
• Less behavioural change. |
• No change in reported sunscreen, hat or clothing use.  
• No control group. |
• No behaviour change. |
| Hughes et al., (1993) | 543 adolescents (12–16 years) from seven schools in England. | PE | G | S | Q | ABK | Control/four interventions, pre-post (longitudinal). | Workbook, video, posters, discussions. | • Difference in knowledge and attitudes compared with control group.  
• No difference in reported behaviour.  
• Behaviour associated with attitude. |
<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Sample and settingy</th>
<th>Med</th>
<th>Cat</th>
<th>Mod</th>
<th>DCM</th>
<th>Mea</th>
<th>Design</th>
<th>Intervention</th>
<th>Findings/Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>cited in Loescher et al., (1995)</td>
<td>318 students from three elementary schools in Tucson, USA.</td>
<td>P</td>
<td>G</td>
<td>S</td>
<td>Q</td>
<td>ABK</td>
<td>Control/2 interventions, pre-post-follow-up (longitudinal).</td>
<td>Sun safety fair/one lesson.</td>
<td>• Both interventions had greatest effect on knowledge. • Full length version better than one day version on attitudinal change. • No intentions to change behaviour were reported at immediate follow-up, few behavioural changes after 3 months</td>
</tr>
<tr>
<td>Loescher et al., (1996)</td>
<td>150, four year olds from 12 preschools/day-care centres in Arizona.</td>
<td>O</td>
<td>G</td>
<td>D</td>
<td>Q</td>
<td>AK</td>
<td>Intervention/ control, pre-post (longitudinal).</td>
<td>Curriculum.</td>
<td>• Significant effects on knowledge and comprehension components of cognition. • No evidence of behavioural change.</td>
</tr>
<tr>
<td>McGee &amp; Williams, (1992)</td>
<td>286 (pre) and 345 (post) students from 10 schools in New Zealand.</td>
<td>P</td>
<td>P</td>
<td>S</td>
<td>M</td>
<td>B</td>
<td>Pre-post intervention (cross-sectional).</td>
<td>Leaflets, posters.</td>
<td>• Sun protection scores increased. • 44% reported sunbathing less often. • 56% reported using sunscreen more.</td>
</tr>
<tr>
<td>Mermelstein &amp; Riesenberg, (1992)</td>
<td>1 703 adolescents from schools in Chicago.</td>
<td>EL</td>
<td>G</td>
<td>D</td>
<td>Q</td>
<td>ABK</td>
<td>Control/ intervention, pre-post (longitudinal).</td>
<td>Video on dangers of skin cancer.</td>
<td>• Knowledge and perceived susceptibility to skin cancer increased. • No change in behavioural intentions.</td>
</tr>
</tbody>
</table>
Table 5.8  International intervention studies  (continued)

<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Sample and settingy</th>
<th>Med</th>
<th>Cat</th>
<th>Mod</th>
<th>DCM</th>
<th>Mea</th>
<th>Design</th>
<th>Intervention</th>
<th>Findings/Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Putnam &amp; Yanagisako, (1985)</td>
<td>Adults interviewed in Hawaii pre (n=318) and post (n=304) intervention.</td>
<td>P</td>
<td>C</td>
<td>D</td>
<td>I</td>
<td>B</td>
<td>Pre-post community intervention (cross-sectional).</td>
<td>Comic book. • A substantial proportion of readers improved sun protection behaviour after reading the comic book. • Knowledge levels increased. • No control group.</td>
<td></td>
</tr>
<tr>
<td>Ramstack et al., (1986)</td>
<td>Students (Grades 4–8) from Arizona schools.</td>
<td>P</td>
<td>G</td>
<td>D</td>
<td>Q</td>
<td>ABK</td>
<td>Pre-post intervention (longitudinal).</td>
<td>Knowledge awareness based curricula. • Change in knowledge and self-reported behaviour in respect to skin cancer prevention.</td>
<td></td>
</tr>
<tr>
<td>Robinson, (1992)</td>
<td>1 042 patients with non-melanoma removed, USA.</td>
<td>PL</td>
<td>G</td>
<td>D</td>
<td>M</td>
<td>B</td>
<td>Interventions at 2 weeks, 2 months and 6 months (longitudinal).</td>
<td>Written materials, discussions, skin examination. • 56% changed habits of outdoor activities. • 62% started to use sunscreen.</td>
<td></td>
</tr>
<tr>
<td>Rossi et al., (1994)</td>
<td>1 016 beachgoers on three beaches on Rhode Island.</td>
<td>PE</td>
<td>G</td>
<td>S</td>
<td>I</td>
<td>B</td>
<td>Cross-sectional.</td>
<td>Variety. • Results not yet available.</td>
<td></td>
</tr>
</tbody>
</table>

Med  Medium:  
M=Mass media;  P=Print;  E=Electronic;  L=Lecture/oral presentation;  O=Other  
Cat  Catchment:  
I=Individual;  G=Group;  C=Community;  P=Population  
Mod  Modality (target):  
S=Strengthen community action;  E=Enable, mediate, advocate;  D=Develop personal skills;  R=Reorient health services;  B=Build healthy public policy  
DCM  Data collection method:  
I=Interview;  T=Telephone survey;  M=Mail survey;  Q=Questionnaire (personally given to respondent);  O=Observation  
Mea  Measures:  
C=Contemplation;  B=Behaviour;  A=Attitude;  K=Knowledge;  I=Intention
5.8 Recommendations

It is recommended that:

12. Australian schools (secondary and primary) and child care services that have not already done so should implement policies which facilitate a comprehensive approach to sun protection, including teaching sun protection in the class room, reducing exposure during outdoor activity, involving teachers, parents and the community in sun protection and environmental changes (ie in a manner consistent with the notion of health promoting schools).

13. State governments support the monitoring and publishing of information on the adoption and implementation of sun protection policies and programs by schools, child-care services, community organisations and local services (eg sporting clubs).

14. Studies be funded to further test the benefits of multifaceted, comprehensive strategies such as policy development and implementation, intersectoral collaboration, educational strategies, media strategies, and economic incentives in availability of protective products and aids, and further inform the development of best-practice principles. This will involve more extensive evaluation and research on innovative programs as well as more traditional intervention studies. Single approaches, like one classroom lesson, or a pamphlet or even one advertisement in the absence of other strategies are not recommended.

15. Sun protection programs focus on the development of strategies to ensure that changes are sustained in the longer-term, particularly for those subgroups within the population (such as adolescents) who are placing themselves at risk.

16. Research projects be funded to investigate the long-term impact of intervention programs shown to be effective in the short term.

17. Studies be undertaken to ascertain the feasibility of disseminating information from successful sun protection interventions, and of adapting comprehensive programs to new settings.

18. Research in the field of skin cancer be undertaken to address the effect of policies regarding exposure to the sun. This needs to be documented to provide information about the impact of sun safe policies on sun exposure by the individual, group or community.

19. All Government departments (Commonwealth and State) review their programs to determine their contribution to sun safety in their workforce and the community.

20. Sun protection programs continue their intersectoral effort to generate those environmental and structural changes, eg shade creation and rescheduling sporting events, that facilitate protective behaviours.

21. Sun protection program managers place greater priority on program evaluation (at a level relevant to the size of the program), including pre- and post-intervention monitoring (see Recommendation 8).
Section Six
Conclusions

6.1 Introduction

The specific terms of reference for the Sun Protection Programs Working Party were to:
• Review and report on the state of scientific knowledge;
• Identify gaps in knowledge, research needs and preventive action;
• Identify the special needs of high risk population groups, as well as the needs of the general population;
• Review and determine measurable and qualitative indicators of program performance;
• Recommend guidelines for evidence-based best practice;
• Advise on the administrative and legislative options to implement recommendations; and
• Assess the implications of recommendations for workforce development.

The purpose of this chapter is to summarise the Working Party’s conclusions with respect to these terms of reference.

6.2 Directions for Preventive Action

The epidemiology of the effects of sunlight confirms the link between exposure to sunlight and a number of health effects, most importantly, skin cancer and eye disease. Clearly, childhood exposure is an important cause of skin cancer. Prevention of exposure in the early stages of life is likely to have a greater impact on the incidence of skin cancer than strategies to reduce exposures in adulthood, though programs targeting adults are also required.

The epidemiological evidence also provides important points for the development of programs. The nature of the exposure to solar radiation is important. The intermittent exposure hypothesis for the relationship of sunlight to melanoma suggests that infrequent exposure of untanned skin to intense sunlight increases the risk of melanoma. Therefore, as the total exposure level of the community is reduced, care must be taken in sun protection programs to remind the community of the risk associated with high and intermittent exposure. In terms of health promotion, the occurrence of sunburn provides immediate feedback to the individual about their harmful exposure. On a longer time frame, naevi may provide early biological markers of subsequent risk of melanoma.

6.3 Indicators of Program Performance

The fundamental aim of sun protection campaigns is to reduce the population’s exposure to the sun. Along with measures of the occurrence of the disease, measures of exposure to the sun and sun protection behaviours are key indicators of program performance. Australia (and other countries) has not established agreement on standard evaluation measures, nor on the interpretation of existing measures. Clearly, further research and discussion are required to establish national benchmarks for the purpose of program evaluation. Further, a national evaluation framework needs to be developed that includes short, medium and long-term program measures. Appendix A includes such a framework developed by New South Wales Cancer Council and New South Wales Health. Information was provided on all major sun protection programs currently undertaken in Australia. One of the disappointing aspects of the information provided was the patchy level of program evaluation. Where programs are truly innovative, there is a need for more than the usual resources for evaluation and research to help better understanding of how they work. This is important both for facilitating adaptation to new contexts and for further refinement of strategies.
6.4 Evidence-based Practice for Facilitating Behaviour Change

To encourage changes in skin protection behaviours that will result in reduced UV exposure requires a mix of educational and structural programs. There is a broad consensus that people should minimise time in the sun during the peak UV hours [about 2 hours each side of true (solar) noon], but when they do go out, they need to protect themselves with clothes, hats, sunglasses, sunscreens and use of shade. Combinations of these measures are particularly important when the period of exposure is likely to be long and/or the ambient UV levels are high. If people need to be outside for most or all of the four hour period around solar noon, they may need to take extraordinary care, using total blockout (eg zinc cream) on the most exposed areas (eg nose) as well as adopting all other practical protective measures.

Behaviour change can be facilitated by providing resources and structures, and appropriately organising activities. Providing shade at and over outdoor venues, making sure sunscreen is available and scheduling outdoor events away from peak UV periods are examples. Such structural changes make it easier for people to behave in sun protective ways. However, unless there are education programs to motivate such behaviour, there is a risk that people will not use the sun protection opportunities that have been provided. It should also be recognised that education campaigns provide the social climate within which structural and policy changes may occur.

In reviewing the empirical evidence of behaviour change, it needs to be understood that measurement of sun protection behaviour did not occur until some time after the risks were identified and often after programs were in place. It is likely that there was behaviour change in response to the dangers before any measurement occurred. Therefore, it may be true that much of the easy to achieve change had occurred beforehand and that we are now taking measurements during a period in which change is harder to achieve. It would be unwise to assume that there had been no change prior to measures being taken, especially in a context where programs had been in place similar to those subsequently associated with or shown to produce behaviour change. Because of the evidence that sun protection programs can change behaviour, caution is also needed in generalising about findings from times and places with pre-existing programs in place compared to those without such programs.

Issues related to undertaking an economic evaluation of the sun protection programs were considered by the Working Party. The primary problems lie in determining the level of reduction in sun exposure required to reduce the incidence of skin cancer, and the relative contribution of any sun protection programs to that reduction in sun exposure. These issues need to be assessed in considering the feasibility of undertaking an economic evaluation.

6.5 Administrative and Legislative Options

On the one hand, Australia is among the world leaders in efforts to prevent skin cancer. There have been a number of innovative research studies and comprehensive programs, which set a benchmark for community-wide activity. On the other hand, much more needs to be done. In Australia to date, there has been no national approach to primary prevention for skin cancer that includes, amongst others, links between cancer organisations and government. While specific activities or programs in some communities or States and Territories have been well planned and implemented, across the country as a whole the application of programs has been ad hoc and limited in scale.

Not all communities have benefited from participation in programs shown to be effective. The ‘Slip, Slop, Slap’ programs have focused on the protection of children, either directly or through their parents. Similarly, a number of programs have been targeted towards teenagers and adults. Given the epidemiological evidence of the impact of exposure in childhood, there is a need to continue to focus on preventing exposure to solar radiation in this age group.

The Working Party also noted that there are differences across the county in the targets chosen, and in the comprehensiveness of effort. Furthermore, Australia has limited means by which it may track its progress in the implementation of prevention efforts. Apart from the evaluated intervention programs reviewed in Section 5 of this report, evidence of the success of these programs is sparse and inconsistent. Evaluated Australian programs have demonstrated some changes in sun safe attitudes and behaviours. Such campaigns have built upon existing community-based efforts and indicate the need for sustained commitment of effort and investment to achieve the desired community-wide change.
Evaluated Australian programs have demonstrated some changes in sun safe attitudes and behaviours. Taking Victoria’s program as a benchmark, significant change is occurring with an annual investment in sun protection health promotion programs of at least $1 million annually. Extrapolating nationally, the Working Party considers that a national expenditure on efficacious programs of upwards of $4 million per annum is a threshold level below which behavioural and social change would not be significant. This represents less than 2.3 per cent of the estimated direct treatment costs of melanoma and other skin cancers.

6.6 Workforce Development

The emphasis of this report has been on the scientific and technical aspect of coordination and evaluation of sun protection programs. As such, the evidence considered in the report primarily focuses on program directions. The framework for intervention in skin cancer prevention is similar to other health promotion programs, and as such is dependent on the generic health promotion skills of the public health workforce. However, skin cancer prevention is fundamentally an intersectoral issue, and can possibly involve a wide cross-section of the community, including diverse community organisations. Therefore, skills in implementing sun protection strategies, need to be developed not only among health professionals but also in the community.

6.7 Recommendations

It is recommended that:

22. Health promotion funding bodies ensure that funding of sun protection programs is at a level to ensure meaningful changes in the community, beyond a higher profile for the issue. Further, funding needs to be provided for a sufficient number of years to maintain and improve on the adoption of sun protective strategies in the community. Dedicated funding to enhance program evaluation needs to be considered by funding agencies. The evaluation and research budgets should be supplemented (by Governments if necessary) to ensure that achievements and processes are well documented.

23. Australian efforts on skin cancer prevention be coordinated through an intersectoral National Sun Protection Strategy that links Cancer Organisations, State, Territory and Commonwealth Health Departments and other relevant sectors.

24. Assessment of the feasibility of undertaking an economic evaluation should occur based on our current knowledge of the effectiveness of primary prevention programs. The work must provide insight into models for economic evaluation that can be applied to current and new programs. As this is outside the scope of this report, an economist should be commissioned to conduct this assessment.

25. Commonwealth and State Governments liaise with tertiary institutions and professional organisations, such as medical faculties and colleges, Divisions of General Practice, the Institute of Environmental Health, Schools of Education, Architecture, Town Planning, Nursing and Public Health to incorporate information on sun exposure, sun protective programs, intervention studies and relevant research into vocational education, training and continuing education.

26. The NHMRC update triennially the available information provided in this report, and its recommendations.
Section Seven
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Appendix A

A STRATEGIC PLAN FOR THE PREVENTION OF SKIN CANCER

Source Document

Key Strategic Aims
• Concentrate on changing attitudes that are predictors of sun protection behaviour.
• Refocus efforts on the provision of supportive physical environments particularly in the area of shade provision.
• Assist and train organisations in the implementation of comprehensive sun protection policies.
• Work more closely with product manufacturers and distributors and the fashion industry to ensure the delivery of sun protection products that are acceptable, fashionable and easy to obtain and use.
• Tailor activities to target high risk groups.

LONG-TERM HEALTH OUTCOME
A reduction in the incidence of, and mortality from, skin cancer

Goals
• An increase in the number of children, adolescents and adults who practise sun protection behaviour.
• Provide the community with an environment that supports sun protection, including organisational, physical and social aspects.
SETTINGS

Educational Institutions

Childcare Centres / Preschools

<table>
<thead>
<tr>
<th>Program Activity</th>
<th>Lead Organisations and Partners *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority (1) within next 2 years</td>
<td></td>
</tr>
<tr>
<td>1.1 Develop shade provision guidelines</td>
<td>• CC, DOH, DSE, PD, FC, DPW, AIEH, GA, KU, Manufacturers</td>
</tr>
<tr>
<td>1.2 Develop shade provision measurement tool/service</td>
<td>• CC, DOH, LGSA, DPW, AIEH, Manufacturers</td>
</tr>
<tr>
<td>1.3 Assist preschool and child care management in the implementation of sun protection policies focusing on structural change</td>
<td>• CC, DOH, KU, LGSA</td>
</tr>
<tr>
<td>1.4 Negotiate inclusion of sun protection policy and shade requirement in preschool/child care centre licensing and building applications</td>
<td>• CC, DOH, LGSA</td>
</tr>
<tr>
<td>1.5 Lobby to include sun protection policy and shade requirement in child care centre accreditation</td>
<td>• CC, DOH</td>
</tr>
<tr>
<td>Priority (2) within next 2 years</td>
<td></td>
</tr>
<tr>
<td>2.1 Train and assist with use of shade provision guidelines and measurement tool/service</td>
<td>• CC, DOH, TAFE, LGSA, Universities</td>
</tr>
<tr>
<td>2.2 Encourage and assist in education of carers and teachers of young children through existing training courses</td>
<td>• CC, LGSA, DPW, AIEH, KU</td>
</tr>
<tr>
<td>Priority (3) within next 5 years</td>
<td></td>
</tr>
<tr>
<td>3.1 Conduct Shade and Sun Protection Policy Awards Scheme</td>
<td>• CC, DOH</td>
</tr>
<tr>
<td>3.2 Conduct Shade and Sun Protection Expo</td>
<td>• CC, DOH, All relevant stakeholders</td>
</tr>
<tr>
<td>3.3 Encourage and assist in the provision of appropriate training for those working in design, architecture and town planning to ensure child care centre and preschool environments are sun protective</td>
<td>• CC, DOH, TAFE, AIEH, Universities</td>
</tr>
</tbody>
</table>

* Abbreviations for lead organisations and partners are listed on pages 97–98
### Health Promotion Outcomes

<table>
<thead>
<tr>
<th>(A)</th>
<th>(B)</th>
<th>(C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation of shade guidelines</td>
<td>Increase in adequate provision of sun protective shade</td>
<td>Increase in children’s sun protection behaviour</td>
</tr>
<tr>
<td>Shade measurements conducted</td>
<td>Positive change in attitudes, knowledge and skills towards sun protection policies and behaviours among carers, teachers, parents and management</td>
<td>Increase in role model’s sun protection behaviour</td>
</tr>
<tr>
<td>Purchase of shade products by child care centres / preschools</td>
<td>Positive change in knowledge, attitudes and skills of children</td>
<td>Increase in children’s use of shade</td>
</tr>
<tr>
<td>Sun protection policies implemented with emphasis on structural change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full accreditation of child care centres to require sun protection policies and shade provision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inclusion of sun protection education in training for carers and teachers of young children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child care centres and preschools involved in Shade and Policy Award Scheme</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information on sun protective child care centre / preschool environments included in training for architects, designers and town planners</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Specific Targets

1. Increase in the number of child care centres with a formal written solar protection policy *(Baseline 18%; Schofield et al., 1993)*
2. Increase in the number of child care centres with a timetable policy *(Baseline 24%; Schofield et al., 1993)*
3. Increase in the number of child care centres with a shade policy *(Baseline 14%; Schofield et al., 1993)*
4. Increase in the number of children in child care centres observed wearing a hat on ten occasions *(Baseline 1%; Schofield et al., 1993)*
5. Increase in the number of children in childcare centres observed wearing a hat on at least one occasion *(Baseline 11%; Schofield et al., 1993)*

### Grouped Targets *(Detailed on page 94–95)*

7. Beachgoers’ use of sun protection measures
Primary and Secondary Schools

<table>
<thead>
<tr>
<th>Program Activity</th>
<th>Lead Organisations and Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Priority (1) within next 2 years</strong></td>
<td></td>
</tr>
<tr>
<td>1.1 Review the NSW Department of School Education policy on protection from the sun</td>
<td>• CC, DSE, Welfare Coordinators</td>
</tr>
<tr>
<td>1.2 Assist schools in the effective implementation of school sun protection policies, focusing on structural change and teachers as role models</td>
<td>• CC, DOH-AD, DSE, C&amp;I Schools</td>
</tr>
<tr>
<td>1.3 Schools development of their own policy on protection from the sun in consultation with the school community</td>
<td>• CC, DSE, C&amp;I Schools, P&amp;C, FOSCO</td>
</tr>
<tr>
<td>1.4 Encourage the inclusion of skin cancer education in primary and secondary school curricula</td>
<td>• CC, BOS, DSE, C&amp;I Schools</td>
</tr>
<tr>
<td>1.5 Develop shade provision guidelines</td>
<td>• CC, DOH, AIEH, DPW, Manufacturers</td>
</tr>
<tr>
<td>1.6 Develop shade provision measurement tool/service</td>
<td>• CC, DOH, AIEH, DPW, LGSA, Manufacturers</td>
</tr>
<tr>
<td>1.7 Ensure new schools and those with renovations include specified amount of shade and appropriate landscaping design</td>
<td>• PD, DSE, DPW, LGSA, C&amp;I Schools</td>
</tr>
<tr>
<td>1.8 Encourage use of existing buildings: verandahs, walkways, classrooms, libraries, halls for passive use</td>
<td>• CC, DSE, C&amp;I Schools</td>
</tr>
<tr>
<td>1.9 Encourage greater acceptance of hat wearing which complies with CC guidelines</td>
<td>• CC, DSE, DOH-AD, P&amp;C, FOSCO, Individual school communities</td>
</tr>
<tr>
<td>1.10 Encourage schools to adopt Sunsmart school uniforms / protective clothing which complies with CC guidelines</td>
<td>• CC, DSE, C&amp;I Schools, P&amp;C, FOSCO</td>
</tr>
<tr>
<td><strong>Priority (2) within next 2 years</strong></td>
<td></td>
</tr>
<tr>
<td>2.1 Train and assist schools with use of shade provision guidelines and measurement tool/service</td>
<td>• CC, DSE, DPW, LGSA, AIEH</td>
</tr>
<tr>
<td>2.2 Ensure relevant training of teachers through tertiary education and ongoing education and support</td>
<td>• CC, DSE, DOH-AD, Universities</td>
</tr>
<tr>
<td>2.3 Conduct workshops to discuss policy implementation ideas and success</td>
<td>• DOH-AD, Individual school communities</td>
</tr>
</tbody>
</table>

* Abbreviations for lead organisations and partners are listed on pages 97–98
### Program Activity

**Priority (3) within next 5 years**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Lead Organisations and Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Raise funds and investigate concessions to increase available shade in schools</td>
<td>• DSE, C&amp;I Schools, Service Clubs, Corporate Sponsors</td>
</tr>
<tr>
<td>3.2 Conduct Shade and Sun Protection Policy Awards Scheme</td>
<td>• CC, DOH</td>
</tr>
<tr>
<td>3.3 Conduct Shade and Sun Protection Expo</td>
<td>• CC, DOH, All relevant stakeholders</td>
</tr>
<tr>
<td>3.4 Encourage and assist in the provision of appropriate training for those working in design, architecture and town planning to ensure school environments are sun protective</td>
<td>• CC, DOH, TAFE, AIEH, LGSA, Universities</td>
</tr>
</tbody>
</table>

*Abbreviations for lead organisations and partners are listed on pages 97–98

### Health Promotion Outcomes

<table>
<thead>
<tr>
<th>Activity</th>
<th>(A)</th>
<th>(B)</th>
<th>(C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation of shade guidelines</td>
<td>Increase in adequate provision of sun protective shade</td>
<td>Increase in student’s sun protection behaviour</td>
<td>Increase in student’s use of shade</td>
</tr>
<tr>
<td>Shade measurements conducted</td>
<td>Positive change in attitudes, knowledge and skills towards sun protection policies and behaviours among teachers and principals</td>
<td>Increase in role model’s sun protection behaviour</td>
<td>Increase in role model’s use of shade</td>
</tr>
<tr>
<td>Existence of legislation about new schools and schools with renovations to include specified amount of shade</td>
<td>Positive change in knowledge, attitudes and skills of students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin cancer education taught across curriculum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SunSmart School Policies implemented with emphasis on structural change</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary and secondary schools involved in Shade and Policy Award Schemes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information in relation to sun protection and policy implementation available to teachers through education and training programs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase of shade products by schools</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information on sun protective school environments included in training for architects, designers and town planners</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Specific Targets

1. Increase in the number of primary schools with a written solar protection policy (Baseline 64%; Schofield et al., 1991)
2. Increase in the number of secondary schools with a written solar protection policy (Baseline 39%; Schofield et al., 1991)
3. Increase in the percentage of adolescents reporting that their school required them to wear a hat when playing outdoor sport (Baseline 32%; Sanson-Fisher, 1994)
4. Increase in the percentage of adolescents reporting that their school required them to wear a hat when outdoors at lunchtime (Baseline 21%; Sanson-Fisher, 1994)
5. Increase in the number of primary schools with a shade policy (Baseline 10%; Schofield et al., 1991)
6. Increase in the number of secondary schools with a shade policy (Baseline 0%; Schofield et al., 1991)
7. Decrease in the amount of time spent outdoors in primary schools during the highest risk period of the day (Baseline 83.7%; Schofield et al., 1991)
8. Decrease in the amount of time spent outdoors in secondary schools during the highest risk period of the day (Baseline 90.7%; Schofield et al., 1991)
9. Increase in the number of primary school students using hats or shade (Baseline 62%; Schofield et al., 1991)
10. Increase in the number of secondary school students using hats or shade (Baseline 64%; Schofield et al., 1991)

Grouped Targets (Detailed on page 94–95)

1. Adolescents’ knowledge
2. Adolescents’ attitudes and intentions to sun protection
4. Adolescents’ level of protection
5. Adolescents’ use of sun protection measures
7. Beachgoers’ use of sun protection measures
## Workplace

<table>
<thead>
<tr>
<th>Activity</th>
<th>Lead Organisations and Partners *</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Priority (1) within next 2 years</strong></td>
<td></td>
</tr>
<tr>
<td>1.1 Develop shade provision guidelines</td>
<td>• Workcover, AIEH, CC, GA, MBA</td>
</tr>
<tr>
<td>1.2 Develop shade provision measurement tool/service</td>
<td>• Workcover, AIEH, CC, MBA, Engineers, Universities</td>
</tr>
<tr>
<td>1.3 Lobby for work-related sun protection products to be tax deductible</td>
<td>• CC, SBCA, Employer Organisations, NA, Unions</td>
</tr>
<tr>
<td>1.4 Establish tax deduction scheme and/or sun protection policies to cover volunteer workers, e.g. sports umpires, surf lifesavers</td>
<td>• CC, Volunteer Associations</td>
</tr>
<tr>
<td>1.5 Lobby to have sun protection policies for outdoor workers mandatory including shade structures where feasible through establishment of code of practice</td>
<td>• Workcover, CC, DOH, MBA, RACS</td>
</tr>
<tr>
<td>1.6 Develop and include sun protection education as part of TAFE and training courses for outdoor workers</td>
<td>• CC, TAFE, DOH, Workcover</td>
</tr>
<tr>
<td><strong>Priority (2) within next 2 years</strong></td>
<td></td>
</tr>
<tr>
<td>2.1 Train and assist with use of shade provision guidelines and measurement tool/service</td>
<td>• Workcover, AIEH, CC, LGSA</td>
</tr>
<tr>
<td>2.3 Conduct industry-based Shade and Sun Protection Policy Awards Scheme</td>
<td>• CC, DOH, Industry Associations</td>
</tr>
<tr>
<td>2.4 Conduct Shade and Sun Protection Expo</td>
<td>• CC, DOH, All relevant stakeholders</td>
</tr>
<tr>
<td>2.5 Educate employers and Occupational Health and Safety (OH&amp;S) committee members about legal obligations and provide training in implementation of policies. Training should be linked to other OH&amp;S training</td>
<td>• Workcover, CC, NA, NSCA, Unions, Employer Organisations</td>
</tr>
<tr>
<td>2.6 Access small businesses, contractors and trades people as above</td>
<td>• Workcover, CC, SBCA, Government Departments who subcontract work, Large employers, Unions, Employer Organisations, Trades Associations, Licensing Bodies</td>
</tr>
<tr>
<td>2.7 Develop peer training programs and provide information to employees about sun protection</td>
<td>• CC, DOH-AD, Occupational Health Nurses</td>
</tr>
</tbody>
</table>

*Abbreviations for lead organisations and partners are listed on pages 97–98

Primary prevention of skin cancer in Australia
<table>
<thead>
<tr>
<th>Program Activity</th>
<th>Lead Organisations and Partners *</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Priority (2) within next 2 years (continued)</strong></td>
<td></td>
</tr>
<tr>
<td>2.8 Encourage and assist in appropriate training for those working in design, architecture and town planning to ensure work environments are designed and planned to be sun protective</td>
<td>• CC, AIEH, TAFE, LGSA, Professional Associations, Universities</td>
</tr>
<tr>
<td>2.9 Implement occupational health and safety legislation in relation to sun protection through training for workplace inspectors following the establishment of a code of practice</td>
<td>• Workcover, NSCA, Unions, CC</td>
</tr>
<tr>
<td>2.10 Develop general audit checklist for sun protection for occupational health and safety committees and employers to be included as part of a code of practice. This should include information on “What is an outdoor worker?” and on the purchase of sun protection equipment</td>
<td>• Workcover, CC, CERP, DOH</td>
</tr>
<tr>
<td><strong>Priority (3) within next 5 years</strong></td>
<td></td>
</tr>
<tr>
<td>3.1 Conduct promotional campaign targeting employers and employees after establishment of code of practice</td>
<td>• Workcover, CC, DOH</td>
</tr>
<tr>
<td>3.2 Liaise with suppliers of sun protection equipment to discuss design and promotional aspects</td>
<td>• CC, Workcover, Employer Organisations, Universities, Unions</td>
</tr>
</tbody>
</table>

*Abbreviations for lead organisations and partners are listed on pages 97–98*
Health Promotion Outcomes

(A)

- Implementation of shade guidelines
- Shade measurements conducted
- Workplaces involved in Shade and Policy Awards Scheme
- Sun protection products to be tax deductible
- Information on legal obligations available to employers and OH&S representatives
- Training programs conducted for OH&S representatives and employers
- Increase in number of sun protection and shade policies implemented in workplaces
- Increase in number of small business with sun protection and shade policies effectively implemented
- Number of peer training and education programs implemented in workplaces
- Inclusion of sun protection education as part of TAFE and training courses for outdoor workers
- Information on sun protective work environments provided for those working in design, architecture and town planning
- General audit sun protection checklist as part of code of practice

(B)

- Increase in adequate provision of sun protective shade in workplaces
- Increase in availability of sun protection products for outdoor workers
- Increase in number of workplaces rescheduling work to avoid outdoor exposure during the danger hours
- Positive change in knowledge, attitudes and skills of OH&S representatives, employers and employees

(C)

- Increase in use of shade by outdoor workers
- Increase in sun protection behaviour by outdoor workers
- Decrease in number of outdoor work hours scheduled between 11am and 3pm

Specific Targets

1. Increase in the percentage of councils with a policy for outdoor workers (Baseline 42%; White et al., 1993)
2. Decrease in the percentage of councils with no policy for outdoor workers (Baseline 45%; White et al., 1993)
3. Decrease in the percentage of councils not scheduling activities to limit workers’ exposure between 11am and 3pm (Baseline 90%; White et al., 1993)
4. Increase in the percentage of councils providing some sort of portable shade construction for outdoor workers when needed (Baseline 26%; White et al, 1993)
5. Increase in the percentage of councils providing long sleeved shirts for sun protection (Baseline 24%; White et al., 1993)
6. Increase in the percentage of outdoor workers using a high level of solar protection (Baseline 49%, Girgis et al., 1994)
### Sport, Recreation and Community

#### Program Activity

<table>
<thead>
<tr>
<th>Priority (1) within next 2 years</th>
<th>Lead Organisations and Partners *</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Develop and implement shade provision policy and guidelines for local government, sport and recreation groups and other public buildings and environments</td>
<td>CC, LGSA, DLG, AIEH, DOH, DSRR, GA, S&amp;R Clubs/SLSC</td>
</tr>
<tr>
<td>1.2 Develop and market shade provision measurement tool/service</td>
<td>CC, DOH, DSRR, LGSA, DPW, AIEH, Engineers, S&amp;R Clubs/SLSC</td>
</tr>
<tr>
<td>1.3 Develop appropriate sun protection policies and train and assist in implementation</td>
<td>CC, DOH, DSRR, LGSA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Priority (2) within next 2 years</th>
<th>Lead Organisations and Partners *</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Train and assist with use of shade provision guidelines and measurement tool/service</td>
<td>CC, DOH, AIEH, LGSA</td>
</tr>
<tr>
<td>2.2 Conduct Shade and Sun Protection Policy Awards Scheme</td>
<td>DOH, CC, AIEH</td>
</tr>
<tr>
<td>2.3 Conduct Shade and Sun Protection Expo</td>
<td>CC, DOH, All relevant stakeholders</td>
</tr>
<tr>
<td>2.4 Lobby for shade provision to be included in retail, sport and recreational development planning</td>
<td>DOH CC, DSRR, AIEH, RACS</td>
</tr>
<tr>
<td>2.5 Establish shade provision as a criterion to be met on building applications and advertise through trade journals</td>
<td>CC, AIEH, LGSA, DOH, Professional Associations</td>
</tr>
<tr>
<td>2.6 Develop community guidelines and information about shade provision in the home environment</td>
<td>CC, LGSA, MBA, NA</td>
</tr>
<tr>
<td>2.7 Provide the community with access to guidelines and information about shade provision in the home environment</td>
<td>LGSA, MBA, NA, Media</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Priority (3) within next 5 years</th>
<th>Lead Organisations and Partners *</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Encourage and assist in appropriate training about the need for sun protection in sport, community recreation and other public use environments for those working in design, architecture and town planning</td>
<td>CC, AIEH, TAFE, Universities, LGSA</td>
</tr>
</tbody>
</table>

* Abbreviations for lead organisations and partners are listed on pages 97–98

Primary prevention of skin cancer in Australia
### Health Promotion Outcomes

<table>
<thead>
<tr>
<th>(A)</th>
<th>(B)</th>
<th>(C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation of sun protection policies and shade guidelines</td>
<td>Increase in adequate provision of sun protective shade</td>
<td>Increase in sport and recreational sun protection behaviour</td>
</tr>
<tr>
<td>Shade measurements conducted</td>
<td>Positive change in attitudes, knowledge and skills among sport, recreation and community groups</td>
<td>Increase in sun protection behaviour amongst trainers and recreation leaders</td>
</tr>
<tr>
<td>Sporting, recreation and community groups involved in Shade and Policy Awards Schemes</td>
<td>Positive change in knowledge, attitudes and skills of participants in sport and recreation</td>
<td>Increase in use of shade by sport and recreation participants</td>
</tr>
<tr>
<td>Inclusion of shade provision in development and building applications</td>
<td>Local councils and commercial agencies to agree to provide shade in existing recreation and outdoor community areas</td>
<td>Guidelines and information on shade provision for the home environment available</td>
</tr>
<tr>
<td>Information on sun protective environments included in training for architects, designers and town planners</td>
<td>Guidelines and information on shade provision for the home environment available</td>
<td>Information on sun protective environments included in training for architects, designers and town planners</td>
</tr>
<tr>
<td>Information in relation to sun protection and policy implementation available to sport, recreation and community groups through education and training</td>
<td>Information in relation to sun protection and policy implementation available to sport, recreation and community groups through education and training</td>
<td>Information in relation to sun protection and policy implementation available to sport, recreation and community groups through education and training</td>
</tr>
</tbody>
</table>

### Specific Targets

1. Increase in the percentage of adolescents who agree that playing sport to avoid the hottest part of the day is a good idea (Baseline 65%; Sanson-Fisher, 1994)
2. Increase in the percentage of adolescents who agree that sports clubs making members wear hats is a good idea (Baseline 47%; Sanson-Fisher, 1994)
3. Increase in the percentage of adolescents reporting that sports clubs provide shade for spectators (Baseline 62%; Sanson-Fisher, 1994)
4. Increase in the percentage of adolescents reporting that sports clubs provide shade for players (Baseline 48%; Sanson-Fisher, 1994)
5. Increase in the percentage of adolescents reporting that sports clubs require members to wear a hat while playing (Baseline 19%; Sanson-Fisher, 1994)
6. Increase in the percentage of councils with a policy for providing shade at pools and beaches (Baseline 11%; White et al., 1993)
7. Increase in the percentage of councils with a formal policy regarding provision of shade in parks and gardens (Baseline 15%; White et al., 1993)

### Grouped Targets

2. Adolescents’ attitudes and intentions to sun protection
3. Adolescents’ attitudes to sun protection products
4. Adolescents’ level of protection
5. Adolescents’ use of sun protection measures
6. Beachgoers’ level of protection
7. Beachgoers’ use of sun protection measures
8. Shade cover provided in the community
# SUN PROTECTION PRODUCTS

**Program Activity**

<table>
<thead>
<tr>
<th>Priority (1) within next 2 years</th>
<th>Lead Organisations and Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Develop guidelines on shade structures and products</td>
<td>• CC, Industry representatives</td>
</tr>
<tr>
<td>1.2 Encourage production of products for adolescents that are sun protective and fashionable</td>
<td>• CC, FIA, Consumer Groups, Media</td>
</tr>
<tr>
<td>1.3 Encourage design of products that are specialised for sport and recreation activities</td>
<td>• CC, DSRR, S&amp;R Clubs, SLSC Consumer Groups</td>
</tr>
<tr>
<td>1.4 Encourage improved sun protection design and fabric of clothing and hats</td>
<td>• CC, DOH, FIA, MF/MU, Manufacturers</td>
</tr>
<tr>
<td>1.5 Develop rating scheme for clothing fabrics (and possibly shade materials)</td>
<td>• Standards Australia</td>
</tr>
<tr>
<td>1.6 Encourage use of SPF15+ in moisturisers and make-up</td>
<td>• CC, CTFAA, Manufacturers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Priority (2) within next 2 years</th>
<th>Lead Organisations and Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Lobby for waiving of sales tax on clothing, hats and shade products that meet specified criteria</td>
<td>• CC</td>
</tr>
<tr>
<td>2.2 Encourage wider distribution of sun protection products at the retail level particularly at sport and recreation retail outlets</td>
<td>• CC, SPSA, All Sports &amp; Recreation Outlets, RTA</td>
</tr>
<tr>
<td>2.3 Provide information and training to people selling sun protection products</td>
<td>• CC, CTFAA, MF/MU, PG</td>
</tr>
<tr>
<td>2.4 Ensure sun protective design issues are included in training/education of designers and architects</td>
<td>• CC, TAFE, Universities</td>
</tr>
<tr>
<td>2.5 Establish patterns (dressmakers patterns for home sewing market) for sun protective clothing</td>
<td>• CC, Industry Representatives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Priority (3) within next 5 years</th>
<th>Lead Organisations and Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Encourage design and marketing of portable shade products and shade structures</td>
<td>• CC, DOH, Manufacturers</td>
</tr>
<tr>
<td>3.2 Encourage wider availability of shade products and structures at both wholesale and retail level</td>
<td>• CC, RTA, Retailers and Manufacturers</td>
</tr>
</tbody>
</table>

*Abbreviations for lead organisations and partners are listed on pages 97–98*
### Health Promotion Outcomes

<table>
<thead>
<tr>
<th>(A)</th>
<th>(B)</th>
<th>(C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of guidelines on shade structures and products</td>
<td>Increase availability of shade products and structures</td>
<td>Increased sale and use of shade and sun protection products that meet specified criteria</td>
</tr>
<tr>
<td>Agreement to manufacture and increase availability of personal sun protection products particularly for adolescents and sport and recreation activities</td>
<td>Availability of wide range of sun protection products</td>
<td></td>
</tr>
<tr>
<td>Ratings scheme introduced for clothing and fabrics</td>
<td>Ratings on clothing and fabrics</td>
<td></td>
</tr>
<tr>
<td>Legislation for waiving of sales tax on specified clothing, hat and shade products</td>
<td>Availability of clothing and fabric products that meet specified criteria</td>
<td></td>
</tr>
<tr>
<td>Agreement of wholesale and retail bodies to manufacture and increase availability of shade structures and products</td>
<td>Increase in sales people’s knowledge and skills</td>
<td></td>
</tr>
<tr>
<td>Training programs and information provided to sales people</td>
<td>Positive change in public knowledge, attitudes and skills toward sun protection products</td>
<td></td>
</tr>
<tr>
<td>Involvement of design and architect schools in designing sun protective clothing, hats and shade structures</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Specific Targets

1. Increase in the percentage of adolescents who disagree that sunscreens cost too much money *(Baseline 55%; Sanson-Fisher, 1994)*

2. Increase in the percentage of councils who encourage the supply of sun protection items through their sale points *(Baseline 70%; White et al., 1993)*

### Grouped Targets *(Detailed on pages 94–95)*

3. Adolescents’ attitudes to sun protection products
4. Adolescents’ level of protection
5. Adolescents’ use of sun protection measures
6. Beachgoers’ level of protection
7. Beachgoers’ use of sun protection measures
8. Shade cover provided in the community
### PUBLIC AWARENESS

<table>
<thead>
<tr>
<th>Program Activity</th>
<th>Lead Organisations and Partners *</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Priority (1) within next 2 years</strong></td>
<td></td>
</tr>
<tr>
<td>1.1 Work with all media, particularly fashion, beauty, sport and lifestyle media, to encourage coverage of sun protection issues</td>
<td>• CC, ACD, MF/MU, SCF</td>
</tr>
<tr>
<td>1.2 Create links with sporting media and personalities to promote sun protection</td>
<td>• CC, DSRR, MF/MU</td>
</tr>
<tr>
<td>1.3 Conduct media campaigns targeting identified barriers to sun protection such as acceptability of hats and shirts particularly for adolescents</td>
<td>• CC, DOH, MF/MU</td>
</tr>
<tr>
<td>1.4 Conduct campaigns directed at reducing high dose intermittent recreational exposure to UV radiation (sunburn)</td>
<td>• CC, ACD, MF/MU, Tourism Industry</td>
</tr>
<tr>
<td>1.5 Educate advertising and marketing consultants and television producers about their role in promoting sun protection</td>
<td>• CC, DOH, ACD, MF/MU, Advertising, Marketing and TV bodies</td>
</tr>
<tr>
<td><strong>Priority (2) within next 2 years</strong></td>
<td></td>
</tr>
<tr>
<td>2.1 Provide information and training about prevention to health professionals</td>
<td>• CC, DOH, MF/MU, CN</td>
</tr>
<tr>
<td>2.2 Develop a speaker’s network</td>
<td>• CC, DOH-AD, GP Groups, MF/MU</td>
</tr>
<tr>
<td>2.3 Continue and further develop community action approaches</td>
<td>• CC, CERP, DOH-AD</td>
</tr>
<tr>
<td>2.4 Provide information about sun protection to parents of young children</td>
<td>• CC, DOH-AD, GP Groups, MF/MU, KU, NMAA, PG</td>
</tr>
<tr>
<td><strong>Priority (3) within next 5 years</strong></td>
<td></td>
</tr>
<tr>
<td>3.1 Conduct a state wide media campaign on shade</td>
<td>• CC, DOH, Media</td>
</tr>
<tr>
<td>3.2 Work with allied health and beauty therapists to promote prevention</td>
<td>• CC, DOH-AD, MF/MU, TAFE, PA, H&amp;B, LGSA</td>
</tr>
</tbody>
</table>

*Abbreviations for lead organisations and partners are listed on pages 97–98*
### Health Promotion Outcomes

<table>
<thead>
<tr>
<th>(A)</th>
<th>(B)</th>
<th>(C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fashion, beauty, sport and leisure industries join in promoting sun protection</td>
<td>Positive change in general public's attitudes, knowledge and skills in relation to sun protection and sun protection products</td>
<td>Increase in sun protection behaviour</td>
</tr>
<tr>
<td>Advertising, marketing and TV industries join in promoting sun protection</td>
<td></td>
<td>Increase in use of shade</td>
</tr>
<tr>
<td>Increased public interest and awareness in sun protection particularly among adolescents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involvement of health professionals in promoting sun protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involvement of allied health and beauty therapists in promoting sun protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Media join in promoting use of shade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involvement of community members in promoting sun protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information available to parents of young children</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Specific Targets

1. Increase in media coverage of sun protection and skin cancer issues  
   *(Baseline 353 news items; Sanson-Fisher, 1993)*

### Grouped Targets  
*(Detailed on pages 94–95)*

1. Adolescents’ knowledge
2. Adolescents’ attitudes and intentions to sun protection
3. Adolescents’ attitudes to sun protection products
4. Adolescents’ level of protection
5. Adolescents’ use of sun protection measures
6. Beachgoers’ level of protection
7. Beachgoers’ use of sun protection measures
8. Shade cover provided in the community
## Grouped Targets

<table>
<thead>
<tr>
<th>Group Descriptor</th>
<th>Targets</th>
<th>Relevant Program Activities</th>
</tr>
</thead>
</table>
| 1. Adolescents’ knowledge | • Increase in the proportion of 11–16 year olds in top third of knowledge score (*Baseline 73%; Sanson-Fisher, 1994*) | • Primary and Secondary Schools  
                                      • Public Awareness |
|                   | • Increase in the percentage of 11–16 year olds in top third of a positive attitudes score (*Baseline 58%; Sanson-Fisher, 1994*) | • Primary and Secondary Schools  
                                      • Sport, Recreation and Community  
                                      • Public Awareness |
|                   | • Increase in the percentage of adolescents who have an intention to try to protect themselves as much as possible (*Baseline 32%; Sanson-Fisher, 1994*) | • Sport, Recreation and Community  
                                      • Sun Protection Products  
                                      • Public Awareness |
| 2. Adolescents’ attitudes and intentions to sun protection | • Increase in the percentage of adolescents who disagree that clothes that protect you from the sun look daggy (*Baseline 47%; Sanson-Fisher, 1994*) | • Primary and Secondary Schools  
                                      • Public Awareness |
|                   | • Increase in the percentage of adolescents who agree that wearing a sun-screen is a good idea when playing sport (*Baseline 75%; Sanson-Fisher, 1994*) | • Primary and Secondary Schools  
                                      • Sport, Recreation and Community  
                                      • Public Awareness |
|                   | • Increase in the proportion of adolescents agreeing that providing shade shelters for people playing or watching sports is a good idea (*Baseline 82%; Sanson-Fisher, 1994*) | • Primary and Secondary Schools  
                                      • Sport, Recreation and Community  
                                      • Sun Protection Products  
                                      • Public Awareness |
| 3. Adolescents’ attitudes to sun protection products | • Increase in the percentage of adolescents aged 11–13 yrs who use a high level of solar protection (*Baseline Males 63%; Females 51%; Sanson-Fisher, 1994*) | • Primary and Secondary Schools  
                                      • Sport, Recreation and Community  
                                      • Sun Protection Products  
                                      • Public Awareness |
|                   | • Increase in the percentage of adolescents aged 14–16 yrs who use a high level of solar protection (*Baseline Males 58%; Females 44%; Sanson-Fisher, 1994*) | • Primary and Secondary Schools  
                                      • Sport, Recreation and Community  
                                      • Sun Protection Products  
                                      • Public Awareness |
|                   | • Decrease in the percentage of adolescents who had a sore or tender sunburn during summer (*Baseline 49%; Sanson-Fisher, 1994*) | • Primary and Secondary Schools  
                                      • Sport, Recreation and Community  
                                      • Sun Protection Products  
                                      • Public Awareness |
<p>| 4. Adolescents’ level of protection | | |</p>
<table>
<thead>
<tr>
<th>Group Descriptor</th>
<th>Targets</th>
<th>Relevant Program Activities</th>
</tr>
</thead>
</table>
| 5. Adolescents’ use of sun protection measures | • Increase in the percentage of adolescents outdoors in the shade *(Baseline 14%; Sanson-Fisher, 1994)*  
• Increase in the percentage of adolescents wearing a recommended hat *(Baseline 6%; Sanson-Fisher, 1994)*  
• Increase in the percentage of adolescents wearing shirt with a collar *(Baseline 20%; Sanson-Fisher, 1994)*  
• Increase in the percentage of adolescents wearing sunscreen on their face *(Baseline 39%; Sanson-Fisher, 1994)*  
• Increase in the proportion of beachgoers using a high level of protection *(Baseline 45%; Foot et al., 1993)*  
• Decrease in the proportion of beachgoers not using any solar protection *(Baseline 16%; Foot et al., 1993)*  
• Increase in the proportion of beachgoers who have applied sunscreen with SPF 15+ on at least one part of the body *(Baseline 6%; <15 yrs 87%; 15–29yrs 55.5%; 30+ yrs 61.2%; Foot et al., 1993)*  
• Increase in the proportion of beachgoers using the correct head gear *(Baseline 17%; <15yrs 11.1%; 15–29yrs 22.4%; 30+ yrs 61.2%; Foot et al., 1993)*  
• Increase in the proportion of beachgoers using the recommended type of shirt *(Baseline 3.4%; <15yrs 2.8%, 15–29 yrs 4.1%; 30+yrs 3.4%; Foot et al., 1993)*  | • Primary and Secondary Schools  
• Sport, Recreation and Community  
• Sun Protection Products  
• Public Awareness |
| 6. Beachgoers’ level of protection |  | • Primary and Secondary Schools  
• Sport, Recreation and Community  
• Sun Protection Products  
• Public Awareness |
| 7. Beachgoers’ use of sun protection measures |  | • Primary and Secondary Schools  
• Sport, Recreation and Community  
• Sun Protection Products  
• Public Awareness |
<table>
<thead>
<tr>
<th>Group Descriptor</th>
<th>Targets</th>
<th>Relevant Program Activities</th>
</tr>
</thead>
</table>
| 8. Shade cover provided in the community | • Increase in the percentage of councils that reported at least some of the play equipment in their parks had shade cover (Baseline 21%; White et al., 1993)  
• Increase in the percentage of pools in the highest shade level category (Baseline 10%; White et al., 1993)  
• Increase in the percentage of beaches in the three highest shade level categories (Baseline 7%; White et al., 1993)  
• Decrease in the percentage of pools in the lowest shade level category (Baseline 38%; White et al., 1993)  
• Decrease in the percentage of beaches in the lowest shade level category (Baseline 79%; White et al., 1993) | • Sport, Recreation and Community  
• Sun Protection Products  
• Public Awareness |
Abbreviations for Lead Organisations and Partners

ACD .......................................................... Australasian College of Dermatologists
AIEH .......................................................... Australian Institute of Environmental Health
BOS .......................................................... Board of Studies
CC .......................................................... NSW Cancer Council
CCR&CERU ............................................ NSW Cancer Council’s Central Cancer Registry and Cancer Epidemiology Research Unit
CERP ....................................................... NSW Cancer Council’s Cancer Education Research Project
C&I Schools ............................................. Catholic and Independent Schools
CN .......................................................... NSW College of Nursing
Consumer Groups .................................... Australian Consumer Association and Australian Federation of Consumer Associations
Corporate Sponsors .................................. Businesses able to support programs by financial or other means
COTA ...................................................... Council on the Ageing
CTFAA ................................................... Cosmetic, Toiletry and Fragrance Association of Australia
DLG .......................................................... Department of Local Government
DOH ......................................................... Department of Health Head Office
DOH-AD .................................................. Department of Health Area and District Health Services
DPW .......................................................... Department of Public Works NSW
DSE .......................................................... Department of School Education
DSRR ........................................................ NSW Department of Sport, Recreation and Racing
Employer Organisations ........................... Employers Federation and industry-based employer organisations
Engineers .................................................... Engineers contacted on a consultancy basis
FIA .......................................................... Fashion Industries of Australia
FOSCO ..................................................... Federation of School and Community Organisations
GA .......................................................... Greening Australia
GP Groups ................................................ For example, Royal Australasian College of General Practitioners
                                         Divisions of General Practice
                                         Rural Doctors Resource Network
                                         Australian Medical Association
KU ................................................................. Children’s Services
LGSA .............................................................. Local Government and Shires Association and/or Local Councils
MBA ............................................................... Master Builders Association of NSW
MF/MU ........................................................... Melanoma Foundation of the University of Sydney and
the Hunter Melanoma Foundation and/or
the Newcastle and Sydney Melanoma Units
NA ................................................................. Nursery Industry Association of NSW
NHMRC .......................................................... National Health and Medical Research Council
NMAA ........................................................... Nursing Mothers’ Association of Australia
NSCA ........................................................... National Safety Council of Australia
PA ................................................................. Physiotherapy Association
P&C ............................................................... Federation of Parents and Citizens’ Associations of NSW
PD ............................................................... Properties Directorate, Department of School Education
PG ............................................................... Pharmacy Guild and/or Pharmacies
RACGP ........................................................ Royal Australasian College of General Practitioners
RACS .......................................................... Royal Australasian College of Surgeons
RTA ............................................................. Retail Traders’ Association of NSW
SBCA .......................................................... Small Business Combined Association of NSW
SCF ............................................................. Skin and Cancer Foundation of NSW
Service Clubs .............................................. For example, Lions, Rotary, Apex, Country Women’s Association
SLSC ........................................................ Surf Lifesaving Clubs
SPSA ........................................................ Swimming Pools and Spa Association
S&R Clubs .................................................. All outdoor sporting and recreation clubs and associations
TAFE .......................................................... NSW Technical and Further Education Commission
Workcover ................................................... Workcover Authority

Primary prevention of skin cancer in Australia
## Appendix B

### Evaluated Primary Prevention Programs in Australia

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Aims</th>
<th>Area Serviced &amp; Target Group</th>
<th>Years</th>
<th>Agency &amp; Other Participating Agencies</th>
<th>Funding Source &amp; Funding Amount</th>
<th>Evaluation, Design, Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun Protection Policy</td>
<td>Promote school guidelines &amp; procedures using ACT Cancer Society’s SUNSMART POLICY GUIDELINES for schools.</td>
<td>ACT Schools/ School Boards</td>
<td>1994</td>
<td>ACT Department of Education and Training</td>
<td>Information not provided</td>
<td>12 months trial period—nil information.</td>
</tr>
<tr>
<td>Sun Protection Strategies for NSW — A Guide for Local Government</td>
<td>Promotion of policies in local government.</td>
<td>NSW Local government — shires</td>
<td>1993</td>
<td>NSW Department of Local Government Co-operatives</td>
<td>Information not provided</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>ME NO FRY Program</td>
<td>Primary prevention social marketing to increase sun protection amongst adolescents.</td>
<td>NSW state wide Adolescents (11–16)</td>
<td>1990 – 1995 annually</td>
<td>Health Promotion Branch, Public Health Division, NSW Health</td>
<td>NSW Health</td>
<td>Series of tracking surveys. (First in 1990/91, but data incompatible with other years.) —report on disks. Qualitative Study in 1994—report on disk.</td>
</tr>
<tr>
<td>Project Name</td>
<td>Aims</td>
<td>Area Serviced &amp; Target Group</td>
<td>Years</td>
<td>Agency &amp; Other Participating Agencies</td>
<td>Funding Source &amp; Funding Amount</td>
<td>Evaluation, Design, Outcome</td>
</tr>
<tr>
<td>--------------</td>
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<td>-------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Skin Safe</td>
<td>Interventions to improve solar protection in primary schools.</td>
<td>II NSW government schools 9–11 year old school students</td>
<td>&lt;1993</td>
<td>Cancer Education Research Program</td>
<td>Information not provided</td>
<td>Randomised controlled trial: group 1: intensive, group 2: standard, group 3: control. Pre-test, two post-test surveys behaviour, knowledge, attitudes and beliefs.</td>
</tr>
<tr>
<td>A workplace intervention for increasing outdoor workers’ use of solar protection</td>
<td>Increase solar protection in outdoor workers.</td>
<td>NSW Hunter region Outdoor workers in a local electrical supply authority</td>
<td>&lt;1994</td>
<td>Cancer Education Research Program NSW Cancer Council—Hunter region office Royal Newcastle Hospital</td>
<td>Information not provided</td>
<td>Randomised Controlled Trial: two group, pre-test and post-test, sun protection behaviour, knowledge, attitudes and beliefs assessed. Significant increase in level of solar protection used, but no changes in attitude observed.</td>
</tr>
<tr>
<td>Change in behaviour, beliefs and intentions for skin cancer prevention</td>
<td>Improve sun protection related knowledge, attitudes and beliefs.</td>
<td>University of Newcastle First year University students</td>
<td>&lt;1989</td>
<td>Not Applicable</td>
<td>Information not provided</td>
<td>Knowledge, attitudes and beliefs, three groups design. (Information vs emotional video vs control). Randomised controlled trial, Pre-test and post-test measures. Increases in skin protection intentions reported.</td>
</tr>
<tr>
<td>NSW Cancer Council Schools Project, Childhood SunSmart Package, Workplace project</td>
<td>Primary prevention and early detection) SunSmart policy for primary schools, SunSmart policy for secondary school, Skin Cancer Control in NSW Health Promotion Strategic Plan 1995–96.</td>
<td>NSW state wide, NSW preschools and child care centres NSW schools</td>
<td>1990</td>
<td>NSW Cancer Council, Health Promotion Unit NSW Health and many others</td>
<td>NSW Cancer Council</td>
<td>Monitoring outcomes, program activity feedback.</td>
</tr>
</tbody>
</table>
### Australian Programs (continued)

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Aims</th>
<th>Area Serviced &amp; Target Group</th>
<th>Years</th>
<th>Agency &amp; Other Participating Agencies</th>
<th>Funding Source &amp; Funding Amount</th>
<th>Evaluation, Design, Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer Free Kids</td>
<td>To encourage healthy lifestyle habits re: skin protection, healthy eating and no smoking to reduce risk of cancer — promote policies in schools and other health professionals dealing with target group.</td>
<td>SA Primary schools</td>
<td>1988–91</td>
<td>Anti-Cancer Foundation, SA</td>
<td>Anti-Cancer Foundation of SA</td>
<td>Baseline survey (of Principals), interview (Principal), post-project survey, no significant differences in project versus other schools. <strong>Note:</strong> Emphasis on policy (not curriculum), secular trend towards already having policies so project did no better than non-project schools.</td>
</tr>
<tr>
<td>Guidelines for reducing exposure to solar UV radiation for school children</td>
<td>Increase provision of shade in schools.</td>
<td>TAS state wide All department school and colleges</td>
<td>1994</td>
<td>Tasmanian Department of Education and the Arts</td>
<td>Information not provided</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Safe Summer</td>
<td>To promote positive health messages and harm minimisation in the areas of: A&amp;D, Sexual Health, Sun &amp; Skin Care.</td>
<td>Southern Region of Tasmania 12–25 year olds</td>
<td>1995</td>
<td>The Link Youth Health Service plus community-based organisations</td>
<td>Department of Community Health Services —$19 000 Hobart City Council —$1 000 Hobart Health Promotion Group —$1 225 HIV/AIDS Unit —$2 000 Peg Putt, MHA —$100</td>
<td>Intervention: T-shirt design competition, “Safe Summer Bus”, information bags, radio plays, skin checks, number of surveys completed, number of items distributed, qualitative non-sampled feedback. <strong>Note:</strong> No firm evaluation.</td>
</tr>
</tbody>
</table>
### Australian Programs (continued)

<table>
<thead>
<tr>
<th>Project Name</th>
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<th>Funding Source &amp; Funding Amount</th>
<th>Evaluation, Design, Outcome</th>
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<tbody>
<tr>
<td>Queensland Health Skin Cancer Prevention Program</td>
<td>To facilitate action in relation to sun protective policies, sun protective environments, sun protective behaviours and early detection.</td>
<td>QLD state wide Media Campaign Teenagers/young adults, adults in sporting groups, outdoor workers and migrant families.</td>
<td>Commencement: 1991/92 Ongoing: 1992/93</td>
<td>HAB, Queensland Health QCF, Education Department, Regional Health Authorities, EHIB, CPRC</td>
<td>HAB = $200 000 Queensland Health $412 000 Department of Tourism Sport and Youth</td>
<td>Needs Assessments, Pre- and post-project surveys (e.g. pools and beaches – HAB and CPRC), Annual Reports. <em>Queensland Sun-Protection Survey, Summer 1992 (outdoors); Slip, Slop, Slap Has Got Serious — Sun Protection Campaign Evaluation 1991/92.</em> Report to Sun Protection Working Party NHMRC 1995.</td>
</tr>
<tr>
<td>Primary school teaching resource Education Dept. Health Schools Project funding</td>
<td>To produce resources to assist in the reduction of skin cancer.</td>
<td>QLD Children, years 5–12</td>
<td>1991–95</td>
<td>CHPCPR QCF</td>
<td>Education Department</td>
<td>Guidelines only.</td>
</tr>
<tr>
<td>SCAT—Skin Cancer and Teenage Project —high schools</td>
<td>To determine the effects of an intervention on sun protective measures in year 8–12 students. To assess the impact of the interventions on knowledge and attitudes.</td>
<td>QLD Teenagers</td>
<td>1992–96</td>
<td>CHPCPR Queensland Health QCF, Education Department</td>
<td>NHMRC QCF Queensland Health $250 000</td>
<td>Randomised controlled trial — in progress.</td>
</tr>
</tbody>
</table>

**NOTE:** CHPCPR = Centre for Health Promotion and Cancer Prevention Research (formerly CPRC = Cancer Prevention Research Centre); QCF = Queensland Cancer Fund; NHMRC = National Health Medical Research Council HAB = Health Advancement Branch; EHIB = Epidemiology and Health Information Branch
## Australian Programs (continued)

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<tbody>
<tr>
<td>Intersectoral Skin Cancer Prevention Policies</td>
<td>To develop intersectoral policy and implementation of strategies for the prevention of skin cancer across all sectors.</td>
<td>QLD state wide intersectoral policies</td>
<td>Commencement: 1991/92</td>
<td>HAB, Queensland Health</td>
<td>HAB, Queensland Health</td>
<td>Enhancing the Early Detection of Melanoma in Queensland (EHIB circular #23), CPRP commissioned project reports.</td>
</tr>
<tr>
<td>Guidelines for the Implementation of a SunSmart Policy</td>
<td>To develop a professional resource document of exemplar policies.</td>
<td>QLD</td>
<td>1994–96</td>
<td>QCF</td>
<td>Queensland Health Promotion Council/Health Department $96 000</td>
<td>Policy Guidelines.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outdoor workers, children, sports people, tourists</td>
<td></td>
<td>CHPCPR</td>
<td></td>
<td></td>
</tr>
</tbody>
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**NOTE:** CHPCPR = Centre for Health Promotion and Cancer Prevention Research (formerly CPRC = Cancer Prevention Research Centre); QCF = Queensland Cancer Fund; HAB = Health Advancement Branch; NHMRC = National Health Medical Research Council; QIMR = Queensland Institute of Medical Research; EHIB = Epidemiology and Health Information Branch; CPRP = Cancer Prevention Research Program.
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<tr>
<td>Slip, Slop, Slap Campaign</td>
<td>Recognition of campaign features. Change in hat wearing and use of sunscreen.</td>
<td>Victoria initially, then National Adult public</td>
<td>1980–86 inclusive</td>
<td>Anti-Cancer Council Victoria CBRC</td>
<td>Anti-Cancer Council of Victoria $50,000 p.a.</td>
<td>Pre-post campaign surveys. Campaign included mass media development of materials and promotion (swimming pools, beaches). Awareness of campaign was high and primary prevention activities increased.</td>
</tr>
<tr>
<td>SunSmart 1989/90</td>
<td>Effects changes which facilitate sun-protection behaviour.</td>
<td>Victoria General population (school students, outdoor workers, local government authorities)</td>
<td>1989–90 inclusive</td>
<td>Anti-Cancer Council of Victoria CBRC</td>
<td>Victorian Health Promotion Foundation $473,000 p.a.</td>
<td>Media campaign, community programs and school program Conducted surveys showed increased awareness of campaign and change in primary prevention behaviours.</td>
</tr>
</tbody>
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NOTE: CBRC = Centre for Behavioural Research in Cancer
## Australian Programs (continued)

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<tr>
<td>SunSmart 1992/93</td>
<td>Change in knowledge, attitudes and beliefs to affect positive choices relevant to skin cancer. Development of environments that reduce the risk of UV radiation. Reduction in sunburn.</td>
<td>Victoria</td>
<td>1992–93 inclusive</td>
<td>Anti-Cancer Council of Victoria</td>
<td>Victorian Health Promotion Foundation $480 000 p.a.</td>
<td>Extensive use of media, schools, workplaces and local councils targeting at risk groups (young men and women, and high leisure and work activities). Evaluation as per previous years. No further change in protective behaviours or prevalence of sunburn. Schools enacted SunSmart practices but policies were scarce among the schools.</td>
</tr>
<tr>
<td>SunSmart 1993/94</td>
<td>Continuation of previous programs.</td>
<td>Victoria</td>
<td>1993–94 inclusive</td>
<td>Anti-Cancer Council of Victoria</td>
<td>Victorian Health Promotion Foundation $480 000 p.a.</td>
<td>High awareness of campaign. No change in levels of sun protective behaviour or the prevalence of sunburn among cross-sectional population samples. Concluded that current amount of resources will only maintain gains, not produce greater change. Notes: 3 months following “60 minutes” program on melanoma (case study)—led to increase in the use of pathology services.</td>
</tr>
<tr>
<td>Cover yourself against skin cancer</td>
<td>Impact of a skin cancer control education package for outdoor workers (Telecom).</td>
<td>Victoria (Trialled in Queensland)</td>
<td>1989–90</td>
<td>Telecom Australia Millionaire Marketing CBRC</td>
<td>Telecom Australia</td>
<td>Pre-post campaign assessments. Significant improvement in shirt use and overall protection—no effect on hat use or use of shade.</td>
</tr>
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**NOTE:** CBRC = Centre for Behavioural Research in Cancer
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<tr>
<td>Sun Protection Guidelines</td>
<td>Promotion of policy in schools.</td>
<td>WA Schools</td>
<td>1994</td>
<td>WA Education Department</td>
<td>WA Health Department, Cancer Council of WA, other agencies</td>
<td>$413,000 over 4 years</td>
</tr>
<tr>
<td>Skin Cancer Prevention Program for Young People</td>
<td>Increase sun protection behaviour, knowledge, attitudes and beliefs.</td>
<td>WA 12–15 year olds via schools, organised sport, local government</td>
<td>1992–95 and ongoing</td>
<td>Cancer Council of WA</td>
<td>Healthway Cancer Foundation</td>
<td>$126,000</td>
</tr>
<tr>
<td>ME NO FRY Campaign = 1994/95 element. (From NSW Health)</td>
<td>Improve sun protection related knowledge, attitudes and beliefs.</td>
<td>WA 11–16 year olds</td>
<td>1994/95</td>
<td>Cancer Foundation of WA</td>
<td>Information not provided</td>
<td>Surveys of target groups pre- and post-campaign. High level of awareness of campaign among target group—additional details provided.</td>
</tr>
</tbody>
</table>
Appendix C

Submissions Received During Public Consultation

Introduction

As part of the process of developing guidelines and advice about sun protection programs, the NHMRC Health Advancement Standing Committee invited public submissions on its preliminary work program in April 1995. Advertisements appeared in The Australian newspaper, and the Commonwealth Government Gazette, and were distributed through the Standing Committee’s mailing list. Letters inviting assistance in meeting the objectives of the Sun Protection Programs Working party were also sent to State and Commonwealth Departments of Health, Sport and Recreation, Child Care, State Health Promotion Managers, Local Government Departments and Associations, and Bureaus of Meteorology as well as key organisations and peak bodies in the area of skin cancer prevention. A total of 41 submissions were received.

In September 1996, the draft report of the Sun Protection Programs Working Party, Primary Prevention of Skin Cancer in Australia was released for public consultation from 10 October 1996–8 November 1996. The advertisement inviting submissions on the draft recommendations about primary prevention of skin cancer appeared in the The Weekend Australian newspaper and the Commonwealth Government Gazette.

The draft report was also sent to the people who had responded to the first stage of consultation, and other key organisations and peak bodies in the area of skin cancer prevention. Seventeen submissions were received from the second stage consultation process.

List of submissions

Submissions from the first stage consultation were received from:

1. Ms Jeanie McKenzie, Manager Health Promotion, New South Wales State Cancer Council.
2. Mr Graham Harrington, Deputy Secretary (Education), Department of Education and the Arts, Hobart, Tasmania.
3. Mr Craig Sinclair, SunSmart Campaign Manager, Anti-Cancer Council of Victoria.
4. Ms Caroline Dean, Education Officer, Cancer Foundation of Western Australia.
5. JG Busch, Executive Director, Ministry of Sport and Recreation, Wembley, Western Australia.
7. Mr Maurice Swanson, Health Promotion Services, Health Department of Western Australia.
8. Ms Fiona Mackie, Project Support Officer, Tasmanian Department of Tourism, Sport and Recreation.
9. Director of Health Advancement Branch, Queensland Health Department.
10. Ms Carol Procter, State/Local Government Relations Unit, Department of Housing and Urban Development, Adelaide, South Australia.
13. Mr Brendan Hartnett, Director Policy, Local Government and Shires Association of New South Wales.
14. Mr Jim McMorrow, Office of the Director-General, New South Wales Department of Training and Education Coordination.
15. RF Roodenrys, Local Government Office, Department of Environment and Land Management, Hobart, Tasmania.
16. Mr John Waldock, Director, Policy and Research, Local Government Association of Queensland Inc.
17. Mr Greg Black, Director-General, Education Department of Western Australia.
18. Ms Addy Carroll, Director, Healthway, Western Australian Health Promotion Foundation.
19. D Gauntlett, A/g Director of Meteorology, Bureau of Meteorology, Department of the Environment, Sport and Territories, Melbourne, Victoria.
20. Matti Urvet, Secretary, Department of Sport and Recreation, Darwin, Northern Territory.
21. Andy Turner, Environment Coordination and Liaison Branch, Department of the Environment, Sport and Territories, Canberra, Australian Capital Territory.
22. Neil McCormack, Principal Education Officer, Northern Territory Department of Education.
25. Yvonne Robinson, Manager, Health Promotion Unit, South Australian Health Commission.
27. Danielle McShane, Graduate Research Officer, Department of Health and Community Services, Hobart, Tasmania.
28. CJ Russell, Assistant Secretary-General, Local Government Association of South Australia.
29. Michael Scott, Chief Executive, Office for Recreation, Sport and Racing, Brooklyn Park, South Australia.
30. Karin Puels, General Manager, Foundation South Australia.
31. David Williams, Director-General, Department of Tourism, Sport and Youth, Brisbane, Queensland.
32. Lyn Stoker, Manager, Health Promotion Branch, New South Wales Department of Health.
33. Garry Payne, Director General, Department of Local Government and Cooperatives, Bankstown, New South Wales.
34. Jan Heslep & Noeleen Tunny, Health Promotion Unit, Blacktown and Mt Druitt Community Health Services, New South Wales.
35. Paul Katris, Lions Cancer Institute Inc, Perth, Western Australia.
36/37 Dr Lyn Roberts, Manager, Cancer Prevention and Education Unit, Anti-Cancer Foundation, Unley, South Australia.
38. Professor Bruce Gray, Professor of Surgery, Medical Director, Lions Cancer Institute Inc, Perth, Western Australia.
39. Craig Sinclair, SunSmart Campaign Director, Anti-Cancer Council, Carlton South, Victoria.
40. Elaine Henry, Executive Director, Cancer Council, Kings Cross, New South Wales.
41. Dr Fedora Trinker, Executive Director, The Anti-Cancer Foundation of South Australia.
Submissions from the second stage consultation were received from:

1. Dr Brendon Kearney, Chairman, NHMRC National Health Advisory Committee, Royal Adelaide Hospital, South Australia.
2. Dr Kerry Kirke, Member, NHMRC National Health Advisory Committee, SA Health Commission, Adelaide, South Australia.
3. J G Busch, Executive Director, Ministry of Sport and Recreation, Western Australia.
4. Dr Lin Fritschi, Senior Research Fellow, Department of Epidemiology and Preventive Medicine, Monash Medical School, Victoria.
5. Dr Fedora Trinker, Executive Director and Dr Lyn Roberts, Manager, Cancer Prevention & Education Unit, The Anti-Cancer Foundation of South Australia.
6. Andrew Niven, Ultimo, New South Wales.
7. Mr Richard S Blake, Managing Director, Hamilton Laboratories, Adelaide, South Australia.
9. Mr Terry Slevin, Senior Manager, Education and Research, Cancer Foundation of Western Australia Inc, Subiaco, Western Australia.
10. Dr Ron Borland, Centre for Behavioural Research in Cancer, Anti-Cancer Council of Victoria, Carlton South, Victoria.
11. Dr Michael Crampton, Assistant Secretary General, The Royal Australian College of General Practitioners, Forrest Lodge, New South Wales.
12. Rose Moroz, R/Director of Curriculum, Education Department of Western Australia, East Perth, Western Australia.
13. Mr Craig Sinclair, SunSmart Campaign Manager, SunSmart, Carlton South, Victoria.
14. Ms Elizabeth C Percival, Executive Director, Royal College of Nursing Australia, Deakin, Australian Capital Territory.
15. Professor John McCaffrey, Queensland Cancer Fund, Queensland.
17. Dr Diana Lange, Chief Health Officer, Queensland Health.
The National Health and Medical Research Council

The National Health and Medical Research Council (NHMRC) is a statutory authority within the portfolio of the Commonwealth Minister for Human Services and Health, established by the National Health and Medical Research Council Act 1992. The NHMRC advises the Australian community and Commonwealth, State and Territory Governments on standards of individual and public health, and supports research to improve those standards.

The NHMRC advises the Commonwealth Government on the funding of medical and public health research and training in Australia and supports many of the medical advances made by Australians.

The Council comprises nominees of Commonwealth, State and Territory health authorities, professional and scientific colleges and associations, unions, universities, business, consumer groups, welfare organisations, conservation groups and the Aboriginal and Torres Strait Islander Commission.

The Council considers and makes decisions on reports prepared by committees and working parties following wide consultation on the issue under consideration.

A regular publishing program ensures that Council’s recommendations are widely available to governments, the community, scientific, industrial and educational groups.

The Council publishes extensively in the following areas:

• Child health • Clinical practice • Communicable diseases • Dentistry • Drugs and poisons • Drug and substance abuse • Environmental health • Health ethics • Infection control • Mental health • Nutrition • Public health • Women’s health.

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