

Sun protection media kit

Summer 2010-11



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Introduction

We all love to be outdoors in warm weather. There is something about fresh air and sunshine that makes you feel great to be alive. And let's face it, in most parts of Australia, the warm climate means there are plenty of opportunities to enjoy an al fresco lifestyle most of the year round.

But we know that too much sun can have its downsides – including sunburn, premature skin ageing, cataracts and skin cancer.

The answer is not to avoid the sun totally, just don't overdo it!

Cancer Council Australia recommends a five-step approach to sun protection when the SunSmart UV Alert indicates the UV Index is at 3 or above:

1. Slip on some sun-protective clothing – that covers as much skin as possible.
2. Slop on SPF30+ sunscreen – make sure it is broad spectrum and water-resistant. Put it on 20 minutes before you go outdoors and every two hours afterwards. Sunscreen should never be used to extend the time you spend in the sun.
3. Slap on a hat – that protects your face, head, neck and ears.
4. Seek shade.
5. Slide on sunglasses – make sure they meet Australian standards.

Extra care should be taken between 10am to 3pm when UV Index levels reach their peak.

The SunSmart UV Alert appears on the weather page of most Australian daily newspapers and is available on the Bureau of Meteorology website. Go to www.bom.gov.au/weather/uv.

For further information on sun protection and skin cancer visit Cancer Council Australia's website, www.cancer.org.au/sunsmart or call the Cancer Council Helpline on 13 11 20.

This booklet has been designed as a reference for journalists writing stories about skin cancer and sun protection issues. If you require further information or have suggestions on what should be added to future editions, please don't hesitate to contact:

Kate Dorrell
Media Manager
Cancer Council Australia
Tel. 02 8063 4100
Email: kate.dorrell@cancer.org.au

Sue Bobbermein
Communications Officer
Cancer Council Australia
Tel. 02 8063 4100
Email : sue.bobbermein@cancer.org.au

Part 1: Skin cancer



Overview

Australia has one of the highest rates of skin cancer in the world, with two in every three Australians diagnosed with skin cancer before the age of 70.¹ This is largely due to our climate, the fact that many of us have fair skin that isn't suited to such harsh conditions, our proximity to the equator and our love of the great outdoors.

Skin cancers account for around 80% of all new cancers diagnosed each year in Australia.²

Anyone can be at risk of developing skin cancer. Although the most serious form of skin cancer – melanoma – is most strongly related to intermittent sun exposure (as may be experienced on holiday or weekends), the total amount of sun exposure is also important.³ There is often a long lag time between exposure and presentation of the disease.

Melanoma can occur at a young age and is the most diagnosed cancer in 15 to 44 year-olds.⁴ Australian adolescents have by far the highest incidence of malignant melanoma in the world, compared with adolescents in other countries. It is the most frequent type of cancer in both sexes, and accounts for one third of all cancers in female adolescents and one quarter in males.⁵ There are also cases of skin cancer being diagnosed in children, however this is rare.

Whenever ultraviolet (UV) radiation levels reach 3 and above, sun protection is required. At that level UV radiation can damage your skin and eyes and lead to skin cancer.⁶

The good news is that skin cancer can almost always be cured if detected early. Australian survival rates from melanoma are generally higher than in other regions due to the high proportion of thin lesions.⁷ All Australians should talk to their doctor about their risk factors for skin cancer and regularly monitor their skin. If any changes are noticed they should consult their doctor or other qualified health professional as soon as possible.

Causes

It is estimated that up to 95% of melanoma and up to 99% of basal cell carcinoma and squamous cell carcinoma in Australia are caused by exposure to UV radiation in sunlight.³

Skin cancers form when skin cells are damaged by UV radiation penetrating the skin. Each cell carries DNA or genetic material that 'tells' each cell what it is, when to develop and when to die. UV damages the skin cells' DNA and this can cause them to mutate and grow abnormally. If these mutant cells are not destroyed by the body's natural defense systems, they will continue to develop and can turn into skin cancers.

People in Queensland and Western Australia face the highest risk of developing melanoma, followed by NSW, Tas, ACT, SA, Vic and NT.⁸

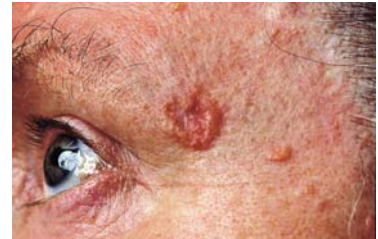
Tanning without burning can still cause skin damage, premature skin ageing and skin cancer.⁹ A very small number of cases of skin cancer are due to a genetic predisposition.¹⁰

Types of skin cancer

There are three main types of skin cancer - basal cell carcinoma, squamous cell carcinoma and melanoma. Melanoma is the least common, but most serious of the three.

Basal cell carcinoma (BCC)

- most common and least dangerous form of skin cancer
- appears as a lump or scaling area
- red, pale or pearly in colour
- as it grows it may become ulcerated like a sore that won't heal
- grows slowly, usually on the head, neck and upper torso.



Squamous cell carcinoma (SCC)

- not as dangerous as melanoma, but may spread to other parts of the body if not treated
- any spot that appears on the lips or ears should be seen by a GP immediately
- a thickened, red, scaly spot which may later bleed easily or ulcerate
- appears on sites most often exposed to the sun
- grows over some months.



Melanoma

- the deadliest form of skin cancer
- if untreated, cancer cells can spread to other parts of the body
- appears as a new spot, or an existing spot, freckle or mole that changes colour, size or shape
- usually has an irregular or smudgy outline and is more than one colour
- grows over weeks to months, anywhere on the body (not just in places that get a lot of sun).



Statistics

Although skin cancer accounts for 80% of all new cases of cancer diagnosed in Australia each year, you will often hear that breast cancer is the most common cancer in women and prostate cancer is the most common in men. That is because most Australian cancer registries don't routinely collect data for non-melanoma skin cancers – only the most serious, melanoma. Non-melanoma skin cancers are often self-detected and are usually removed in doctors' surgeries, although they still account for a quarter of all deaths from skin cancer.¹¹

Skin cancers are by far the most common cancers managed by GPs. GPs in Australia have over one million patient encounters per year for skin cancer.¹²

Non-melanoma skin cancer

- Each year, around 434,000 Australians are treated for one or more non-melanoma skin cancers (basal cell carcinoma and squamous cell carcinoma).¹³
- The age-standardised incidence rate for non-melanoma skin cancer is 1170 per 100,000 – 884 for basal cell carcinoma (BCC) and 387 for squamous cell carcinoma (SCC).¹
- The rate of diagnosis of new cases of SCC rose by 133% between 1985 and 2002 and was similar across both males and females.¹
- The rate of diagnosis of new cases of BCC rose by 35% between 1985 and 2002 and was greater in men (42%) than in women (26%).¹⁴
- In 2007, 448 Australians died from non-melanoma skin cancer - 305 males and 143 females.¹¹
- Despite their high incidence, mortality rates for non-melanoma skin cancer are relatively low – 3.0 per 100,000 for men and 1.0 per 100,000 for women.¹¹

Melanoma

General melanoma incidence:

- Overall, melanoma is the fourth most common cancer in Australia, with over 10,300 new cases diagnosed each year.^{16,15}
- 7.9% of cases are diagnosed in people aged under 35 years, 26.5% of people diagnosed are aged 35-54, 41.1% aged 55-74 and 24.5% aged 75 and older.¹⁶
- Australians have a 1 in 18 lifetime risk of getting a melanoma by the age of 85.¹⁶
- In people aged 15-44, melanoma and breast cancer are the most common cancers.⁴
- The melanoma incidence rates in Australia and New Zealand are around four times as high as those found in Canada, the US and the UK.¹⁶ Melanoma incidence rates in Australia and New Zealand are between two and five times as high as those found in Canada, the United States and the United Kingdom.¹⁷ Australian adolescents have by far the highest incidence of malignant melanoma in the world, compared with adolescents in other countries. It is the most frequent type of cancer in both sexes, and accounts for one third of all cancers in female adolescents and one quarter in males.¹⁸

Melanoma incidence in men:

- In men, it is the third most common cancer after prostate and bowel cancer, with more than 6000 new cases each year.¹⁶
- 6.1% of cases are diagnosed in men aged under 35 years, 23.7% in those aged 35-54, 44.7% in those aged 55-74 and 25.5% in those aged 75 and older.¹⁶
- Australian men have a 1 in 14 lifetime risk of getting a melanoma by age 85.¹⁶
- The incidence of melanoma among men increased by approximately 10.8% between 1996 and 2006.¹⁶

Melanoma incidence in women:

- In women, it is the third most common cancer after breast and bowel, with 4275 new cases each year.¹⁶
- 10.5% of cases are diagnosed in women aged under 35 years, 30.5% in those aged 35-54, 35.9% in those aged 55-74 and 23.1% in those aged 75 and older.¹⁶
- Australian women have a 1 in 24 risk of getting a melanoma by age 85.¹⁶
- The incidence of melanoma among women stay constant between 1996 and 2006.¹⁶

Melanoma death and survival rates:

- More than 1200 Australians die from melanoma each year.¹⁶
- Australians have a 1 in 137 chance of dying from melanoma by the age of 85 – men have a 1 in 90 chance and women a 1 in 248 chance.¹⁶
- Relative five-year survival rates for melanoma are 90% for Australian males and 94% for Australian females.¹⁹ Survival rates have risen significantly since the early 1980s as a result of early detection.

*NB: The five year relative survival compares the survival of people diagnosed with cancer with the survival of the entire Australian population of the same sex and age in the same calendar year.

Cost of treating skin cancer

- The estimated total treatment cost for non-melanoma skin cancer during 2000-01 was \$264 million.²⁰
- The estimated total treatment cost for melanoma during 2000-01 was \$30 million.²⁰

Detection

Unlike many other forms of cancer, skin cancer is often visible – making it easier to detect in the early stages. Early detection is crucial if skin cancer is to be cured.

Tumour thickness is the most important factor in survival after a melanoma diagnosis. Melanoma has a poor prognosis if the tumour is diagnosed at an advanced stage, underscoring the need for early detection. There is some evidence that promotion of early detection of melanoma has resulted in thinner tumours being diagnosed and an increase in survival rates.

Skin cancers may appear as a changed skin growth – in colour, shape or texture, or an open skin wound that won't heal. Common skin cancers may look like red, brown, black or bluish patches, sores, spots, ulcers or lumps. Melanoma may appear as an existing mole that has changed, a dark-coloured spot with rough edges or a small collection of dark bumps.

The most common sites for melanoma are the lower legs for women and the trunk for men.⁷ Basal cell carcinomas and squamous cell carcinomas are usually found on areas often exposed to the sun. However, skin cancer can also occur in abnormal places like underneath fingernails and toenails, on the palms of your hands and on the soles of your feet.

All adults should be aware of any changes in their skin and see their doctor immediately with any concerns. Use a hand-held mirror to check the skin on your back and the back of your neck – or ask someone else to have a look for you. Don't forget to check underneath your armpits, your inner legs, ears, eyelids, hands and feet. Use a comb to move sections of hair aside and inspect your scalp.

Treatment

If skin cancer is detected early, a removal procedure is likely to be needed. In more developed cases of melanoma, the tissue surrounding the cancer must also be removed.

All types of skin cancers are treated either by removal, prescription ointments, radiation therapy or, for more advanced cases, chemotherapy. A combination of treatments may be necessary.

Be aware that skin cancer can re-occur and not necessarily in the same place. Make sure you continue to check your skin regularly and take notice of any changes.

Sunburn

How common is sunburn?

Cancer Council Australia's National Sun Protection Survey 2006-07 found 14% of Australian adults aged 18-69 (1.8 million) and 24% of adolescents aged 12-17 (397,000) were sunburnt on an average summer weekend.⁹ Children (0 to 11 year-olds), have the lowest rates of sunburn with 8% getting sunburnt on a typical summer weekend.²¹

In Australia, sunburn can occur in just 15 minutes on a fine January day.²² The most commonly cited reasons for getting sunburnt are people 'forgetting to protect' and/or poor application of sunscreen.²³

The good news is that there has been a reduction in the incidence of sunburn among adults on summer weekends, decreasing from 18% in 2003-04, to 14% in 2006-07. However, the same study found adolescents were almost just as likely to get burnt as three years prior (25% in 2003-04 compared to 24% in 2006-07).²¹

People reported spending significantly more time outdoors during peak UV times with warm summer temperatures between 22 and 34 degrees Celsius as compared with cooler temperatures below 22 degrees. Sunburn rates were highest at temperatures between 28 and 34 degrees, compared to cooler temperatures less than 22 degrees.²⁴

What causes sunburn?

It is UV radiation in the sunshine that causes our skin to burn. People tend to confuse heat with UV radiation intensity. The heat is in fact infrared radiation, not UV radiation. UV radiation cannot be seen or felt. UV isn't related to temperature and UV levels can be very high even on cool or cloudy days, when we least expect to get burnt.

When UV radiation reaches our skin, the epidermis releases chemicals that cause the blood vessels to swell and leak fluids, causing inflammation, pain and redness – otherwise known as sunburn. This type of damage can occur in as little as 15 minutes and will continue to develop for 24 to 72 hours after exposure to the sun.

Damaged skin cells self-destruct and peel off. Although peeling is unpleasant, it is actually your body's way of getting rid of damaged skin cells.

Both UVA and UVB cause skin damage and increase the risk of developing both common skin cancer and melanoma. UVA penetrates deepest into the skin.

All types of sunburn, whether serious or mild, can cause permanent and irreversible skin damage and can lay the groundwork for skin cancer later in life.³ Further sunburn only increases your risk of developing skin cancer.

A mild sunburn, which reddens and inflames the skin slightly, is known as first degree sunburn. Second degree sunburn occurs with more serious reddening of the skin and water blisters. Third degree sunburn requires medical attention.

What to do if you are sunburnt

Give your skin the time it needs to repair and build up another protective barrier of cells. Stay out of the direct sun until the redness, peeling and pain have disappeared. When you go out, stay in the shade, slap on a hat, slip on protective clothing, make sure the sunburnt area is also covered, and apply plenty of sunscreen. Try to maintain this habit even when the sunburn has gone away.

Other tips:

- Drink plenty of water to replenish your fluid levels.
- As soon as it becomes comfortable to do so, apply a moisturising cream to the burnt area to keep it moist and supple. Even though it will not prevent peeling, moisturising will help prevent the new skin below from drying out.
- Chemists stock a range of sunburn treatments that can be rubbed or sprayed on to the skin.
- For severe sunburn, or if you are experiencing blistering, headaches, nausea, vomiting, dizziness or severe pain, you should see a doctor immediately.

Tanning

A tan is much more than your skin turning brown. Skin cells located in your epidermis (the top layer of skin) produce a pigment called melanin that gives skin its natural colour. When skin is exposed to UV radiation, melanin production is stimulated, causing the skin to darken.

Tanning is the skin's response to UV exposure and a way of protecting itself from further sun damage. Tanning is skin cells in trauma. Even a light tan is a sign your skin has been exposed to too much sun. Tanning without burning can still cause DNA damage and skin damage leading to premature skin ageing and can also cause skin cancer.⁹

Given the risks associated with tanning, it is disturbing that 46% of Australian adults believe a tan looks healthy.⁹ The misguided notion of a 'healthy tan' is surprisingly most prominent in older men and women aged 45-69 (50%), while younger men and women aged 18-24 are least likely to believe a tanned person looks healthy (44%).²⁵

Encouragingly, the message appears to be reaching teenagers, with almost 90% of 12-17 year-olds aware that sun exposure increases the risk of skin cancer and more than two thirds did not attempt a suntan during the season.²⁵

Fair-skinned people have a less protective form of melanin. When fair-skinned people go out in the sun, cells called melanocytes produce melanin, which stays in the top layer of skin for four or five days, giving them a tanned appearance. The melanin produced by fair-skinned people is much less protective meaning no amount of sun baking will protect you from sunburn and skin damage.²⁶

A natural tan offers very limited sunburn protection – usually an average of an SPF4, depending on the skin type.²⁷

Solariums

No solarium can provide a safe tan.²⁸ Adverse health effects associated with ultraviolet radiation including skin cancer and premature skin ageing have been well documented in international and national reports for many years. Furthermore, the body of evidence directly linking solarium use to adverse health effects continues to grow.

Solariums may emit much higher concentrations of ultraviolet (UV) radiation than the sun – up to five times as strong as the midday summer sun.²⁹

Solariums emit UVA and UVB radiation, both known causes of skin cancer. In general, solariums predominantly emit UVA, however in recent years, solariums have been manufactured to produce higher levels of UVB to mimic the solar spectrum and higher levels of UV radiation intensity to speed up the tanning process.

Overexposure to ultraviolet radiation from the sun and artificial sources is of considerable public health concern. UV radiation plays an important role in the development of skin cancer, cataracts and other eye conditions, and suppresses the immune system. Cumulative UV radiation also results in premature skin ageing.

Given the health risks associated with the use of solariums, Cancer Council Australia, the Cancer Society of New Zealand and the Australasian College of Dermatologists do not recommend the use of artificial UV radiation tanning devices for cosmetic purposes. For the same reason it is not recommended that solariums are used to boost vitamin D levels.

In April 2008, Australia's nine health ministers agreed to adopt a nationally consistent regulatory scheme for the regulation of the solaria industry in Australia, which is still being rolled out at different rates in each state.

Cancer Council Australia's position statement *Solariums* can be viewed online at www.cancer.org.au/positionstatements under SunSmart.

Fake tans

If people must tan their body, a tanning method that doesn't use UV radiation is preferable. Some Australians have turned to fake tans as an alternative to browning their skin through UV exposure or in a solarium. There are several forms of fake tans on the market, including tablets, lotions and sprays. And there are more in development, including "tan accelerators" and pre-tanning products that claim to boost pigment production when the skin is exposed to the sun.

Fake tan lotions and sprays contain ingredients that temporarily dye the skin brown. The tan fades as dead skin cells flake off, often in around a week.

While fake tans don't carry the direct skin cancer risks associated with sunbathing and solariums, users should remember they still need to use sun protection when the UV levels are 3 and above. This is the level that can cause skin and eye damage and increase the risk of skin cancer.

Some fake tan lotions and sprays do contain sunscreen, but they only provide short-term protection from the time of application – the protection doesn't last for the life of the tan. Promoting a fake tanning product as protective against UV radiation may be misleading to consumers. A fake tan product will not adequately protect users from the sun. They must still use a combination of sun protection measures.

The desire for a tan has been part of the Australian culture since the mid-1900s. Sun-browned skin has been prized as a sign of good health and attractiveness. However, we now know that deliberately

overexposing skin to UV radiation can increase your risk of developing skin cancer. While Cancer Council encourages people to be proud of their natural skin colour, we do acknowledge that some people prefer a tanned appearance and that using a fake tan to achieve this is a safer alternative to sunbathing or using a solarium.

Tinted sunscreens are available which provide colour to all parts of the body where it is applied. The colour is not permanent, washing off with soap and water. Tinted sunscreen may be helpful in identifying areas of the body missed in the application of the sunscreen.

Cancer Council Australia's position statement *Fake tans* can be viewed online at www.cancer.org.au/positionstatements under SunSmart.

Other sun-related health problems

Eye problems

Exposing the eyes to too much UV radiation can cause short-term complaints such as:

- mild irritation
- excessive blinking
- swelling
- difficulty looking at strong light³⁰
- acute photokeratopathy, also known as sunburn of the cornea or snow blindness.

Exposure to UV radiation over long periods can lead to more serious damage to the eyes^{30,31} such as:

- cataracts, or cloudiness of the lens
- cancer of the conjunctiva, the membrane covering the white part of the eye
- pterygium (pronounced tur-rig-i-um), an overgrowth of the conjunctiva on to the cornea
- solar keratopathy, or cloudiness of the cornea
- skin cancer of the eyelids and around the eyes
- ocular melanoma.³²

To protect eyes from ultraviolet (UV) radiation, choose sunglasses that:

- are close-fitting
- wrap around and cover as much of the eye area as possible
- meet Australian Standard AS 1067:2003 for sunglasses
- are marked eye protection factor (EPF) 10.

A broad-brimmed hat can reduce UV radiation to the eyes by 50%.³³ Sunglasses and fashion spectacles: sunglasses category 2, 3 or 4) can reduce UV radiation exposure to the eyes by up to 98% (Australian Standard AS 1067:2003 (Sunglasses and fashion spectacles).)

Premature ageing

Most of the visible signs of ageing are the result of damage to the skin caused by exposure to UV radiation. This can include increased skin wrinkling, loss of elasticity, irregular pigmentation and altered skin texture. It is generally irreversible without cosmetic surgery.

The skin on the face is very delicate and the most susceptible to sun damage.

Australians are particularly prone to sun damage and premature ageing, given the extreme levels of UV radiation they are exposed to throughout the year.

Apply sunscreen to clean, dry skin and then put any moisturisers and makeup on top. Anyone who uses cleanser, toner and moisturiser, should apply in this order: cleanse, tone, sunscreen and moisturise.

A combination of sun protection measures including shade, a hat, sunglasses, clothing and sunscreen will help to protect your skin and delay the visible signs of ageing.

Vitamin D and sun exposure

Cancer Council's 2006-07 National Sun Protection Survey found that there was high awareness of news reports of vitamin D and sunlight, with 35% of teenagers and 59% of adults recalling media coverage on this issue. Of these, 17% of adolescents and 13% of adults said such reports made them think they should go out into the sun more without protecting their skin, which is a worrying trend.⁹

The human body needs vitamin D to regulate calcium levels in the blood and to make and maintain healthy, strong bones. However, a balance is required between avoiding an increased skin cancer risk and achieving enough UV radiation to maintain adequate vitamin D levels. The sun's ultraviolet (UV) radiation is both a major cause of skin cancer and the best natural source of vitamin D.³⁴

Most vitamin D is made in the skin from exposure to the sun's UV radiation. There are also very small amounts of vitamin D that occur naturally in fish and eggs, while margarine and some types of milk have added vitamin D. However it is difficult to get enough vitamin D from diet alone.

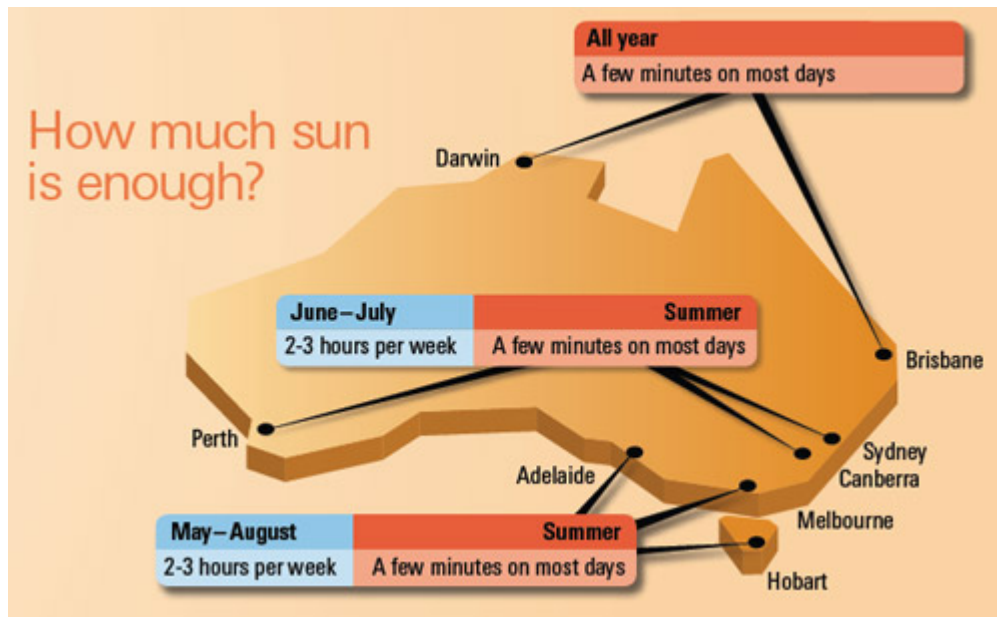
The body can only absorb a certain amount of vitamin D at a time. Prolonged sun exposure does not cause vitamin D levels to increase. Short periods of sun exposure may be more efficient at producing vitamin D.³⁵

In summer, most Australians with fair to olive skin get enough vitamin D during their typical daily outdoor activities even if they apply sunscreen.³⁶

A few minutes of sun exposure on their face, arms and hands on either side of the peak UV period (10am-3pm) should be enough to help maintain vitamin D levels. People with naturally very dark skin may need three to six times this exposure and supplementation may be required.³⁷

In winter, most people who live in southern parts of Australia (where the UV level drops below 3) usually do not need sun protection unless in alpine regions, near highly reflective surfaces such as snow or outdoors for extended periods. To maintain vitamin D levels over the winter months most people in southern parts of Australia need two to three hours of sun exposure on their face, arms and

hands spread over a week. People with naturally very dark skin may need three to six times this exposure and supplementation may be required.³⁷



Who is at risk of vitamin D deficiency?

- **People with naturally very dark skin.** The pigment in skin (melanin) acts as a filter to ultraviolet B (UVB) radiation and reduces synthesis of vitamin D.³⁷
- **People with little or no sun exposure.** This group includes:
 - older adults, especially the frail, who are in medium to long-term residential care, or aged care, or are housebound.³⁸
 - people who wear concealing clothing for religious or cultural purposes.³⁹
 - people who deliberately avoid sun exposure for cosmetic or health reasons.
 - people at high risk of skin cancers.
 - people who are hospitalised long-term.
 - people with a disability or chronic disease.
 - people in occupations such as taxi drivers, factory workers, night -shift workers.

People in these groups, and others who think they may be vitamin D deficient, should ask their doctor about their vitamin D levels. Low vitamin D may have no obvious symptoms, but without treatment, it can have significant health effects.

Vitamin D levels can be checked through a simple blood test and inadequate levels can be treated with supplements. People concerned about vitamin D deficiency should seek medical advice on the next course of action.

The use of solariums is not recommended to boost vitamin D levels because of their health risks.

The SunSmart UV Alert is the best tool for determining when sun protection is required and when it is safe to go outside without sun protection. Sun protection is needed when the UV Index reaches 3 or above. For more information on the SunSmart UV Alert, see page 17.

Cancer Council Australia's position statement *Risks and benefits of sun exposure*, developed in conjunction with Osteoporosis Australia, the Australasian College of Dermatologists and the Australian and New Zealand Bone and Mineral Society, can be viewed online at www.cancer.org.au/positionstatements under SunSmart.

Photosensitivity

People on certain types of medication should be aware that they may be more susceptible to UV damage.

According to the Australasian College of Dermatologists, these medications include doxycycline (an antibiotic commonly used for acne, which is also used as an anti-malarial), non-steroidal anti-inflammatory drugs (for arthritis), sulphur drugs (used as antibiotics), the cardiac drug amiodarone (for tachyarrhythmias) and thiazides (fluid tablets).

Part 2: Sun protection



Sun protection and the UV Index

Australia experiences high levels of UV radiation, mainly because of our proximity to the equator. UV radiation levels vary throughout the year according to the height of the sun (the higher the sun is in the sky, the higher the UV radiation level), whether you are in the northern or southern part of the country, the amount of cloud cover, altitude, ozone levels and the presence of UV reflective surfaces such as light coloured concrete and snow.⁴⁰

The higher the UV Index, the less time it takes for skin damage to occur. Generally, UV radiation levels are most intense around the middle of the day (between 10am and 3pm).

The UV Index is a simple and informative way of describing the sun's UV radiation intensity. The UV Index has five categories:

- Low : UV Index of 1-2
- Moderate: 3-5
- High: 6-7
- Very high: 8-10
- Extreme: 11 and above

Cancer Council recommends Australians use sun protection measures when the UV Index is 3 or above and at all times when in alpine regions, or near highly reflective surfaces such as snow or outdoors for extended periods.

SunSmart UV Alert

The SunSmart UV Alert informs people when it is necessary to use sun protection measures. It is a quick and easy tool for people to know when UV Index levels will be high enough to damage the skin and eyes and lead to skin cancer.

When the UV Index is forecast to reach 3 or above, the Bureau of Meteorology issues the SunSmart UV Alert. The SunSmart UV Alert is reported daily in most newspapers around Australia, some mobile phone and radio weather forecasts and on the Bureau of Meteorology website at www.bom.gov.au/weather/uv.

When the SunSmart UV Alert is issued, Cancer Council recommends a five-step approach to sun protection:

1. Slip on some sun-protective clothing – that covers as much skin as possible.
2. Slap on SPF30+ sunscreen – make sure it is broad spectrum and water resistant. Put it on 20 minutes before you go outdoors and every two hours afterwards. Sunscreen should never be used to extend the time you spend in the sun.
3. Slap on a hat – that protects your face, head, neck and ears.
4. Seek shade.
5. Slide on sunglasses – make sure they meet Australian standards.

Sunscreen

According to the 2006-07 National Sun Protection Survey, only 37% of Australian adults use sunscreen when outdoors during peak UV times on summer weekends, despite the known risk factors of sun exposure and sunburn.²⁵

Cancer Council recommends the use of SPF30+, broad spectrum, water resistant sunscreen. SPF15 sunscreen is often recommended in European health and beauty magazines – but for the harsh Australian climate, SPF30+ is the most protective.

Sunscreen should never be the first line of defense against sun exposure. It should always be complemented with use of shade, protective clothing, a hat and a pair of sunglasses.

The SPF number is a guide to a sunscreen's protection properties. The amount of time it takes a person to burn depends on the time of day, the time of year, the amount of UV reflection, how cloudy it is and their skin type. It is impossible to calculate all these things in everyday situations. In laboratory conditions, SPF30+ sunscreen filters around 97% of UV radiation. However, many Australians apply too little sunscreen. This means they usually get less than half the protection stated on the product label.⁴¹

It is important to realise that no sunscreen offers 100% protection against UV radiation. Some UV radiation will always get through a sunscreen. The higher the SPF, the smaller the amount of UV radiation getting through - but what gets through accumulates and may lead to sunburn if you stay out in the direct sun for too long.

Sunscreen should be applied at least 20 minutes before going outdoors so that it can be absorbed into the skin properly. It should be reapplied every two hours, regardless of the instructions on the packaging. Sunscreen can be easily wiped off or lost through perspiration and reapplication is necessary to maintain an adequate level of protection.

Remember that the price of a sunscreen does not necessarily indicate quality. Chemical ingredients in sunscreen may vary, but ultimately all reach the SPF as stated on the bottle. Sunscreens will be more expensive because of the added fragrances, moisturisers and in some cases, more advanced ingredients that may have better ability to protect across the UVA spectrum.

Because of the high level of melanin in their skin, people with naturally very dark skin do not normally need to apply sunscreen and can safely tolerate relatively high levels of UV radiation without getting burnt.⁴² They need to make an informed decision about this. However it is recommended that all people, regardless of skin type, wear a hat and sunglasses to protect their eyes and face.

Cancer Council Australia's position statement, *Use of SPF30+ sunscreen*, can be viewed online at www.cancer.org.au/positionstatements under SunSmart.

Ingredients

All sunscreens on the Australian market have been approved by the Therapeutic Goods Administration as safe and effective.

The ingredients in sunscreens are usually categorised as 'inorganic' (also known as physical or mineral ingredients that are produced using chemical processes) and 'organic' (chemical ingredients). Many effective sunscreens contain a combination of organic and inorganic ingredients. Unlike organic



vegetables, in this case we are not talking chemical-free - because all sunscreen ingredients are chemicals.

The inorganic ingredients both absorb and reflect UV radiation, whereas organic ingredients only absorb. This means the energy from the UV radiation must then be disposed of in some other way, usually by converting it into heat.

Some of the most common sunscreen ingredients are:

- OMC - octyl methoxycinnamate (an organic absorber) - a prime UVB filter
- methylbenzylidene camphor (an organic absorber) - a prime UVB filter
- butyl methoxycinnamate (an organic absorber) - a prime UVA filter
- zinc oxide (an inorganic reflector and absorber) - a prime UVA and UVB filter
- titanium dioxide (an inorganic reflector and absorber) – a prime UVA and UVB filter

Inorganic ingredients such as titanium dioxide and zinc oxide often confer a better broad spectrum capability and at the high end of the market may also be nearly transparent. Traditionally, the particles in these ingredients which have helped them scatter, reflect or absorb solar radiation, have been large enough to make the sunscreen visible when applied – thus the traditional white nose on the lifeguard or cricketer. But newer, smaller reflecting powders provide broad spectrum protection against UV radiation and are more cosmetically acceptable because they are invisible when applied.

There is also some evidence to suggest that these two inorganic ingredients are less likely to cause skin irritation.

Rather than looking for sunscreens that contain particular ingredients, you should seek out a sunscreen labelled:

- SPF30+
- broad spectrum (protects against UVA and UVB radiation)
- water-resistant

For information on sunscreen use and babies, refer to the 'Protecting babies' section of this guide on page 24.

Nanoparticles and sunscreen

Nanotechnology has been used in sunscreens for many years. To date, our assessment, drawing on the best available evidence, is that nanoparticulates used in sunscreens do not pose a risk. However, we continue to monitor research and welcome any new research that sheds more light on this topic. Sunscreen formulas and their components are regulated through the Therapeutic Goods Administration (TGA). In early 2009, the TGA conducted an updated review of the scientific literature in relation to the use of nanoparticulate zinc oxide and titanium dioxide in sunscreens.

The TGA review concluded that:

- The potential for titanium dioxide and zinc oxide nanoparticles in sunscreens to cause adverse effects depends primarily upon the ability of the nanoparticles to reach viable skin cells.
- To date, the current weight of evidence suggests that titanium dioxide and zinc oxide nanoparticles do not reach viable skin cells; rather, they remain on the surface of the skin and in the outer layer of the skin that is composed of non-viable cells.

The TGA's report concerning the safety of sunscreens can be found at:
www.tga.health.gov.au/alerts/sunscreens.htm

Cancer Council looks closely at TGA's advice, as well as our own evidence-based reviews.

Sunscreens also use 'microfine' or 'micronised' particles, which are larger than nanoparticles:

- Nanoparticles are smaller than 100 nanometres and invisible to the human eye – a nanometre is 0.000001 millimetre.
- Microfine particles are smaller than those used in conventional white zinc sunscreens, however are larger than nanoparticles – usually in the range of 100 to 2500 nanometres.

Cancer Council sunscreens contain microfine particles, but do not contain nanoparticles.

Sunscreen has been proven to reduce the risk of skin cancer, in particular non-melanoma skin cancer.

Sensitive skin

If you have sensitive skin and have had a reaction to a sunscreen, try a fragrance-free product.

Sunscreen milks or creams formulated for sensitive skin usually contain titanium dioxide or zinc oxide and are less likely to contain alcohol or fragrances that may irritate the skin. As with all products, stop using sunscreen immediately if any unusual reaction is observed.

Sunscreen tips

- Cancer Council recommends that the average-sized adult should apply at least a teaspoon of sunscreen to each arm, leg, front of body and back of body and at least half a teaspoon to the face (including the ears and neck). That is, 35mL of sunscreen for one full body application.
- Put your sunscreen on 20 minutes before going outdoors to give it time to properly disperse and settle on your skin. Don't rub it in too much – the skin will absorb it.
- Apply sunscreen to clean, dry skin – if you want to use moisturiser and make-up, it should be applied on top of sunscreen.
- Always check and follow the use-by date on sunscreen.
- Remember to reapply sunscreen every two hours, or more regularly if you are swimming or perspiring a lot.
- Never use sunscreen to extend the amount of time you would spend in the sun.
- Sunscreen should be stored at a temperature below 30°C. If left in excessive heat (e.g. in the glove box of a hot car or in the sun on the beach), over time, the product may not work as well.

Sun protection and cosmetics

A growing number of cosmetics have an SPF rating. How much protection do they provide? And how do sunscreens and cosmetics mix?

If you are going to spend any amount of time in the direct sunlight, Cancer Council strongly recommends you use an SPF30+ sunscreen on your face as well as other areas of exposed skin, rather than cosmetics, even if they have a high SPF rating.



If you are going to be indoors for most of the day, with only incidental sun exposure, a cosmetic with SPF of 30+ is adequate to protect from sunburn, but will only be effective for up to two hours. To ensure protection you will need to reapply after two hours.

If you are planning to wear sunscreen and moisturisers or cosmetics, it is best to apply your sunscreen first – on clean, dry skin. If sunscreen is applied on top of skin that has already been moisturised, it will not disperse as well, so will not be as effective.

Sunscreen can be applied as a moisturiser under make-up – some sunscreens actually contain a moisturiser.

Some people mistakenly believe an SPF20 moisturiser and SPF10 foundation used together will form a protection of SPF30. This is not true; you will only be protected to the level of the highest SPF product – in this case SPF20.

Opaque lipsticks provide some protection against UV – they usually contain titanium dioxide, which will provide an SPF of at least 10. To make sure you are getting the best protection, use an SPF30+ lipstick.

Eye protection

When your eyes are exposed to cumulative UV radiation, it can cause irritation and irreversible eye damage, resulting in cataracts or temporary blindness. Skin cancer can also occur on the eyelid and on the eye's surface.

Invest in a good pair of sunglasses and wear them whenever you are outside during daylight. Sunglasses are probably the least seasonal of all sun protection products available – many Australians tend to wear them for most of the year. In fact 58% of adults wear sunglasses when outside during peak UV hours on summer weekends.²⁵

All sunglasses must meet the Australian Standard (AS/NZ 1067:2003 – category 2, 3 or 4) – check the swing tag before purchase. For the best protection, choose sunglasses with an EPF (eye protection factor) of 10. Spending more doesn't necessarily equate to getting a better quality product - some of the cheaper brands have proven to be the best.

You can also get swimming goggles with EPF10.

If you wear glasses, consider having a UV-protective coating added, investing in a pair of prescription sunglasses or buying protective shades that can be worn over your glasses.

A broad-brimmed hat will also reduce significantly the amount of UV radiation reaching your eyes.

Cancer Council Australia's position statement, *Eye protection*, can be viewed online at www.cancer.org.au/positionstatements under SunSmart.



Clothing

One of the best barriers between your skin and the sun is clothing. Yet only 19% of Australian adults and only 9% of adolescents wear 3/4 length or long-sleeved tops when outdoors during peak UV times on summer weekends.²⁵

When choosing clothing for sun protection, there are three things to keep in mind - the design, the closeness of the weave and comfort. Collared shirts and at least three-quarter length trousers and three-quarter sleeve tops offer good coverage.

Garments specially designed for sun protection will carry a UPF (ultraviolet protection factor) rating on their tags. The higher the number, the greater the protection from UV radiation. Cancer Council sun protection clothing offers a UPF rating of 50+ - a rating which gives the best protection.

Fabrics that don't carry a UPF rating don't necessarily offer less protection than those that have been tested – but it will be more of a guessing game. Most cotton and cotton/polyester fabrics provide protection equal to about UPF20.

Lightweight fabrics such as linen, cotton or hemp will help keep you cool.

Bear in mind that fabrics offer less protection when wet – so make sure you wear sunscreen under loosely woven fabrics. And clothing isn't going to cover up all of your skin - put sunscreen on the exposed bits, slap on a hat and slide on some sunglasses.



Hats

While more Australians realise the importance of protecting their skin, over half still fail to wear a hat when they are outdoors during peak UV times on summer weekends, with fewer than 25% opting for styles with a wide protective brim.²⁵

Younger adolescent males in particular are more likely to wear caps, which offer only minimal protection.

Hats can significantly reduce the amount of UV radiation reaching the face, the part of the body most sensitive to the prematurely ageing rays of the sun. Hats as those in the Cancer Council range offer a UPF of 50+.

A sun protective hat is one that protects the face, head, neck and ears. Broad-brimmed or bucket style hats made of a close weave fibre offer the best protection. If you can see through the hat material, the sun will get through, which is why the close weave is important. Baseball caps are not recommended, as they fail to shade most of your face. Legionnaire hats, which protect the ears and neck, are great for kids.



Protecting babies

Current evidence suggests that childhood sun exposure contributes significantly to the lifetime risk of skin cancer.³

Cancer Council recommends that babies under 12 months are not exposed to direct sun. A baby's skin is thin, extremely sensitive and can burn easily.⁴³ The more sun exposure during childhood, the greater the risk of skin cancer in later life.

The Australasian College of Dermatologists recommends the use of a sunscreen 'at any age when there is unavoidable exposure to the sun' and states sunscreen is safe to use on babies.⁴⁴ Many brands have a gentler babies or toddlers formula. Sunscreens with titanium dioxide or zinc oxide reflect UV radiation away from the skin, and are less likely to cause problems with sensitive skin. There is no evidence that using sunscreen on babies is harmful, although some babies may develop minor skin irritation in response to sunscreen use. Sunscreen milks or creams formulated for sensitive skin usually contain titanium dioxide or zinc oxide and are less likely to contain alcohol or fragrances that might irritate the skin. As with all products, stop using sunscreen immediately if any unusual reaction is observed.

When this is not possible, parents and carers should minimise exposure of babies to UV radiation by observing the following recommendations:

- Plan the day's activities to minimise the baby's exposure to the sun, especially between 10am and 3pm.
- Cover as much of the baby's skin as possible with loose-fitting clothes and wraps made from closely woven fabrics.
- Choose a hat with a broad-brim or in a legionnaire style so the baby's face, neck and ears are protected. For young babies, choose a design that will crumple easily when the baby puts their head down.
- Make use of available shade and provide shade for the baby's pram, stroller or play area. The material used should cast a dark shadow. The baby will still need to be protected from scattered and reflected UV radiation.
- Check the baby's clothing, hat and shade positioning regularly to ensure he/she continues to be well protected from UV radiation.
- Apply an SPF30+, broad spectrum, water resistant sunscreen to small areas of skin that cannot be protected by clothing (such as face, ears and backs of hands). Sunscreen will need to be applied 20 minutes before going outside and reapplied every two hours or more often if it has been wiped or washed off. Test the sunscreen on a small area of the baby or toddler's skin to check for any skin reactions.
- Use a shade visor or hang a blanket over the side windows in the car. The laminated glass on front windshields usually have UPF ratings of 70 or higher and block more than 98% of UV radiation, but the side and back windows don't offer as good protection, usually about UPF15 or less (blocking up to 93% of UV radiation). To provide adequate sun protection, products should have a UPF of 70 or higher.⁴⁵

Cancer Council Australia's position statement, *Sun protection and infants (0-12 months)*, can be viewed online at www.cancer.org.au/positionstatements under SunSmart.

Shade

Shade provides good protection from the sun and is easy to use. Shade alone can reduce overall exposure to UV radiation by about 75%⁴⁶ and when used in conjunction with sun protective clothing, hats, sunglasses and sunscreen, enables maximum sun protection to be achieved.

An increasing number of organisations recognise the need to provide shade – and as the community's knowledge about sun protection improves, so does their demand for public facilities with adequate shade.

Creating effective shade can be tricky. Even if you are shaded from direct sun, you can still be exposed to considerable UV radiation indirectly. UV radiation can reach you on the ground from three sources:

- directly, in a straight line from the sun;
- scattered from the open sky; and
- reflected from surfaces such as walls, concrete and sand.

Indirect UV radiation is generally weaker than direct radiation, but can still cause damage to the skin and eyes. A mixture of direct and indirect UV radiation can result in a higher level of exposure than direct UV radiation alone.

A well designed and correctly positioned shade structure casts shade where and when it is most needed. The incorrect positioning of shade structures and trees can result in unexpected shadows that provide little shelter from direct and indirect UV radiation.

For the best protection, choose shade that has extensive overhead or side cover and is positioned away from highly reflective surfaces if possible.

For further information on building effective shade structures, contact your state or territory Cancer Council.

Sun protection and the workplace

The 2008 National Hazard Exposure Worker Surveillance survey found that 34% of workers were exposed to direct sunlight during working hours⁴⁷, Cancer Council recommends employers implement sun protection policies to protect their employees from sun exposure and the risk of skin cancer.

Progress has been made in recent years, with 51% of outdoor workers now having a sun protection policy at their workplace, according to the Cancer Council's National Sun Survey.⁹ The survey also found 49% of outdoor workers were provided with sunscreen, 46% were provided with hats and 26% were provided with portable shade by their employers.

Cancer Council Australia has developed a series of national resources designed to reduce the risk of skin cancer in the workplace*:

- *Skin cancer and outdoor work: a guide for employers*
- *Skin cancer and outdoor work: a guide to working safely in the sun*
- Sun protection in the workplace position statement

Under Australian occupational health and safety legislation, employers have a legal requirement to maintain a safe working environment for their employees. Employees also have a duty to take care of their own health and safety and cooperate with employers' efforts to improve health and safety.

In 2006, the Australian Radiation Protection and Nuclear Safety Agency released *Occupational UVR Exposure Standard RPS12* (www.arpansa.gov.au/pubs/rps/rps12.pdf), which provides clear guidance on the importance of sun protection for outdoor workers and sets out occupational exposure limits.

In 2008, Safe Work Australia released the updated *Guidance Note for the Protection of Workers from the Ultraviolet Radiation in Sunlight* providing practical information for Australian workplaces to assess and reduce workplace exposure to ultraviolet radiation. This is available online at <http://www.safeworkaustralia.gov.au/swa/HealthSafety/HazardsSafetyIssues/UltravioletRadiationinSunlight.htm>

Implementing a comprehensive sun protection program, which includes a range of simple protective measures, can prevent sun-related injuries and reduce the suffering and costs associated with skin cancer – including reduced productivity, morale and financial returns.

There are several steps employers can take:

- Provide shade and move tasks into shaded areas where possible
- Schedule work that needs to be done in direct sunlight before 10am or after 3pm when UV radiation levels are lower
- Where available, use the SunSmart UV Alert as a guide for when sun protection is required by outdoor workers
- Require the use of and provide sun protective work wear, hats, sunscreen and sunglasses to protect outdoor workers from the sun
- Provide information, instruction, training and supervision to increase knowledge about skin cancer and sun protection at work.

The Australian Taxation Office has recognised the importance of sun protection for outdoor workers, making the cost of sunscreen, sunglasses and hats tax deductible. For further information, visit the ATO website www.ato.gov.au.

Cancer Council Australia's position statement, *Sun protection in the workplace*, can be viewed online at www.cancer.org.au/positionstatements under SunSmart.

Skin cancer and outdoor work: a guide for employers and *Skin cancer and outdoor work: a guide to working safely in the sun* are available from state and territory Cancer Councils*. To order the resources or for more information, call Cancer Council Helpline on 13 11 20 (local call from anywhere in Australia)

*Workplace guides are available in all states and territories except Queensland, where a similar resource *Minimise your risk of skin cancer: a kit for outdoor workers*, has been developed by Queensland Health, the Department of Industrial Relations and Cancer Council Queensland. For details, visit www.health.gov.au/sunsafety.

Glossary

A quick guide to the most-used acronyms in the sun protection vocabulary.

UVR - ultraviolet radiation.

UVA and **UVB** - these types of radiation cause skin damage and pose a skin cancer risk. UVB has a shorter wavelength than UVA.

UVC - naturally-occurring UVC radiation, which has an even shorter wavelength than UVA and UVB, is absorbed or scattered before it reaches the earth's surface.

SPF - sun protection factor. This is an industry measure of a sunscreen's ability to filter out UV. In Australia, the highest SPF rating is SPF30+.

EPF - eye protection factor. Similar to the SPF, but relating to sunglass lenses and goggles. The highest is EPF 10.

UPF - ultraviolet protection factor. UPF levels indicate how good clothing is at protecting your skin against the sun. Any UPF 15+ garment should provide reasonable protection – but the higher the level, the better the protection. The highest rating is UPF 50+.

Broad spectrum - this refers to the ability of a sunscreen to filter both UVA and UVB.

About Cancer Council Australia

Cancer Council Australia is the nation's peak independent cancer control organisation. Its members are the eight state and territory Cancer Councils (see below), which work together to undertake and fund cancer research, prevent and control cancer and provide support for people affected by cancer.

People seeking information and advice about skin cancer and sun protection can:

- call **Cancer Council Helpline** on 13 11 20; or
- visit cancer.org.au/sunsmart

Cancer Council Australia

GPO Box 4708
SYDNEY NSW 2001
Tel: (02) 8063 4100
Fax: (02) 8063 4101
Email: info@cancer.org.au
Website: www.cancer.org.au

State and Territory contacts

Cancer Council ACT

5 Richmond Avenue
FAIRBARN ACT 2609
Tel: (02) 6257 9999
Fax: (02) 6257 5055
Email: reception@actcancer.org
Website: www.actcancer.org

Cancer Council New South Wales

153 Dowling Street
WOOLLOOMOOLOO NSW 2011
Tel: (02) 9334 1900
Fax: (02) 9358 1452
Email: feedback@nswcc.org.au
Website: www.cancercouncil.com.au

Cancer Council Northern Territory

Unit 2/3, Casi House 25 Vanderlin Drive
WANGURI NT 0810
Tel: (08) 8927 4888
Fax: (08) 8927 4990
Email: admin@cancernt.org.au
Website: www.cancercouncilnt.com.au

Cancer Council Queensland

553 Gregory Terrace
FORTITUDE VALLEY QLD 4006
Tel: (07) 3258 2200
Fax: (07) 3257 1306
Email: info@cancerqld.org.au
Website: www.cancerqld.org.au

Cancer Council Tasmania

180-184 Collins Street
HOBART TAS 7000
Tel: (03) 6233 2030
Fax: (03) 6233 2123
Email: infotas@cancer.org.au
Website: www.cancertas.org.au

Cancer Council Victoria

1 Rathdowne Street
CARLTON VIC 3053
Tel: (03) 9635 5000
Fax: (03) 9635 5270
Email: enquiries@cancervic.org.au
Website: www.cancervic.org.au

Cancer Council Western Australia

46 Ventnor Avenue
West Perth WA 6005
Tel: (08) 9212 4333
Fax: (08) 9212 4334
Email: enquiries@cancerwa.asn.au
Website: www.cancerwa.asn.au

Cancer Council South Australia

202 Greenhill Road
EASTWOOD SA 5063
Tel: (08) 8291 4111
Fax: (08) 8291 4122
Email: tcc@cancersa.org.au
Website: www.cancersa.org.au

- ¹ Staples M, Elwood M, Burton R, Williams J, Marks R, Giles G. Non-melanoma skin cancer in Australia: the 2002 national survey and trends since 1985. *Medical Journal of Australia* 2006;184: 6-10.
- ² Australian Institute of Health and Welfare (AIHW) & Australasian Association of Cancer Registries (AACR). *Cancer in Australia: an overview*, 2008; 46(42).
- ³ Armstrong BK. How sun exposure causes skin cancer: An epidemiological perspective. In: Hill D, Elwood JM, English DR, (Eds). *Prevention of Skin Cancer*. Dordrecht, The Netherlands: Kluwer Academic Publishers, 2004, pp. 89-116.
- ⁴ Australian Institute of Health and Welfare (AIHW) & Australasian Association of Cancer Registries (AACR). *Cancer age specific data cube*. AIHW, 2007. Retrieved from www.aihw.gov.au on January 7, 2008
- ⁵ Stiller CA. International patterns of cancer incidence in adolescents. *Cancer Treatment Reviews* 2007; 33 (7): 631-645.
- ⁶ World Health Organization (WHO). *Global Solar UV Index: A practical guide: A joint recommendation of the World Health Organization, World Meteorological Organization, United Nations Environment Programme, and the International Commission on Non-Ionizing Radiation Protection*. WHO: Geneva, Switzerland, 2002. Available from <http://www.who.int/uv/publications/en/UVIGuide.pdf>.
- ⁷ Thursfield V, Giles G. *Canstat No. 44: Skin cancer*. The Cancer Council Victoria: Melbourne, Australia, November 2007.
- ⁸ Australian Institute of Health and Welfare (AIHW) & Australasian Association of Cancer Registries (AACR). *Cancer in Australia: an overview*, 2008. AIHW cat.no. CAN 46. AIHW: Canberra, December 2008. Available from www.aihw.gov.au.
- ⁹ Raab WP. Photodamaged skin: a medical or a cosmetic concern? *Journal of International Medical Research* 1990; 18(Suppl 3): 2c-7c.
- ¹⁰ Hansson J. Familial melanoma. *The Surgical Clinics of North America* 2008; 88 (4): 897-916, viii.)
- ¹¹ Australian Bureau of Statistics (ABS). *Causes of death 2007*. 3303.0. 3303.0. Commonwealth of Australia: Canberra, March 18 2009. Available from www.abs.gov.au.
- ¹² Australian Institute of Health and Welfare (AIHW). *Non-melanoma skin cancer: general practice consultations, hospitalisation and mortality*. Cancer series no. 43. Cat no. 39. AIHW: Canberra 2008.
- ¹³ Australian Institute of Health and Welfare (AIHW) & Australasian Association of Cancer Registries (AACR). *Cancer in Australia 2001*. AIHW cat.no. CAN 23. AIHW: Canberra 2004. Available from www.aihw.gov.au.
- ¹⁴ Australian Institute of Health and Welfare (AIHW). *Non-melanoma skin cancer: general practice consultations, hospitalisation and mortality*. Cancer series no. 43. Cat no. 39. AIHW: Canberra 2008.
- ¹⁵ National Cancer Control Initiative. *The 2002 national non-melanoma skin cancer survey. A report by the NCCI Non-melanoma Skin Cancer Working Group*. NCCI Melbourne. 2003.
- ¹⁶ Thursfield V, Farrugia H, Giles G. *Canstat No. 47: Cancer in Victoria 2007*. Cancer Council Victoria: Melbourne, Australia, February 2010
- ¹⁷ Australian Institute of Health and Welfare (AIHW) & Australasian Association of Cancer Registries (AACR). *Cancer in Australia 2001*. 2004.
- ¹⁸ Ferlay J, Bray F, Pisani P, Parkin DM. *GLOBOCAN 2002. Cancer incidence, mortality and prevalence worldwide. IARC CancerBase No. 5, version 2.0*. IARC Press: Lyon, France 2004. Available from <http://www-dep.iarc.fr/>.
- ¹⁹ Stiller CA. International patterns of cancer incidence in adolescents. *Cancer Treatment Reviews* 2007; 33 (7): 631-645.
- ²⁰ Australian Institute of Health and Welfare & Cancer Australia & Australasian Association of Cancer Registries. *Cancer survival and prevalence in Australia: cancers diagnosed from 1982 to 2004*. AIHW: Canberra 2008.
- ²¹ Australian Institute of Health and Welfare. *Health system expenditures on cancer and other neoplasms in Australia, 2000-2001*. AIHW cat.no. HWE 29. Australian Institute of Health and Welfare, : Canberra, Australia 2005. Available from www.aihw.gov.au.
- ²² Dobbins SJ, Fairthorne A, Bowles K-A, Sambell N, Spittal M, Wakefield M. Sun protection and sunburn incidence of Australian children: summer 2003-04. Centre for Behavioural Research in Cancer, The Cancer Council Victoria: Melbourne, October 2005 unpublished 2005.

- ²² Samanek AJ, Croager EJ, Gies P, Milne E, Prince R, McMichael AJ, Lucas RM, Slevin T. Estimates of beneficial and harmful sun exposure times during the year for major Australian population centres. *Medical Journal of Australia* 2006; 184 (7): 338-341.
- ²³ Centre for Behavioural Research in Cancer. The 2006-07 National Sun Protection Survey: Reports 1 & 2. The Cancer Council Victoria. 2008
- ²⁴ Bowles K-A, Dobbins SJ, Wakefield M. *Sun protection and sunburn incidence of Australian adults: Summer 2003 - 2004*. Centre for Behavioural Research in Cancer, The Cancer Council Victoria: Melbourne, Australia, February 2005 unpublished 2005
- ²⁵ Centre for Behavioural Research in Cancer. The 2006-07 National Sun Protection Survey: Reports 1 & 2. The Cancer Council Victoria. 2008
- ²⁶ Wu C. Unravelling the mystery of melanin: does a tan protect skin from sun damage or contribute to it? *Science News* 1999; 156: 190-1.
- ²⁷ Gange RW et al. Comparative protection efficiency of UVA- and UVB-induced tans against erythema and formation of endocuclease-sensitive sites in DNA by UVC in human skin. *J Invest Dermatol*. 1985 Oct; 85(4): 362-4.
- ²⁸ National Health and Medical Research Council (NHMRC) Suntanning parlours, solaria, home tanning equipment (position statement- revised). NHMRC, 2002.
- ²⁹ Walter, D, Marrett, L, From, L, Hertzman, C, Shannon, H, Roy, P. The association of cutaneous malignant melanoma with the use of sunbeds and sunlamps. *American Journal of Epidemiology*, 131, 2 (1990): 232-243.
- ³⁰ Taylor H. Climatic droplet keratopathy and pterygium. *Australian Journal of Ophthalmology* 1981; 9:199-206.
- ³¹ Moran D, Hollows F. Pterygium and ultraviolet radiation: a positive correlation. *British Journal of Ophthalmology* 1984; 68: 343-6.
- Roberts T, Coroneo M. Pterygium: the curse of the Australian sun lover. *Modern Medicine* 1999; September: 31-5.
- Coroneo M. Pterygium as an early indicator of ultraviolet insolation: a hypothesis. *British Journal of Ophthalmology* 1993; 77: 734-9.
- West S. et al. Sunlight exposure and risk of lens opacities in a population-based study. The Salisbury eye evaluation project. *JAMA* 1998; 280: 714-8.
- Hollows F, Moran D. Cataract – the ultraviolet risk factor. *Lancet* 1981; ii: 1249-50.
- Taylor H. The biological effects of UVB on the eye. *Photochemistry & Photobiology* 1989; 50: 489-92.
- ³² Vajdic CM, Krickler A, Giblin M, McKenzie J, Aitken J, Giles GG, Armstrong BK. Incidence of ocular melanoma in Australia from 1990 to 1998. *International Journal of Cancer*. 2003; 105(1):117-22.
- ³³ Taylor H. The biological effects of UVB on the eye. *Photochemistry & Photobiology* 1989; 50: 489-92
- ³⁴ Calvo MS, Whiting SJ, Barton CN. Vitamin D fortification in the United States and Canada: current status and data needs. *American Journal of Clinical Nutrition* 2004; 80(suppl) 1710S-1716S.
- ³⁵ Norman AW, Sunlight, season, skin pigmentation, vitamin D, and 25-hydroxyvitamin D: integral components of the vitamin D endocrine system *American Journal of Clinical Nutrition* 1998; 67: 1108-10
- ³⁶ Samanek A, Croager E, Gies P, Milne E, Prince R, McMichael A, Lucas R, Slevin T. Estimates of beneficial and harmful sun exposure times during the year for major Australian population centres. *Medical Journal of Australia* 2006;184(7): 338-41.
- ³⁷ Clemens TL, Adams JS, Henderson SL, Holick MF. Increased skin pigment reduces the capacity of skin to synthesize vitamin D3. *Lancet* 1982; 1(8263): 74-76
- ³⁸ Riggs BL. Role of the vitamin D-endocrine system in the pathophysiology of postmenopausal osteoporosis. *Journal of Cellular Biochemistry* 2003; 88(2): 209-15
- ³⁹ Thomson K, Morley R, Grover SR, Zacharin MR. Postnatal evaluation of vitamin D and bone health in women who were vitamin D-deficient in pregnancy, and in their infants. *Medical Journal of Australia* 2004; 181 (9): 486-8.
- ⁴⁰ Liley JB, McKenzie RL. Where on earth has the highest UV? *UV radiation and its effects - an update 2006*. Dunedin, New Zealand: National Institute of Water and Atmospheric Research, 2006.
- ⁴¹ Schalka S, Silva dos Reis VM, Cuc'e LC. The influence of the amount of sunscreen applied and its sun protection factor (SPF): Evaluation of two sunscreens including the same ingredients at different concentrations. *Photodermatology, Photoimmunology & Photomedicine* 2009; 25 (4): 175-180.

⁴² World Health Organization. The known health effects of UV: I am dark-skinned – do I still need to be careful? World Health Organization, 2008. Retrieved from www.who.int/uv/faq/uvhealthfac/en/index5.html on 15 December, 2008

⁴³ Seidenari S, Giusti G, Bertoni L, Magnoni C, Pellacani G. Thickness and echogenicity of the skin in children as assessed by 20-MHz ultrasound. *Dermatology* 2000; 201 (3): 218-222.

⁴⁴ Sullivan JR. *A–Z of Skin: Baby and Toddler Protection*. Australasian College of Dermatologists, 2001. Retrieved from www.dermcoll.asn.au/public/a-z_of_skinbaby_toddler_protection.asp on 31 October 2006.

⁴⁵ Armstrong BK, Kricger A. Epidemiology of Sun Exposure and Skin Cancer. *Cancer Surveys*. 1996;26: Skin Cancer.

⁴⁶ Parsons PG, Neale R, Wolski P, Green A. The shady side of solar protection. *Medical Journal of Australia* 1998; 168(7): 327–30.

⁴⁷ Australian Safety and Compensation Council. *National hazard exposure worker surveillance (NHEWS) survey: 2008 results*. Commonwealth of Australia: Canberra, Australia, November 2008.