

National Health Strategies to Reduce Sun Exposure in Australia and the United States

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ABSTRACT: Australia has developed a national health care policy that has made prevention of the occurrence of skin cancer a societal responsibility. Its strategies for skin cancer control have included careful documentation of the incidence of skin cancer over the last two decades. After realizing that the magnitude of sun exposure during childhood is a major risk factor in the development of skin cancer, Australia provides successful strategies to monitor and reduce the frequency of skin cancer. Early in the 1970s, education campaigns for the public as well as the healthcare worker were implemented that included booklets, posters, and teaching materials. This educational program allowed the public as well as healthcare workers to diagnose accurately the presence of skin cancer. In addition to identifying tumors at an early stage, Australia managed an exciting educational program on photodamage prevention. Australian standards governing ultraviolet radiation protection were incorporated into numerous comprehensive legislative bills that set standards for a wide variety of sun protective products to include sunscreens, photoprotective apparel, sunglasses, and occupational standards for sun exposure. On the basis of these comprehensive standards, the epidemic of skin cancer has been curbed, as documented.

In contrast to Australia, the United States has relatively few comprehensive skin cancer prevention programs. These programs include the National Skin Cancer Prevention Educational Program, National Skin Cancer Prevention and Detection Month, The Skin Cancer Foundation's Self-Examination Program, and the State of California and US Food and Drug

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Administration Sunscreen legislation. It is difficult to measure the impact of these innovative efforts because there is not an accurate monitoring system for all skin cancers in the United States. However, the National Cancer Institute does determine the incidence of melanoma, which is reported annually by the American Cancer Society in their January/February issue of *CA Journal for Clinicians*. Statistics on other skin cancers are only projective. In the absence of an accurate, comprehensive statistical monitoring system for the frequency of skin cancer in the United States, as well as the limited legislative initiatives, it is difficult for organizations such as the American Academy of Dermatology, the American Cancer Society, the Centers for Disease Control and Prevention, and The Skin Cancer Foundation to ascertain the results of their efforts to prevent skin cancer. Consequently, the prevention of skin cancer in the United States is a personal rather than a societal responsibility.

KEYWORDS: sun exposure, ultraviolet radiation, melanoma, squamous cell carcinoma, basal cell carcinoma, telephone survey, National Skin Cancer Prevention Education Program, dysplastic, sunscreen, hats, clothing, ultraviolet protection factor, photoprotective clothing, sunglass, education, American Academy of Dermatology, Centers for Disease Control and Prevention, The Skin Cancer Foundation, American Cancer Society, Melanoma Month

I. INTRODUCTION

In 1999, Emmons and Colditz¹ wrote a compelling editorial that encouraged the US to develop a national policy that would prevent excess sun exposure. They pointed out that it is now well established that childhood sun exposure is the primary risk for melanoma. The seminal observation linking age at exposure to risk was the finding that the incidence of melanoma increased among the immigrants to Australia who were children at the time of migration. They concluded that reduction of exposure to the sun throughout life is warranted to reduce the risk of melanoma and nonmelanoma skin cancer.

They pointed out that in other parts of the world, sun protection is viewed as a societal responsibility. These countries have established strong norms that encourage citizens to use a variety of sun protection strategies. Consequently, it is the purpose of this collective review to acknowledge the different national educational programs in Australia and the United States that are designed to educate these nations about the dangers of sun exposure, in an effort to prevent the occurrence of skin cancer.

II. AUSTRALIAN STRATEGIES ON SKIN CANCER CONTROL

In 1985, the first Australian national survey of non-melanocytic skin cancers (NMSC) showed that two out of three people born in Australia were likely to require treatment for at least one skin cancer in their lifetime.² These data recorded the highest rates of medically treated NMSC reported to that point. The same survey was administered again in 1990 and 1995, with startling results. Over a 5-year period, the incidence of NMSCs increased by 19%, of basal-cell carcinomas (BCC) by 11%, and of squamous cell carcinomas (SCC) by 51%.³ Over a 10-year period, BCC increased by 19% and SCC by 93%.⁴ These rates translated to almost 2% of Australians being treated for NMSC annually. Melanoma is the fifth most common cancer to occur in either men or women under 50 years of age; over 8000 new cases of melanoma are diagnosed each year.⁵

Data on national Australian skin cancer mortality can be traced back efficiently for more than a century because of state registrars of births, deaths, and marriages. Skin cancer outnumbers all other forms of cancer in Australia by approximately three to one.⁶

In a study published in 1989 by Marks et al.,⁷ the authors concluded that the treatment of NMSC each year costs significantly more than would a major preventative campaign.

II.A. Identification of Skin Cancers

When melanomas kept increasing 3–10% each year in the 1970s,⁸ campaigns were launched in order to teach people how to recognize the signs of skin cancer. The training of pharmacists and doctors, especially general practitioners, to identify skin cancers at an early stage was key to this strategy. The Australian Cancer Society and the Australian College of Dermatologist started the first Skin Cancer Awareness Week in 1985; the theme was, “What does skin cancer look like?”⁹ Booklets, posters, and teaching materials were sent to every general practitioner and every specialist in Australia. Public education days were filled with screening activities, such as spot checks.

After years of identification campaigns, a 1992 study to judge public knowledge about moles and melanomas in Victoria found that 91% of those surveyed recognized the term “melanoma,” but only 10% could correctly identify the key characteristics of early melanoma.¹⁰ More tellingly, studies probing skin cancer knowledge among general practitioners found that further education was necessary to make correct diagnoses.^{11,12} General practitioners were better at providing correct diagnosis for benign lesions (75%) than for skin cancers (61%) or dysplastic lesions (61%). They had more difficulty in recognizing early melanoma than late melanoma and were more likely to manage benign lesions (85%) and dysplastic lesions (34%) than skin cancers (4%). Those doctors who correctly identified tumors had high knowledge of the appropriate management steps for the tumors.

II.B. Education on Photodamage Prevention

In addition to identifying tumors at an early stage, steps to prevent skin cancer were implemented into

education programs in the 1980s. The Anti-Cancer Council of Victoria created *Slip! Slop! Slap!*, a program featuring the cartoon characters Sid Seagull and his son Sam, who taught children about sun safety with the help of a catchy jingle. This program taught people to *slip* into a shirt, *slop* on some sunscreen, and *slap* on a hat. Since the introduction of this show, other photoprotective television programs have sprung up, including *SunSmart* and *Me No Fry*. The latest campaigns feature Seymour Snowman and targets parents of children less than 12 years of age.

Since then, sun-related attitudes and behaviors have changed substantially, particularly in people born after 1950. Hat wearing and sunscreen use have had measurable successes, although the trends in mean proportion of body surface area covered are not as easily determined.¹³ Smith et al.¹⁴ reported in 2002 the results of a three-summer-long campaign to increase the use of sun protection measures among children under 12 years old. They showed that parents had a significant amount of knowledge about the protective benefits of sunscreens, hats, and clothing but lacked an understanding about shade cover and the role of childhood sun exposure to skin cancer later in life. Adults followed these sun protection measures less often than children.

II.C. Legislation

Australian standards (AS) governing ultraviolet radiation (UV-R) protection have been developed over the past 20 years in order to facilitate not just a change in sun *behavior* among Australian nationals, but also to facilitate a change in sun *habits*.¹⁵ Current standards include AS 4174, developed in 1994 to regulate synthetic shade cloth; AS 2635, developed in 1983 to regulate the installation, maintenance, and operation of solarium for cosmetic purposes; AS/NZS 2604, developed in 1983 and revised most recently in 1998 to regulate sunscreen products and their classification; AS 1067.1, developed in 1990 to regulate sunglasses and fashion eye wear; and AS/NZS 4399,

developed in 1996 to regulate photoprotective apparel and its classification. In addition, the National Health and Medical Research Council (NHRMC) issued a standard for occupational exposure limits to UV-R in 1989.

According to AS/NZS 2604, 1998, sunscreen products may claim a maximum sun protection factor (SPF) of 30+. This legislation is aimed at limiting sun exposure and maximizing the amount of sunscreen applied to the body. Australia was the first country to legislate the UV protection claims of apparel, as well as the test methodology for apparel evaluation and classification. This standard, AS/NZS 4399:1996, designates the term "ultraviolet protection factor" (UPF) for labeling of photoprotective clothing. A maximum UPF of 50+ blocks 98% of UV-R. The only mandatory sunglass standard in the world belongs to Australia: AS 1067.1:1990 Sunglass and fashion spectacles Part 1: Safety Requirements. Workers in Australia are protected by the Occupational Standard for Exposure to Ultraviolet Radiation (1989), which sets exposure limits (EL) where irradiance values are known and exposure time is controlled. This standard is especially important in Australian summer at noontime, because outdoor workers can exceed the NHRMC guidelines in 10–15 minutes and need protection against UV-R.

Other efforts to curb the epidemic of skin cancer include legislation to remove sales tax from approved sunscreens, sun protection policies and teaching resources (the SunSmart Schools Program) implemented at schools, sun protection included in the criteria for Early Childcare Centers accreditation, specialty skin cancer clinics opened, and creation of shade in schools and other public open space areas with canopies or trees.¹⁵

III. NATIONAL STRATEGIES TO PREVENT SKIN CANCER IN THE UNITED STATES

In contrast to Australia, the United States has relatively few comprehensive skin cancer prevention programs. These programs included the National Skin

Cancer Prevention Education Program, National Skin Cancer Prevention and Detection Month, The Skin Cancer Foundation, California legislation, and the US Food and Drug Administration (FDA) sunscreen legislation.

III.A. National Skin Cancer Prevention Education Program

To assess public knowledge and awareness about melanoma, the American Academy of Dermatology (AAD) initiated a nationwide telephone survey in 1995 in which 1001 individuals participated.¹⁶ This AAD survey documented that a high proportion of US adults (42%) lack knowledge and awareness about melanoma. The finding that levels of public awareness were lowest among the youngest respondents (persons aged 18–24 years) was especially important because the responsible use of sunscreens (SPF 15+) before the age of 18 could reduce the lifetime incidence of nonmelanoma skin cancers by 78%.¹⁷

The Centers of Disease Control (CDC) in collaboration with the AAD, initiated the National Skin Cancer Prevention Education Program (NSCPEP) in 1996 to prevent the development of melanoma and other skin cancers.¹⁸ In 1996, an estimated 1 million cases of skin cancer were diagnosed, of which approximately 95% were SCC cell or BCC cell carcinomas.¹⁹ Although the incidence of melanoma is less than those of SCC and BCC, the case/fatality rate was highest for persons with melanoma. Between 1973 and 1992, mortality from melanoma increased 34%, the third highest increase of all cancers.²⁰ During 1973 to 1992, the death rate for melanoma increased 48% among men, representing the highest sex-specific increase of all cancers.²⁰

The major goals of NSCPEP were to increase public awareness about skin cancer and to help reduce the occurrence of and deaths associated with skin cancer. Their strategies to achieve this goal were to develop and disseminate educational messages for children, their parents, and other caregivers; to devise guidelines for school curriculum to evaluate the utility and value

of the UV index; and to develop educational messages for health care providers.

The membership of the Centers for Disease Control and Prevention (CDC)'s NSCPEP, in collaboration with AAD, was expanded to include the American Cancer Society, the US Environmental Protection Agency, the National Weather Service, state health departments, universities, and other public and private organizations in 1998.²¹ Program efforts were expanded to include media campaigns and health education efforts among target groups. Prevention education for nurses, evaluation of a UV index combined with UV index worksite demonstration projects, development of school and community health guidelines for skin cancer prevention/sun protection, and formation of a national counsel for skin cancer prevention were initiated.

In 2000, the NSCPEP introduced a new approach to the prevention of skin cancer.²² It announced the Choose Your Cover Campaign, aimed primarily at young people. The goal of this educational effort was to influence social norms related to sun protection and tanned skin, as well as improving awareness, knowledge, and behaviors related to skin cancer. This program informed the public that even a few serious sunburns could enhance a person's risk for skin cancer. It also promoted the Choose Your Cover sun protection options: seeking shade, covering up, wearing a hat and sunglasses, and using sunscreens that have a sun protection factor of 15 or higher to provide UVA and UVB protection for the skin.

It established a website on the Choose Your Cover skin cancer protection campaign, www.cdc.gov/chooseyourcover. This website provides more detailed educational information on skin cancer prevention.

III.B. May: National Melanoma/Skin Cancer Detection and Prevention Month

The American Academy of Dermatology, the American Cancer Society, and the CDC designated May as National Melanoma/Skin Cancer Detection and Prevention Month.²³ This month is dedicated to in-

creasing public awareness of the importance of early detection and treatment of skin cancer, including BCC, SCC, and melanoma. The American Cancer Society estimated that in 2001, approximately 1.3 million new cases of curable BCC and SCC carcinomas would be detected.²⁴ In addition, approximately 51,400 new cases of melanoma would be diagnosed. An estimated 7800 people would die from melanoma and other skin cancers. Although death rates from SCCs and BCC are low, these cancers can cause damage and disfigurement if left untreated. However, when detected early, approximately 95% of these carcinomas can be cured.

III.C. The Skin Cancer Foundation

The Skin Cancer Foundation is the only national and international foundation concerned exclusively with skin cancers. Its mission is to stem the epidemic of skin cancer with preventive public education campaigns to teach adults, children, and their caregivers about the dangerous UV rays of the sun as well as to change public attitudes and behaviors toward tanning and sun exposure. The Foundation encourages detection of skin cancers at the earliest stage, when they are almost always curable; offers physician education and training programs; and supports research into effective new skin cancer diagnostic techniques and therapies. Since 1981, it has offered a Seal of Recommendation for photoprotective products that reinforce The Foundation's educational guidelines and advocacy of the use of UV-protective products. Photoprotective product categories include sunscreens, sunglasses, window films, laundry detergent additives, and photoprotective fabrics, including clothing. More than 200 products in the United States and some 60 abroad currently have been awarded the Seal.

In order to be certified, the product must have a minimum SPF/UPF of 15 and meet the specified criteria of The Skin Cancer Foundation's Photobiology Committee. These include stringent testing to support the SPF/UPF value and verify certain safety requirements, such as phototoxicity and contact irri-

tancy. If water resistance claims are made, the product must be tested to ascertain its potency after repeated immersion. The Skin Cancer Foundation performs a valuable service to industry and to the consumer by ensuring a product's ongoing adherence to FDA guidelines.

III.D. California Legislation

Karin Graham began the William S. Graham Foundation for Melanoma Research after her 22-year-old son William ("Billy") died from melanoma. Billy's death transformed his mother into a sun-safety crusader. In 1998, the World Health Organization invited Karin Graham to Australia, where school programs regularly teach children sun safety and protect them outdoors. When she returned to California, Karin learned that schools would forbid hats and other sun-protective clothing on the playground for fear of gang representation. Karin then lobbied the California Senate to legislate children's sun protection. The Senate bill Sb-310, aka "Billy's Bill for Sun Safety," was born. Authored by Senator Don Perata, (D-Alameda) and sponsored by the American Cancer Society and the California Medical Association with the backing of Assemblymen Rod Pacheco (R-Riverside), "Billy's Bill" was passed by the legislature and approved by the governor in October 2001. This bill marks the first photoprotective bill in the United States. It reads:

"THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS;

SECTION 1. Section 35183.5 of the Education Code is amended to read:

- (a)(1) Each school site shall allow, for outdoor use during the school day, articles of sun-protective clothing including, but not limited to, hats.
- (a)(2) Each school site may set a policy related to the type of sun-protective clothing including,

but not limited to, hats, that pupils will be allowed to use outdoors pursuant to paragraph (1). Specific clothing and hats determined by the school district or school site to be gang-related or inappropriate apparel may be prohibited by the dress code policy.

- (1) Each school site shall allow pupils the use of sunscreen during the school day without a physician's note or prescription.
- (2) Each school site may set a policy related to the use of sunscreen by pupils during the school day.
- (3) For purposes of this subdivision, sunscreen is not an over-the-counter medication.
- (4) Nothing in this subdivision requires school personnel to assist pupils in applying sunscreen.

SECTION 2. This act shall be known and may be cited as Billy's Bill for Sun Safety."

III.E. FDA Sunscreen Regulations

The FDA regulates sunscreen products as over-the-counter (OTC) drugs. In 1999, the FDA issued a final monograph that established conditions under which OTC sunscreen drug products are generally recognized as safe and effective and not misbranded.²⁵ Although this monograph was issued for implementation in May 2001, it has been delayed until complete guidelines for UV-B and UV-A protection are completed. Under this monograph, the FDA approves only 16 sunscreen agents, although sunscreens can be identified by drug, chemical, or trade name.

Combinations of sunscreen active ingredients are used in sunscreen products to provide broader coverage. In the 1999 Final Monograph, the FDA indicated that two or more sunscreen active ingredients could be combined in a single product when used in concentrations established for each ingredient. The concentration of each active ingredient must be suf-

ficient to contribute to a minimum SPF of not less than 2 to the finished product. The finished product should have a minimum SPF of not less than the number of sunscreen active ingredients used in the combination, multiplied by 2.

In addition to the statement of the sunscreen's product identity, the FDA indicated that the following labeling statements must be prominently placed on the principal display panel. For products that satisfy the "water-resistant" product testing procedures, the manufacturer must insert one of the following terms: "water," "water/sweat," or "water/perspiration" resistant. For products that satisfy the "very water resistant" sunscreen testing procedures, the manufacturer must select one of the following terms: "very water resistant," "very water/sweat resistant," or "very water/perspiration resistant." For products that satisfy the "water resistant" testing procedures, the manufacturer may state that the product retains SPF after 40 minutes of activity in water, sweating, or perspiring. For products that satisfy the "very water resistant" testing procedures, the product must be labeled that it retains SPF after 80 minutes of activity in water, sweating, or perspiring. The sunscreen product expiration date must be easily visible, allowing the user to discard the outdated product and purchase a new product. The chemical preservatives stabilizing the antioxidants and other sunscreen ingredients break down over time, rendering the sunscreen product insufficient and ineffective past its expiration date. For more information on product labeling, refer to the appendix of the FDA monograph that provides more detailed labeling instructions.²⁵

Sun protection offers a varying degree of substantivity, or adherence to the skin, after sweating, swimming, or washing. The FDA has outlined standardized tests that allow the manufacturer to appropriately label their sunscreen products. For products that satisfy the "very water resistant" sunscreen labeling, the sun protection value of the sunscreen must be determined after 80 minutes of water immersion using the following procedure for the "very water resistant test": apply sunscreen product, followed by the waiting period after application of the sunscreen product indicated on

the product labeling; 20 minutes of moderate activity in water; 20-minute rest period; 20-minute moderate activity in water; 20-minute rest period; 20 minutes' moderate activity in water; 20-minute rest period; 20 minutes' moderate activity in water; and conclude test by air drying the test site, after which the standard solar simulator exposure is undertaken.

For manufacturers wanting to make the claim of "water resistant," the following water immersion test must be followed: apply sunscreen product, followed by the waiting period after application of the sunscreen product indicated on the product labeling; 20 minutes of moderate activity in water; 20-minute rest period; 20 minutes' moderate activity in water; conclude water test by air drying test site and begin solar simulator exposure to test site area. In both the evaluation of the "water resistant" or "very water resistant" sunscreen testing procedures, an indoor fresh water pool, whirlpool, and/or Jacuzzi maintained at 23 to 32 °C must be used in these testing procedures.

The FDA monograph specified an upper limit of SPF 30 for sunscreen products, which means any product with an SPF greater than 30 can only be labeled as SPF 30+. The standard FDA method involves a sunscreen application of 2 mg/cm². In nonlaboratory conditions, the average application thickness is more like 0.5–1.0 mg/cm². The product application technique outside of laboratories alters the SPF, usually lowering the percentage of UV blocked.

Although many sunscreens provide excellent UV-B protection, they often lack UV-A protection, particularly UV-A I, the main cause of melanoma.²⁶ Unfortunately, no consensus exists about the best method for measuring UV-A protection. The available methods of measuring UV-A protection have been reported by Stanfield et al.²⁷

IV. DISCUSSION

Australia has taken great strides in the last 25 years to change the photoprotection behaviors of its citizens; efforts are now underway to further change those behaviors into habits. Australia's legislation empowers its

educational campaigns and promotes societal responsibility. Mortality from skin cancer is steadily declining in Australia. In the United States, however, educational campaigns about the seriousness of skin cancer have only been underway a little less than a decade. There are currently no mass media campaigns; in fact, US media promotes tanning and “sun worship” through commercials, printed advertisements, and television programs featuring sun-bronzed heroes and heroines. A lack of societal responsibility from the government communicates to US citizens that, indeed, the consequences of skin cancer must not be severe.

The absence of legislation ensures any responsibility for photoprotection falls squarely on the individual. Most individuals, faced with the lack of legislation, lack of education, and thus lack of understanding about the seriousness of sun, choose to ignore what steps they could take to protect themselves. This policy of silence by US government is expensive, cost ineffective, and dangerous to our society. There are signs of hope, however, with the efforts of Karin Graham, The Skin Cancer Foundation, and the AAD, as well as the FDA Final Monograph on Sunscreens. Ultimately, though, physicians remain the societal group best informed of sun dangers. Physicians must continue to educate their patients and promote healthy sun behaviors year-round until public awareness reaches new heights.

It is difficult to measure the impact of these innovative efforts because there is not an accurate monitoring system for all skin cancers in the United States. However, the National Cancer Institute does determine the incidence of melanoma, which is reported annually by the American Cancer Society in their January/February issue of *CA Journal for Clinicians*. Statistics on other skin cancers are only projective. In the absence of an accurate, comprehensive statistical monitoring system for the frequency of skin cancer in the United States, as well as the limited legislative initiatives, it is difficult for organizations such as the American Academy of Dermatology, the American Cancer Society, the CDC, and The Skin Cancer Foundation to ascertain the results of their efforts to prevent skin cancer. Consequently, the prevention of

skin cancer in the United States is a personal rather than a societal responsibility.

V. CONCLUSION

Australia has developed a national health care policy that has made prevention of the occurrence of skin cancer a societal responsibility. Its strategies for skin cancer control have included careful documentation of the incidence of skin cancer over the last two decades. After realizing that the magnitude of sun exposure during childhood is a major risk factor in the development of skin cancer, Australia provides successful strategies to monitor and reduce the frequency of skin cancer. Early in the 1970s, education campaigns for the public as well as the healthcare worker were implemented, which included booklets, posters, and teaching materials. This educational program allowed the public and healthcare workers to diagnose accurately the presence of skin cancer. In addition to identifying tumors at an early stage, Australia managed an exciting educational program on photodamage prevention. Australian standards governing ultraviolet radiation protection were incorporated into numerous comprehensive legislative bills that set standards for a wide variety of sun protective products to include sunscreens, photoprotective apparel, sunglasses, and occupational standards for sun exposure. On the basis of these comprehensive standards, the epidemic of skin cancer has been curbed, as documented.

In contrast to Australia, the United States has relatively few comprehensive skin cancer prevention programs. These programs include the National Skin Cancer Prevention Educational Program, National Skin Cancer Prevention and Detection Month, The Skin Cancer Foundation's Self Examination Program, and the California and US Food and Drug Administration sunscreen legislations. It is difficult to measure the impact of these innovative efforts because there is not an accurate monitoring system for the frequency of all skin cancers in the United States. However, the National Cancer Institute does determine the inci-

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