Primary Prevention of Skin Cancer in Children and Adolescents:
A Review of the Literature

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Skin cancer is the most prevalent cancer in the United States of America (Jemal et al., 2007). The American Cancer Society estimated that there would be greater than 1 million newly diagnosed cases of basal cell and squamous cell skin cancer and just fewer than 60,000 melanoma diagnoses in 2007 in the United States alone (American Cancer Society, 2007). Australia has the highest incidence of skin cancer in the world, with 106,000 expected new cases in 2006 (Australian Institute of Health and Welfare, 2006). Although basal cell and squamous cell skin cancers have very low death rates, melanoma is a life-threatening disease that was predicted to cause 8,110 deaths in 2007, accounting for a large majority of all skin cancer fatalities. Between 1950–1954 and 1990–1994, the melanoma mortality rate spiked at 191% in males and 84% in females (Jemal, Devesa, Fears, & Hartge, 2000). Skin cancer is a disease that predominantly affects white people.

Basal cell and squamous cell skin cancers are the 2 most common types of skin cancers, accounting for 75% and 20% of all skin cancers, respectively (American Cancer Society, 2006). Melanomas are...
the most fatal form of skin cancer (American Cancer Society, 2007; Edwards et al., 2005; Jemal et al., 2007). Melanoma is one of most common forms of cancer in people from birth to the age of 39 (American Cancer Society, 2007). Survival rates for melanomas that are localized when detected are approximately 99% but decrease to about 15% when they are not diagnosed until later stages of cancer (Jemal et al., 2007).

There are 2 major causes of skin cancer: genetic predisposition and ultraviolet radiation exposure of the skin (Bishop, Harland, Randerson-Moor, & Bishop, 2007). It can be indirectly deduced from available evidence that exposure of the skin to ultraviolet radiation is responsible for both nonmelanoma and melanoma cancers (Armstrong & Kricker, 2001). Exposure to ultraviolet radiation is most dangerous to youths; most ultraviolet damage is caused during childhood and adolescence (Whiteman, Whiteman, & Green, 2001).

Worldwide, nations are taking steps to enact intervention programs and promote healthy living and the prevention of skin cancer. In 1995, the American Academy of Dermatology performed a nationwide study of public knowledge of melanoma which indicated that 42% of respondents were completely unaware of what melanoma is. The lowest rates of knowledge of melanoma were found among persons between 18 and 24 years of age and at lower income and education levels. To effect significant changes in prevention efforts, policies depend on the availability of resources such as prevention information, early detection programs, public awareness by the community and health care providers, and a means through which to disseminate information and provide services (Centers for Disease Control and Prevention [CDC] & the National Institutes of Health [NIH], 2000).

**Procedure**

An extensive search of MEDLINE, CINAHL, and PSYCHInfo using the keywords “skin cancer prevention,” “skin cancer intervention,” and “sun exposure” was conducted to gather information for this review. Also, the reference lists for the articles used from MEDLINE, CINAHL, and PSYCHInfo were examined and articles were drawn from these lists.

**Findings**

Intervention analyses were divided into 3 categories: primary, secondary, and tertiary prevention (Mahon, 2003). Primary prevention data were the principle focus of this inquiry. The 3 levels of prevention are used as a standard for intervention policies to achieve the best possible health for populations through prevention, early detection, and treatment of the disease and the interruption and deceleration of the course of the disease and accompanying symptoms (Adams et al., 2001). Primary prevention efforts aim to avert the development of a disease and are often accomplished through educational initiatives and health promotion (Mahon, 2003).

**Primary Prevention in Primary Schools**

Primary prevention interventions in primary schools target children between kindergarten and 8th grade. These educational and behavioral initiatives aim to augment students’ knowledge of sun-safe behaviors and attitudes toward skin protection and to encourage students to practice more sun-protective behaviors. Educational interventions and policies are also geared toward informing teachers and parents about the dangers of ultraviolet radiation from the sun (Saraiya et al., 2004). Primary school-age children are generally more open and responsive to efforts to increase sun-safe behaviors and improve attitudes toward skin cancer prevention than are older children and adolescents (Cockburn, Hennrikus, Scott, & Snason-Fisher, 1989), and because most children spend the majority of the peak hours for ultraviolet radiation at school, primary school instruction on sun-safe behaviors and attitudes is a popular method of primary prevention.

The CDC released “Guidelines for School Programs to Prevent Cancer” in 2002 to promote prevention-related activities in school environments (Glanz, Saraiya, & Wechsler, 2002). The report highlights 7 major principles that can be implemented to effect change in the school setting. These guidelines include (a) creating policies to reduce ultraviolet radiation exposure from the sun; (b) providing environments for activities that are sun-safe and encourage healthy living; (c) introducing education initiatives for students, teachers, and parents to promote
sun-protective behaviors and safe attitudes; (d) including students’ families, school administrators, teachers, faculty, and health services in the efforts to increase sun-safety awareness and practices; and (e) regularly evaluating the successful policies and practices. The CDC emphasizes the necessity of parent and teacher collaboration with students for enhanced knowledge, behaviors, and attitudes, as well as flexibility and moderation when working with students.

Primary prevention in primary schools focuses predominantly on augmenting the prevalence of sun-safe behaviors, awareness, and attitudes. Behavior interventions include the use of hats and protective clothing when exposed to the sun (Buendell, 2002; Eakin, Maddock, Techur-Pedro, Kaliko, & Derauf, 2004; Geller, Rutsch, Kenausis, & Zhang, 2003; Milne et al., 1999; Reynolds, Buller, Yaroch, Maloy, & Cutter, 2005), seeking shade when outdoors (Buendell, 2002; Geller et al., 2003; Eakin et al., 2004; Milne et al., 1999; Reynolds et al., 2005), wearing sunglasses for eye protection (Buendell, 2002; Geller et al., 2003; Reynolds et al., 2005), using sunscreen with a proper sun-protection factor (Buendell, 2002; Geller et al., 2003; Eakin et al., 2004; Reynolds et al., 2005), establishing a school policy for sun protection and creating a school schedule to accommodate avoidance of peak levels ultraviolet radiation (Buendell, 2002; Eakin et al., 2004), and creating a partnership between students, teachers, and parents to achieve maximum success (Buendell 2002; Eakin et al., 2004). See Table 1 for a summary of interventions. Changing attitudes toward sun safety and ultraviolet radiation exposure was also a targeted goal in these educational interventions (Buendell, 2002; Eakin et al., 2004; Geller et al., 2003).

Kidskin, an intervention study performed in West Australia that targeted the use of hats and shade for primary school-age children, demonstrated that although a large percentage of children in this study used hats to protect from the sun, the type of hats being worn were not optimal for sunlight protection, and outdoor play areas of most schools provided inadequate amounts of shaded space (Buendell, 2002). Also, it was proven that school administrators who were part of this study largely overestimated the use of proper hats and available shaded areas in their schools. See Table 1 for a summary of the Kidskin intervention.

A common primary school intervention in the United States is Sunny Days, Healthy Ways, a sun-safe curriculum administered for children in kindergarten through 8th grade (Buendell, 2002). The immediate effects of this program were only found in enhancing students’ knowledge of sun safety, but after students were exposed to the program for several years, it augmented sun-protective behaviors and safe attitudes and resulted in large improvements in sun-safety knowledge (Buller, Taylor, et al, 2006). It was also found that reduced coloration from the sun was common in more students as they grew older (and received more Sunny Days, Healthy Ways instruction), indicating that more sun-safe behaviors were being practiced. See Table 1 for a summary of the Sunny Days, Healthy Ways intervention.

The SunWise School Program is an intervention developed by the Environmental Protection Agency geared toward large-scale sun-protection education initiatives to affect knowledge, behaviors, and attitudes in American primary schools to reduce the national incidence of skin cancer (Geller et al., 2003). The results of an evaluation of the short program (1-2 hours of educational instruction) demonstrated that it achieves success in educating students and communicating knowledge, but there was little change in sun-safe practices in children of all ages, indicating that they did not apply the knowledge to their behaviors. The ability of the program to change students’ attitudes about the sun, specifically those concerning socially influenced ideas about the appearance and healthiness of tan skin, depended on the age of the students being studied; children between 5 and 9 years of age were much more receptive to this knowledge than older students. Table 1 summarizes the SunWise School Program intervention.

Comparison of the Sunny Days, Healthy Ways program and SunWise School Program indicates that educational interventions can aid in the dissemination of knowledge regarding sun-safe behaviors, but frequent and extended instruction and practices are most successful in altering behaviors and generating more comprehensive change. However, because primary schools face many issues in attempting to keep their students safe and creating an environment in which they are protected and encouraged to excel, skin cancer prevention initiatives are often designated as low priority compared with issues such as violence, substance abuse, and proper nutrition (Geller et al., 2003). Therefore, the SunWise School Program may be a more practical, although less effective, manner of reaching children and teachers.
Table 1. National and International Sun-Protection Interventions (1995-2006)

<table>
<thead>
<tr>
<th>Author and Year</th>
<th>Name of Intervention</th>
<th>Setting/Location</th>
<th>Target Population</th>
<th>Purpose</th>
<th>Outcomes and Findings</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milne, et al. (1999)</td>
<td>Kidskin</td>
<td>Primary schools, Australia</td>
<td>Primary school-age children</td>
<td>Increase sun-protective behaviors, decrease sun exposure</td>
<td>87% of children wore a hat in the sun, 14.5% of playgrounds were shaded areas</td>
<td>Administration overestimates shade and sun-protection behaviors; more protective hat styles needed.</td>
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<tr>
<td>Geller, et al. (2003)</td>
<td>SunWise</td>
<td>Primary and secondary schools, United States</td>
<td>Children grades K-8</td>
<td>Increase sun-safety behaviors and knowledge among students</td>
<td>Increased playing in shade and intent to use sunscreen, attitudes toward healthiness of a tan decreased</td>
<td>Brief and consistent sun safety education in schools can increase knowledge and sun-safe behaviors in children.</td>
</tr>
<tr>
<td>Buller, Buller, et al. (2006)</td>
<td>Sunny Days, Healthy Ways</td>
<td>Elementary schools, United States</td>
<td>Children grades K-5</td>
<td>Increase sun-protective behaviors and knowledge among students</td>
<td>Programs were most successful when given more than 2 school years, as opposed to 1 or none</td>
<td>Sun-safety education is needed over several school years to significantly affect behavior and attitudes.</td>
</tr>
<tr>
<td>Geller et al. (2005)</td>
<td>SunSmart</td>
<td>High school in Florida, United States</td>
<td>High school students</td>
<td>Increase sun-protective behaviors and knowledge among students</td>
<td>Significant increases in sun-safety knowledge, no change in sun-safe behaviors or sunscreen use</td>
<td>Further research is needed to find what types of programs work best to augment sun-safe behaviors in students.</td>
</tr>
<tr>
<td>Glanz, Geller, et al. (2002)</td>
<td>The Pool Cool Program</td>
<td>Swimming pools in Hawaii and Massachusetts, United States</td>
<td>Children ages 5-10, parents, lifeguards, aquatics instructors</td>
<td>Increase sun-protective behaviors among pool users and lifeguards</td>
<td>Increase in overall sun-safe behaviors and decrease in number of sunburns</td>
<td>Interventions relevant to sun-safe behaviors that are low cost, adaptable to different ethnic groups.</td>
</tr>
<tr>
<td>Mayer, et al. (2001)</td>
<td>(No name)</td>
<td>Zois in California, United States</td>
<td>Children and caregivers</td>
<td>Increase sun-protective behaviors among zoo visitors</td>
<td>Sales of sunscreen and sun-protective hats increased at intervention site</td>
<td>Multicomponent programs are useful tools in promoting sun safety.</td>
</tr>
<tr>
<td>Parrot et al. (1999)</td>
<td>(No name)</td>
<td>Soccer fields in Georgia, United States</td>
<td>Coaches and parents of youth soccer players</td>
<td>Increase sun-protective behaviors among youth soccer players</td>
<td>Adults told youth to use sunscreen more often; found instructing youth on sun safety easier</td>
<td>Adults are willing to participate in study to augment sun safety in children; educating adults aids children.</td>
</tr>
<tr>
<td>Boutwell (1995)</td>
<td>Under Cover Skin Cancer Prevention Project</td>
<td>Communities in Texas, United States</td>
<td>All community members</td>
<td>Increase awareness of ultraviolet radiation index through the media</td>
<td>Public aware of sun’s dangers; favor “healthy” tanned look attributable to social norms and pressures</td>
<td>Media is a useful tool in increasing skin cancer prevention behaviors.</td>
</tr>
<tr>
<td>Montague, et al. (2001)</td>
<td>Slip! Slop! Slap!</td>
<td>Australia</td>
<td>National population</td>
<td>Change society’s approach to sun and sun-related behaviors</td>
<td>Increased sun-protective behaviors, changed attitudes toward tanning, increased knowledge about sun’s dangers and skin cancer</td>
<td>Research, evaluation, consistency, and continuity are major elements essential to success of sun-safety programs.</td>
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The need for primary prevention of skin cancer in primary schools is a major public health issue. Many schools that are receptive to interventions and concerned about their students’ well-being in the sun fail to provide sufficient prevention education and, often, do not address the need for policy or education at all, creating an unhealthy situation, particularly because students spend the majority of critical ultraviolet radiation exposure hours in a school environment (Eakin et al., 2004). It is important to reach students at a young age because as children grow older they become less receptive to interventions and it is more challenging to change attitudes regarding sun exposure and alter behaviors (Cockburn et al., 1989; Geller et al., 2003; Reynolds et al., 2005). Still, primary prevention interventions at the primary school level have enjoyed success that other prevention programs have not shared. The advantages of these programs can be used as models for prevention efforts in other areas of the community.

Primary Prevention in Secondary Schools and Colleges

Primary prevention in secondary schools is not a major priority in the education system (Buller, Buller, & Reynolds, 2006). Because children reach an age at which they form their own attitudes and opinions regarding tanning and skin cancer and are more responsible for their own protection from the ultraviolet radiation, sun-protection policies and education are important for secondary school and college students (Saraiya et al., 2004). In a large-scale national survey of public secondary schools in America, it was determined that before the CDC released the “Guidelines for School Programs to Prevent Skin Cancer” in 2002, only 10% of high schools in the United States had an established sun-protection policy, although 96% of schools claimed to educate their students on sun-safe behaviors. Many schools were willing and interested in the initiation of a sun-protection curriculum to protect and educate their students.

Although schools demonstrated interest in improving education interventions (Buller, Buller, et al., 2006b), high school students have not expressed significant levels of responsiveness or change to prevention education (Geller et al., 2005). In a study performed in a secondary school in Florida on the results of the SunSmart America curriculum administered by science teachers, it was shown that education and prevention initiatives were successful in instructing students and increasing knowledge and awareness of the effects of ultraviolet radiation and sun-safe behaviors, but students were not receptive to the information in terms of applying it to their own personal behaviors; there was no significant change in the use of sunscreen, hats, or sunglasses (Geller et al., 2005). The study provided support for the use of multiunit curricula with more extensive knowledge about the dangers of ultraviolet radiation instead of short-term and brief instruction, as well as the creation of a sun-safe environment and policy establishment by the school and the involvement of parents and health care providers in skin cancer prevention efforts. See Table 1 for a summary of the SunSmart Program intervention.

College students demonstrate similar avoidance to behavioral changes regarding sun-protective behaviors (Autier et al., 1999). It has been shown that when college students do practice sun-safe behaviors, such as using sunscreens with high sun-protection factors, the amount of time spent in the sun by these sunscreen users is relationally increased. These findings support the idea that sunscreen use is associated with higher risk of developing skin cancer because the use of sunscreen delays sunburns from forming and thereby encourages longer exposure to ultraviolet radiation.

Educational initiatives and prevention interventions at the secondary school and college level have seen limited success in changing students’ behaviors regarding sun-safe practices, which is most likely a result of increased influences from social norms and societal pressures that result in the practice of unsafe behaviors related to ultraviolet radiation (Saraiya et al., 2004). These attitudes toward the value of sun safety have been challenging to overcome, particularly as students grow older (Autier et al., 1999; Buller, Taylor, et al., 2006; Geller et al., 2005). Because there have not been sufficient numbers of reliable and effective studies performed at this level, no statistically valid conclusions can be drawn about the widespread effects of interventions in secondary schools and colleges.

Primary Prevention in Outdoor Recreational and Tourism Settings

Locations of outdoor recreational activities and tourist attractions are important venues for primary
prevention of skin cancer because these endeavors make people more susceptible to increased ultraviolet radiation. These interventions are popular at pools and beaches, zoos, and outdoor athletic activities (Boyett et al., 2002; Glanz, Geller, Shigaki, Maddock, & Isnec, 2002; Mayer et al., 2001; Parrot et al., 1999).

The Pool Cool Program was developed to promote sun protection in outdoor pools by training lifeguards, providing instructions on sun safety, providing sunscreen and shade, publicizing sun-safety tips and messages, and holding informal discussions for environmental and policy changes (Glanz, Geller, et al., 2002). This program was practiced, compared with a less rigorous and more strictly informational intervention control, and evaluated in Hawaii and Massachusetts. The results of this study showed that the Pool Cool Program was successful in promoting greater amounts of sun-safe behaviors and reducing sunburns than the control. The advantages of the Pool Cool Program are that it is relatively inexpensive, includes interactive involvement of parents and children, can be practiced on a wide scale, and can be used to target environments where ultraviolet radiation exposure is very high and clothing use is low. This type of sun-protection intervention is also necessary at beaches, where parents generally rely only on sunscreen to protect their children and do not use shade or protective clothing to avoid ultraviolet radiation (Boyett et al., 2002). Table 1 provides a summary of the Pool Cool Program.

An intervention and evaluation study performed at the San Diego Zoo to increase the prevalence of sun-safe behaviors through the distribution of “tip sheets” to parents highlighting sun-safe behaviors, activities and suggestions for children, and reduced prices on sunscreen and sun-protective hats revealed that visitor awareness and reminder of sun protection are successful means of boosting sun-safe behaviors (Mayer et al., 2001). Sales of sunscreen and sun-protective hats increased, as did hat use, but the hat use increase was not significant enough to make a conclusion. See Table 1 for a summary of the intervention performed at zoos.

Another important venue in which to study skin cancer prevention intervention is children’s outdoor physical activities. In a study in Georgia on the education of parents and coaches of youth soccer players about sun-protective behaviors, coaches were guided to become role models for their players by practicing sun-safe behaviors and advocating sun protection to players and parents (Parrot et al., 1999). The coaches and parents were responsive to the intervention, and the study showed that the players were more receptive to sun protection than before the intervention and that coaches and parents encouraged sun safety to the children more often. Table 1 summarizes the pilot study performed on soccer coaches and parents.

Primary prevention intervention initiatives have been successful in outdoor recreational settings. The best means of increasing sun protection is spreading awareness of the dangers of the sun and providing sun-safe products and shade for parents and children to use (Glanz, Geller, et al., 2002; Mayer et al., 2001; Parrot et al., 1999). Recreational locations are an excellent venue to reach families as a whole and promote skin cancer prevention to large groups of people, in addition to educating children and parents separating in school, occupational, and community settings. Another benefit of interventions performed in recreational settings is that these prevention efforts may reach people who are not generally targeted for interventions because they do not attend schools or are not reached by larger community-wide initiatives. Outdoor recreational activities do not need to be halted; outdoor physical activity is an important part of a healthy lifestyle, but providing environments that are more supportive to minimizing ultraviolet radiation exposure and promoting safe sun habits are important to prevent skin cancer.

Primary Prevention and Health Care Providers

The involvement of health care providers in primary prevention of skin cancer in children is critical to informing parents and children about sun safety. These professionals are in the position to spread prevention efforts to the mass population because they contact a large majority of the general public and are trusted with the health of their patients. To properly assist their patients, health care providers such as physicians, nurses, and even pharmacists should be educated on positive sun-safety attitudes and behaviors as well as the dangers of skin cancer. Health care professionals also should be advised to practice their own sun safety, because there seems to be a strong correlation between personal sun-protective behaviors of physicians and their prevention practices for their patients (Gritz et al., 2003). It has been shown
that pediatricians often rely predominantly on advocating sunscreen use for protection from ultraviolet radiation and recommend the use of shade, hats, and protective clothing and the avoidance of peak hours of radiation much less frequently (Geller et al., 1998; Gritz et al., 2003).

A study in Colorado reported that education and counseling of pediatricians on proper sun-protective behaviors and attitudes and advocating the discussion of skin cancer prevention with patients and their parents were successful in augmenting positive sun-safety strategies (Crane et al., 2006). Patients and families who received the intervention significantly increased the use of hats, sunglasses, and shade to protect from ultraviolet radiation. At this point, however, the consequences of educating health care providers on the best sun-protective behaviors and encouraging them to deliver this information to their patients and their families have not been evaluated enough to make conclusions with sufficient evidence.

The American Academy of Dermatology (AAD) has adopted a program for skin cancer prevention in hopes of emulating the success that large-scale prevention interventions have had in Australia (American Medical Association [AMA], 1998). The AAD contacts summer camps, physical education and recreational sports directors, magazines that appeal to teens, and child-associated organizations such as the Boys Scouts and Girl Scouts of America to encourage early education on skin cancer prevention, the dangers of the sun, and sun-protective behaviors. The AAD also supports efforts to manufacture more effective sunscreens and alter social norms regarding tanning and the sun.

Primary Prevention and the Media

The media has been exploited in primary prevention as an excellent means for far-reaching and cross-cultural access to many communities simultaneously. Populations are generally very influenced by the media, and attitudes on the effects of the sun are not against the norm (AMA, 1998). The media has shown to be an effective way of communicating with large groups of people, but there is evidence that it needs support from other prevention initiatives and is not enough to change behaviors alone (Boutwell, 1995; Richards, Reeder, & Bulliard, 2004; Smith, Ferguson, McKenzie, Bauman, & Vita, 2002).

The Under Cover Skin Cancer Prevention Project based in Texas used the services of 4 media partners in 4 cities to telecast ultraviolet radiation readings 4 times daily, in addition to educational tips and advice on behavioral changes to its viewers (Boutwell, 1995). Ultraviolet radiation readings were also available by telephone. Evaluation of the intervention proved it to be successful in reaching mass populations and disseminating information, but it seemed to have little effect on behavioral actions or attitudes toward skin cancer prevention. See Table 1 for a summary of the Under Cover Skin Cancer Prevention Project.

A similar media intervention was conducted in Australia, where the use of television, radio, and print media material was part of an initiative to increase sun-protection behaviors, particularly targeted at children younger than 12 and their parents (Smith et al., 2002). The campaign enjoyed large success in terms of reaching a considerable amount of the population, and a high percentage of the survey participants recalled the program. However, especially between campaigns, knowledge and behaviors were not significantly affected by the campaign, similar to the results of the media intervention in Texas. The effects were very short term, also indicating that supplemental education and behavioral interventions are needed to strengthen the effects of mass media campaigns.

Skin cancer prevention initiatives promoted via the media can be used to complement other community prevention interventions, especially by increasing awareness of daily ultraviolet radiation messages and other short-term information (Boutwell, 1995; Richards et al., 2004; Smith et al., 2002), but the media has not been proven suitable for a principal means of primary prevention (CDC, 2003). These types of interventions have several limitations and obstacles. Airtime for the broadcast or discussion of the ultraviolet radiation index can be costly and time consuming, making media companies reluctant to cooperate (Richards et al., 2004).

Primary Prevention, Nationally and Internationally

Primary prevention of skin cancer in the United States and internationally has the same basic goals: to reduce the incidence of skin cancer by increasing awareness and knowledge of skin cancer, sun safety, and sun-protective behaviors and attitudes. Skin cancer
prevention in Australia has seen much success from effective interventions through valuable research and critical evaluation incorporating a strong degree of regularity and stability in exploits (Montague, Borland, & Sinclair, 2001). Skin cancer prevention is a serious issue in Australia; it is the nation with the highest incidence of cancer in the world, with half of its population affected at one time throughout their life and melanoma rising to the third most fatal cancer.

Australia has 2 major skin cancer prevention interventions, Slip! Slop! Slap! and SunSmart, both data-driven and continually developing programs that have seen much success (Montague et al., 2001). Launched in 1980, Slip! Slop! Slap! encourages Australians to “slip” on protective clothing, “slop” on sunscreen, and “slap” on a hat. SunSmart, founded in 1988, aims to educate the public, advocate the establishment of protection policies, and encourage behavior modifications for sun safety and early screening for skin cancer patients. The use of public education, political advocacy, and mass media to bring skin cancer prevention issues to the forefront of Australian public health policy has been important in the success of the program. With ample funding, research, and evaluation, Slip! Slop! Slap! and SunSmart have changed behaviors and attitudes of the Australian population. See Table 1 for summaries of the Slip! Slop! Slap! and SunSmart programs.

Nationwide and school-wide efforts to alter skin cancer prevention behaviors and attitudes have seen more success in Australia than in North America and Europe (Buller & Borland, 1998). Children of all ages have higher levels of unprotected exposure to ultraviolet radiation, and parents, caregivers, and children practice fewer and less intense sun-protective behaviors in North America and Europe than in Australia. Despite precautions against the sun taken by parents, caregivers, and schools, artificial exposure to ultraviolet radiation through the use of tanning booths was very prevalent in North America and Europe than in Australia. Despite precautions against the sun taken by parents, caregivers, and schools, artificial exposure to ultraviolet radiation through the use of tanning booths was very prevalent in North America and Europe, particularly by females, but nearly nonexistent in Australia. Women and girls exhibited more interest than men and boys in sunbathing and tanning (Buller & Borland, 1998), but sun protection and sunscreen use (Stanton, Janda, Baade, & Anderson, 2004) were also higher in females. Females were found to spend less time outside in Australia, North America, and Europe (Buller & Borland, 1998).

Sunscreen use was found to be the most common form of sun protection worldwide, and prevention in childhood was largely dependent on parents’ personal behaviors and attitudes (Buller & Borland, 1998; Stanton et al., 2004). The dangers of large-scale dependency on sunscreen for protection of ultraviolet radiation include that it is not the most effective means of defense against the sun, its use is commonly accompanied by the belief that it is suitable for extended sun exposure, and it gives a false sense of security for users (Stanton et al., 2004). It was also a universal occurrence that sun-protection behaviors and sun-safety attitudes weaken as children reach adolescence (Buller & Borland, 1998; Stanton et al., 2004).

Skin cancer prevention and safety are substantial concerns in North America, Australia, and Europe. Prevention programs and interventions are more advanced, more successful, and more extensive in Australia than in North America and Europe (Buller & Borland, 1998; Montague et al., 2001; Stanton et al., 2004). It is clear that intervention programs in North America and Europe need to follow Australia’s steps to success by filling research gaps, communicating with all members of the community, and disseminating knowledge in a more effective manner to alter behaviors and attitudes toward sun protection.

Psychological and Social Aspects of Primary Prevention

It has been repeatedly proven that awareness of the dangers of skin cancer and ultraviolet radiation and knowledge about sun safety and sun protection are not sufficient to produce effective behavioral changes, especially among adolescents and young adults (Autier et al., 1999; Boutwell, 1995; Buller et al., 2006; Geller et al., 2003; Geller et al., 2005; Richards et al., 2004; Saraiya et al., 2004; Smith et al., 2002). One of the biggest obstacles to overcome in skin cancer prevention is not spreading awareness and knowledge but rather challenging contemporary attitudes toward the sun and tanning, cultural norms, and societal pressures, particularly in young people, who are generally very influenced by popular culture and their peers.

The attitudes of adolescents and teenagers, as well as many adults, toward tanning have many adverse effects on skin cancer prevention behaviors. A study by the AAD reported that more than half of Americans believe that having a tan makes a person...
appear more healthy (AMA, 1998). The AAD also reported that television and media repeatedly portray the idea that a tan is attractive and highlight beach scenes and tanning. What is not revealed to the public, however, according to Dr. Darrell Rigel of New York University, is that the tans on television stars from shows such as Baywatch are artificial and derived from lotions; stars use sunscreen on set, and they wear protective clothing in shaded areas when not being filmed. It is apparent that the fear of developing skin cancer is not strong enough to deter people, especially adolescents and teenagers, from dangerous behaviors, including sunbathing and artificial tanning, in order to conform to societal norms of beauty and health. For boys, the appeal of a tan seems to be an image of masculinity, as where for girls it is seen as attractive.

In a study performed to assess attitudes in American youth regarding benefits of sun protection versus the benefits of being tan, it was found that less than one third of American youth are properly protected from sun exposure (Cokkindies et al., 2001). Two major attitudes toward tanning and sun protection were evaluated: personal appearance and reaction to being tan versus the advantages of protecting skin to stay healthy, using sunscreen, decreasing cancer risk, and postponing the early development of wrinkles on the skin. It was found that younger children were receptive to the second attitude that focused on the benefits on sun protection, whereas older girls focused mainly on the idea that the sun accelerates the formation of wrinkles. Teenagers were more responsive to the idea of feeling healthy and looking attractive when tanned than were younger children. Those children who did not find tanning appealing were more likely to practice better sun-protective behaviors. This study demonstrates the dangers of negative attitudes toward sun protection and shows that future interventions need to break down these attitudinal barriers in order to affect behavioral change. A study of the attitudes of Italian youth showed similar links between attitudes toward the attractive appearance of tan skin and the failure to properly protect against ultraviolet radiation (Monfrecola, Fabbrocini, Posteraro, & Pini, 2000).

An attitudinal intervention in Maryland for young teenagers assessed the effects of the competing attitudes that tans are attractive and healthy and that practicing sun-safe behavior is “cool” (Alberg, Herbst, Genkinger, & Duszynsky, 2002). Again, students were found to have below-average knowledge of sun-protection behavior. Although girls were more aware of the dangers of the sun, they were also more receptive to the idea that tanning was attractive. The need to promote positive attitudes concerning sun protection and to eradicate ideas relating tan skin to attractiveness were demonstrated, because although students were educated on sun-protective behaviors, they did not practice sun safety because social norms and attitudes toward tanning were stronger than the desire to be protected.

Conclusions on Primary Prevention

Primary prevention programs have seen the greatest amount of success in primary schools and outdoor recreational and tourism settings. Programs to advance prevention behaviors and attitudes can benefit from analyzing the successes of prevention in these settings and applying them to other locations. Multiunit or multicomponent programs have continually demonstrated greater success in knowledge, awareness, behavioral, and attitude improvements on sun protection and should replace short-term, single-faceted programs. Also, the society-wide success that Australian skin cancer prevention programs have had in altering and augmenting sun-protective behaviors and ameliorating attitudes regarding sun safety are a valuable model for other nations lagging in skin cancer prevention.

Implications for Public Health

Remaining Gaps in Research

The largest research gap concerning skin cancer prevention is evaluation of the effectiveness of primary interventions. Many primary interventions have been devised and conducted across many diverse settings; however, there are only 2 major sites (primary schools and recreational and tourism settings) where these interventions have been properly evaluated to a point where conclusions on their effectiveness can be drawn. Also, there appears to be a discontinuity in methods and measurement techniques as well as an incongruence among evaluation systems that hinders the compatibility of separate experimental research
and damages the validity of comparative analyses because the data from different studies cannot be accurately related.

Another area of research that appears to greatly affect skin cancer prevention that is in need of more extensive investigation and strategy planning is the adjustment of attitudes and social norms toward more positive reception of skin-protection behaviors, particularly in older children and females. These attitudes and cultural standards present a very challenging problem to prevention efforts that must be overcome to achieve success in a large-scale augmentation of sun-protection behaviors.

The effects of sunscreen are widely debated; some professionals believe that sunscreen contributes to the development of melanoma because sunscreen creates a false sense of security among users and promotes longer periods of exposure to ultraviolet radiation. Research to support or refute this claim is essential, because sunscreen is a major part of primary prevention of skin cancer and it is imperative that the effects of sunscreen use be completely researched and understood.

**Future Directions of Research and Interventions for Interdisciplinary Health Teams**

The chief concerns of future research should be to fill in the information and research gaps outlined above in order to create the most effective methods of prevention and form the most successful skin cancer prevention programs. Research on the effectiveness of sunscreen should be at the forefront of initiatives to fill informational gaps. Future research endeavors should evaluate the effectiveness of specific messages being sent through intervention programs. Systematic reviews of current literature are a positive way to compile information on specific topics and highlight contradictions and gaps in research.

The further dissemination of information through pervasive interventions is imperative to continue the advancement of skin cancer prevention. For this to occur, increases in the support and funding of these projects are necessary. Interventions may be useful to promote the rates of skin self-examinations and skin examinations performed by health care providers and dissuade children and adults from using indoor tanning facilities. The development of a melanin-producing cream to create a natural-looking artificial tan while simultaneously protecting the user against sunburn has been suggested as a safer alternative to indoor tanning (AMA, 1998).

The use of humor and alarmism in interventions has been evaluated, and these methods have been identified as negative forms of knowledge presentation because they cause interventions to reach fewer people and have less serious impacts (Richard, Martin, Gouvernet, Folchetti, & Bonerbandi, 1999). The use of strong language to convey a message, particularly when overtly drawing conclusions and making strong suggestions, appears to have positive effects on producing constructive attitudes and promoting sun-safe behaviors (Buller et al., 2000). Creators and administrators of interventions should heed the findings of these studies and incorporate them into the production of messages and choice of language. The use of media to support prevention campaigns can be another useful tool, but it must not be relied on as a sole source of communication of knowledge and awareness. The Internet is also a positive educational resource, particularly for a generation of children who spend large amounts of time at the computer, and should be exploited by interventions in primary and secondary schools in particular (Hornung et al., 2000).

Policy making is a controversial issue when involving skin cancer prevention. There have been movements to ban the use of indoor tanning facilities, but because tanning is a multibillion dollar industry, these policies have encountered strong resistance (Levine, Sorace, Spencer, & Siegel, 2005). Also, it is debatable whether the government can make that type of decision for its citizens; if people are informed, they can draw their own conclusions, make their own decisions, and deal with the consequences individually, especially because indoor tanning does not affect the skin cancer development of anyone but the user. The use of this type of legislation would move the preventive efforts from targeting the individual to targeting the population as a whole and would remove freedom of choice from the citizens (Garvin & Eyles, 2001). However, policies in schools, care settings, and recreational settings have been suggested to augment sun-protective behaviors (Stacey, et al., 2005) and should be further investigated and incorporated into interventions.

Interventions and research in North America and Europe should be modeled after Australian programs and research that have enjoyed large-scale success in informing the population, increasing knowledge,
altering sun-protection behaviors, and transforming attitudes toward sun protection and tanning. Australian skin cancer research has been conducted with strong degrees of consistency, continuity, and regularity throughout all experiments; further research in North America and Europe should follow these guidelines.

Conclusion

Skin cancer is an increasing public health concern in the contemporary world. The dangers of skin cancer can be ameliorated through prevention efforts, especially those targeted at children. Primary prevention interventions have seen the most success in primary schools and in recreational settings, particularly those interventions that use multunit extended instruction. The ability of media and health care providers to disseminate information can also be used to spread awareness and knowledge of skin cancer dangers and prevention. Social norms and attitudes toward tanning and sun protection deter older children from practicing sun-safe actions. Completing necessary research to fill informational gaps is imperative to advance skin cancer prevention, particularly in North America and Europe, and should be aimed at evaluating current interventions and revolutionizing attitudes toward tanning and cultural norms.

References


