MMWR™

Morbidity and Mortality Weekly Report

Recommendations and Reports April 26, 2002 / Vol. 51 / No. RR-4

Guidelines for School Programs To Prevent Skin Cancer

Centers for Disease Control and Prevention

SAFER • HEALTHIER • PEOPLE™

The *MMWR* series of publications is published by the Epidemiology Program Office, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30333.

SUGGESTED CITATION

Centers for Disease Control and Prevention. Guidelines for school programs to prevent skin cancer. MMWR 2002;51(No. RR-4):[inclusive page numbers].

On the Cover: Photograph © 2001. Reproduced with permission from U.S. Environmental Protection Agency Sun Wise School Program.

CONTENTS

Guidelines for School Programs To Prevent Skin Cancer

Prepared by
Karen Glanz, Ph.D., M.P.H.[1]
Mona Saraiya, M.D., M.P.H.[2]
Howell Wechsler, Ed.D., M.P.H.[3]
[1]*Cancer Research Center of Hawaii*
University of Hawaii, Honolulu
[2]*Division of Cancer Prevention and Control*
[3]*Division of Adolescent and School Health*
National Center for Chronic Disease Prevention and Health Promotion

Summary

Skin cancer is the most common type of cancer in the United States. Since 1973, new cases of the most serious form of skin cancer, melanoma, have increased approximately 150%. During the same period, deaths from melanoma have increased approximately 44%. Approximately 65%–90% of melanomas are caused by ultraviolet (UV) radiation. More than one half of a person's lifetime UV exposure occurs during childhood and adolescence because of more opportunities and time for exposure. Exposure to UV radiation during childhood plays a role in the future development of skin cancer. Persons with a history of ≥1 blistering sunburns during childhood or adolescence are two times as likely to develop melanoma than those who did not have such exposures. Studies indicate that protection from UV exposure during childhood and adolescence reduces the risk for skin cancer. These studies support the need to protect young persons from the sun beginning at an early age. School staff can play a major role in protecting children and adolescents from UV exposure and the future development of skin cancer by instituting policies, environmental changes, and educational programs that can reduce skin cancer risks among young persons.

This report reviews scientific literature regarding the rates, trends, causes, and prevention of skin cancer and presents guidelines for schools to implement a comprehensive approach to preventing skin cancer. Based on a review of research, theory, and current practice, these guidelines were developed by CDC in collaboration with specialists in dermatology, pediatrics, public health, and education; national, federal, state, and voluntary agencies; schools; and other organizations. Recommendations are included for schools to reduce skin cancer risks through policies; creation of physical, social, and organizational environments that facilitate protection from UV rays; education of young persons; professional development of staff; involvement of families; health services; and program evaluation.

Introduction

Skin cancer is the most common type of cancer in the United States (*1*). Since 1973, the number of new cases of melanoma, the skin cancer with the highest risk for mortality and one of the most common cancers among young adults, has increased. The incidence of melanoma has increased 150%, and melanoma mortality rates have increased by 44% (*1*). Because a substantial percentage of lifetime sun exposure occurs before age 20 years (*2,3*) and because ultraviolet (UV) radiation exposure during childhood and adolescence plays an important role in the development of skin cancer (*2,4*), preventive behaviors can yield the most positive effects, if they are initiated early and established as healthy and consistent patterns throughout life. Children spend several hours at school on most weekdays, and some of that time is spent in outdoor activities. Schools, therefore, are in a position to teach and model healthy behaviors, and they can use health education activities involving families to encourage sun-safe behaviors at home. Thus, schools can play a vital role in preventing skin cancer.

This report is one of a series of guidelines produced by CDC to help schools improve the health of young persons by promoting behaviors to prevent the leading causes of illness and death (*5–8*). The primary audience for this report includes state and local health and educational agencies and nongovernmental organizations concerned with improving the health of U.S. students. These agencies and organizations can translate the information in this report into materials and training programs for their constituents. In addition, CDC will de-

The material in this report was prepared for publication by the National Center for Chronic Disease Prevention and Health Promotion, James S. Marks, M.D., M.P.H., Director; the Division of Cancer Prevention and Control, Nancy C. Lee, M.D., Director; and the Division of Adolescent and School Health, Lloyd J. Kolbe, Ph.D., Director.

velop and disseminate materials to help schools and school districts implement the guidelines. At the local level, teachers and other school personnel, community recreation program personnel, health service providers, community leaders, policymakers, and parents may use these guidelines and complementary materials to plan and implement skin cancer prevention policies and programs. In addition, faculty at institutions of higher education may use these guidelines to train professionals in education, public health, sports and recreation, school psychology, nursing, medicine, and other appropriate disciplines.

Although these skin cancer prevention guidelines are intended for schools, they can also guide child care facilities and other organizations that provide opportunities for children and adolescents to spend time in outdoor settings (e.g., camps; sports fields; playgrounds; swimming, tennis, and boating clubs; farms; and recreation and park facilities). These guidelines address children and adolescents of primary- and secondary-school age (approximately 5–18 years). The recommendations are based on scientific evidence, medical and behavioral knowledge, and consensus among specialists in education and skin cancer prevention. In 2003, CDC will publish a chapter on cancer in its *Community Guide to Preventive Services* (*9*), which will summarize information regarding the effectiveness of community-based interventions geared toward preventing skin cancer.

School-based programs can play an important role in achieving the following national Health Objectives for the Year 2010 related to skin cancer prevention: 1) increase the proportion of persons who use at least one of the following protective measures that might reduce the risk for skin cancer: avoid the sun between 10 a.m. and 4 p.m., wear sun-protective clothing when exposed to the sun, use sunscreen with a sun-protection factor (SPF) ≥15, and avoid artificial sources of UV light; and 2) reduce deaths from melanoma to <2.5 per 100,000 persons (*10*).

Burden of Skin Cancer

Skin cancer is the most common type of cancer in the United States (*11*). The two most common kinds of skin cancer — basal cell carcinoma and squamous cell carcinoma — are highly curable. However, melanoma, the third most common type of skin cancer and one of the most common cancers among young adults, is more dangerous. In 2001, approximately 1.3 million new cases of basal cell or squamous cell carcinoma were diagnosed with approximately 2,000 deaths from basal cell and squamous cell carcinoma combined. Melanoma, by contrast, will be diagnosed in 53,600 persons and will account for 7,400 deaths, more than three fourths of all skin cancer deaths (*12*).

Basal cell carcinoma, which accounts for 75% of all skin cancers (*11*), rarely metastasizes to other organs. Squamous cell carcinoma, which accounts for 20% of all skin cancers, has a higher likelihood of spreading to the lymph nodes and internal organs and causing death (*13*), but these outcomes are also rare. Melanoma is nearly always curable in its early stages, but it is most likely to spread to other parts of the body if detected late. Melanoma most often appears on the trunk of men and the lower legs of women, although it also might be found on the head, neck, or elsewhere (*14,15*).

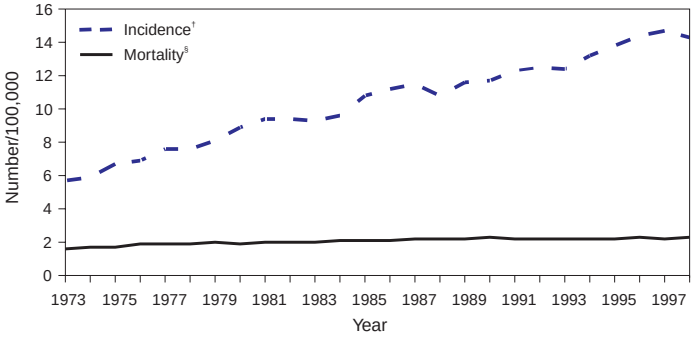
In the United States, diagnoses of new melanomas are increasing, whereas diagnoses of the majority of other cancers are decreasing (*16*). Since 1973, the annual incidence rate for melanoma (new cases diagnosed per 100,000 persons) has more than doubled, from 5.7 cases per 100,000 in that year to 14.3 per 100,000 in 1998 (*1*) (Figure). The rapid increase in annual incidence rates is likely a result of several factors, including increased exposure to UV radiation and possibly earlier detection of melanoma (*17*). Since 1973, annual deaths per 100,000 persons from melanoma have increased by approximately 44%, from 1.6 to 2.3 (Figure). However, over the course of the 1990s, mortality rates have remained stable, particularly among women (*16,18–19*). Although doctors must report other types of cancer (including melanomas) to cancer registries, they are not required to report squamous or basal cell cancer, which makes tracking trends in the incidence of these two cancers difficult. However, death rates for basal cell and squamous cell carcinoma have remained stable (*12*).

Risk Factors for Skin Cancer

Excessive Exposure to UV Radiation

Skin cancer is largely preventable by limiting exposure to the primary source of UV radiation, sunlight. Sunlamps and

FIGURE. Melanoma of the skin (invasive): SEER incidence and U.S. mortality rates*, 1973–1998



* Rate is age-adjusted to 1970 U.S. population.
† 1973 Incidence rate: 5.7 per 100,000 persons; 1998 incidence rate: 14.3 per 100,000.
§ 1973 Mortality rate: 1.6 per 100,000; 1998 mortality rate: 2.3 per 100,000.
Source: Cancer Statistics Review, 1973–1998.

tanning beds are other sources. Persons with high levels of exposure to UV radiation are at an increased risk for all three major forms of skin cancer. Approximately 65%–90% of melanomas are caused by UV exposure (*20*). The epidemiology implicating UV exposure as a cause of melanoma is further supported by biologic evidence that damage caused by UV radiation, particularly damage to DNA, plays a central role in the development of melanoma (*4*). Total UV exposure depends on the intensity of the light, duration of skin exposure, and whether the skin was protected by sun-protective clothing and sunscreen. Severe, blistering sunburns are associated with an increased risk for both melanoma and basal cell carcinoma. For these cancers, intermittent intense exposures seem to carry higher risk than do lower level, chronic, or cumulative exposures, even if the total UV dose is the same. In contrast, the risk for squamous cell carcinoma is strongly associated with chronic UV exposure but not with intermittent exposure.

The two most important types of UV radiation, UV-A and UV-B radiation, have both been linked to the development of skin cancer. UV-A rays are not absorbed by the ozone layer, penetrate deeply into the skin, and cause premature aging and possibly suppression of the immune system (*4,21,22*). Up to 90% of the visible changes commonly attributable to aging are caused by sun exposure. UV-B rays, which are partially absorbed by the ozone layer, tan and sometimes burn the skin. UV-B radiation has been linked to the development of cataracts (*23–25*) and skin cancer. Recommended skin cancer prevention measures protect against both UV-A and UV-B radiation.

Childhood and Adolescent UV Exposure

Exposure to UV radiation during childhood and adolescence plays a role in the future development of both melanoma and basal cell cancer (*26–32*). For example, the risk for developing melanoma is related strongly to a history of ≥1 sunburns (an indicator of intense UV exposure) in childhood or adolescence (*27,28,33,34*). Similarly, sunburns during these periods have been demonstrated to increase the risk for basal cell carcinoma (*30,31*).

Childhood is the most important time for developing moles, which is an important risk factor for skin cancer. Sun exposure in childhood might increase the risk for melanoma by increasing the number of moles (*33*). A study supports the use of sun protection during childhood to reduce the risk for melanoma in adulthood (*35*).

Children and adolescents have more opportunities and time than adults to be exposed to sunlight (*36–38*) and thus more opportunities for development of skin cancer (*4,39,40*). More than one half of a person's lifetime UV exposure occurs during childhood and adolescence (*3,41*).

Skin Color and Ethnicity

Although anyone can get skin cancer, persons with certain characteristics are particularly at risk. For example, the incidence of melanoma among whites is approximately 20 times higher than among blacks (*1*). Hispanics appear to be at less risk for melanoma than whites; a study conducted in Los Angeles, California, indicated that the incidence rates for Hispanics were 2–3 per 100,000, whereas the rate for non-Hispanic whites was 11 per 100,000 (*42*). For basal cell and squamous cell carcinoma, rates among blacks are 1/80 of the rates among whites (*43*).

The ethnic differences in observed rates are attributable mostly to skin color. The color of the skin is determined by the amount of melanin produced by melanocytes, which also protect the skin from the damage produced by UV radiation. Although darkly pigmented persons develop skin cancer on sun-exposed sites at lower rates than lightly pigmented persons, UV exposure increases their risk for developing skin cancer (*44*). The risk for skin cancer is higher among persons who sunburn readily and tan poorly (*45*), namely those with red or blond hair, and fair skin that freckles or burns easily (*14,46,47*).

Moles

The most measurable predictors of melanoma are having large numbers and unusual types of moles (nevi) (*48,49*). Usually not present at birth, moles begin appearing during childhood and adolescence and are associated with sun exposure. Most moles are harmless but some undergo abnormal changes and become melanomas. A changing mole, particularly in an adult, is often indicative of the development of melanoma (*45*).

Family History

The risk for melanoma increases if a person has ≥1 first-degree relatives (i.e., mother, father, brother, and sister) with the disease. Depending on the number of affected relatives, the risk can be up to eight times that of persons without a family history of melanoma. Nonetheless, only approximately 10% of all persons with melanoma have a family history of melanoma (*45,50*).

Age

The incidence of skin cancer increases exponentially with age because older persons have had more opportunities to be exposed to UV radiation and they have diminished capacity to repair the damage from UV radiation (*4,14,43*). Approximately one half of all melanomas occur in persons aged <50 years. Melanoma is one of the most common cancers found in persons aged <30 years (*14*); it is the most common cancer

occurring among persons in the 25–29 age group and the third most common in the 20–24 age group (*51*).

Environmental Factors Affecting UV Radiation

Environmental factors that increase the amount of UV radiation exposure received by humans include a latitude closer to the equator; higher altitude; light cloud coverage (allows 80% of UV rays to go through the clouds); the presence of materials that reflect the sun (e.g. pavement, water, snow, and sand); being outside near noontime (UV-B radiation is highest in the middle of the day and varies more by time of day than does UV-A); and being outside during the spring or summer (*21,52*). Ozone depletion could potentially increase levels of solar radiation at the earth's surface (*53,54*).

Artificial UV Radiation

In 2000, the National Institute of Environmental Health Sciences concluded that sunlamps and tanning beds are carcinogenic (*55*). Although limited, epidemiologic evidence suggests that a causal relation exists between artificial UV radiation and melanoma (*55,56*). The type and amount of UV radiation emitted from some sunbeds appear to be similar to that of noontime summer sun, and in some cases, the amount is even higher than the sun would emit (*57*). Artificial UV radiation can substantially damage the skin (i.e., cause sunburn) and has been linked to ocular melanoma (*52,58*). Sunlamps and tanning beds should be avoided.

Protective Behaviors

Options for skin cancer prevention (Box 1) include limiting or minimizing exposure to the sun during peak hours (10 a.m.–4 p.m.), especially the 1-hour period closest to the noon hour (11 a.m.–1:00 p.m. when the UV rays are the strongest), wearing sun-protective clothing, using sunscreens that have UV-A and UV-B protection, and avoiding sunlamps and tanning beds.

Most medical and cancer organizations advocate the use of similar skin cancer prevention measures (*59*). The American Cancer Society (*60*), the American Academy of Dermatology (*61,62*), the American Academy of Pediatrics (*63*), the American Medical Association (*64*), and the National Cancer Institute (*65*) all recommend patient education on UV radiation avoidance and sunscreen use. The third U.S. Preventive Services Task Force is revising their guidelines on provider counseling for skin cancer prevention and sunscreen use.

BOX 1. Skin cancer protective behaviors

- Minimize exposure to the sun during peak hours (10 a.m.–4 p.m.).
- Seek shade from the midday sun (10 a.m.– 4 p.m.).
- Wear clothing, hats, and sunglasses that protect the skin.
- Use a broad-spectrum sunscreen (UV-A and UV-B protection) with a sun-protection factor of ≥15.
- Avoid sunlamps and tanning beds.

Avoiding the Sun and Wearing Proper Clothing and Sunglasses

Some forms of protection (e.g., avoiding the sun, seeking shade, and wearing sun-protective clothing) are the first approach toward preventing skin cancer. One study has demonstrated that wearing sun-protective clothing can decrease the number of moles (*66*); another study demonstrated that the protective effect of clothing depends primarily on the construction of the fabric (a tighter weave permits less UV radiation to reach the skin) (*67*). Other important factors include fiber type (natural cotton or Lycra™ transmits less UV radiation than bleached cotton) and color (darker colors transmit less UV radiation); additional factors include whether the fabric is wet or stretched (transmission of UV radiation increases as the fabric becomes more wet and stretched) (*68*). Wide-brimmed hats (>3-inch brim) and Legionnaire hats (baseball type of hat with attached ear and neck flaps) provide the best protection for the head, ears, nose, and cheeks (*69*). In 2001, the Federal Trade Commission and the Consumer Safety Product Commission assisted in the development of voluntary industry standards in the United States for rating the UV protective value of different types of clothing and of shade structures (*70*). These standards should help the public make informed decisions concerning protection against UV radiation (*68,71*).

Sunglasses protect the eyes and surrounding areas from UV damage and skin cancer. Although no federal regulations exist for sunglasses, the American Academy of Ophthalmology recommends that sunglasses block 99% of UV-A and UV-B radiation. A chemical coating applied to the surface of the lens is the protective mechanism; protection does not correlate with the color or darkness of the lens (*72*). Sunglasses can reduce UV radiation exposure to the eye by 80%, and when combined with a wide-brimmed hat or Legionnaire hat, UV exposure to the face is reduced by 65% (*73*).

Shade structures and trees can reduce direct UV radiation, but the protection offered is dependent on the direct and indirect UV radiation from the surrounding surface (e.g., sand and concrete) (*74,75*). For example, umbrellas with more overhang provide more UV protection than those with less overhang.

Sunscreens

Sunscreens are an important adjunct to other types of protection against UV exposure. Using sunscreen is one of the most commonly practiced behaviors for preventing skin cancer.

During the previous decade, new studies have contributed to an increased understanding of the role of sunscreen in possibly preventing skin cancer. The U.S. Preventive Services Task Force is revising their recommendations on sunscreen use, but the International Agency for Research on Cancer has concluded that topical use of sunscreens probably prevents squamous cell carcinoma of the skin. The group drew no conclusions regarding whether the use of sunscreens reduces the incidence of basal cell carcinoma or melanoma (*76*) (Appendix A).

Clinical trials have demonstrated that sunscreens are effective in reducing the incidence of actinic keratoses, the precursors to squamous cell carcinoma (*77,78*). One randomized clinical trial demonstrated that sunscreens are effective in reducing squamous cell carcinoma itself (*79*). Another randomized trial demonstrated that, among children who are at high risk for developing melanoma, sunscreens are effective in reducing moles, the precursors and strongest risk factor for melanoma (*80*). Unfortunately, many persons use sunscreens if they intend to stay out in the sun longer, and they reduce the use of other forms of sun protection (e.g., clothing or hats), thereby, acquiring the same or even a higher amount of UV radiation exposure than they would have obtained with a shorter stay and no sunscreen (*22,76,81*).

The guidelines in this report recommend 1) using various methods (e.g., avoiding the sun, seeking shade, or wearing protective clothing) that reduce exposure to the full spectrum of UV radiation as the first line of protection against skin cancer and 2) using sunscreen as a complementary measure. In some instances, sunscreens might be the only responsible option. However, to be effective, sunscreens must be applied correctly (Appendix B). For example, users should apply sunscreen and allow it to dry before going outdoors and getting any UV exposure (*82,83*). Similarly, users should reapply sunscreen after leaving the water, sweating, or drying off with a towel. Use of insufficient quantities of sunscreen (*84,85*) or use of a sunscreen with insufficient protection are other concerns. Manufacturers determine the SPF (a measure of protection from only UV-B radiation) by applying an adequate amount of sunscreen (1–2 ounces) on humans and testing under artificial light, which is usually not as strong as natural light (*86*). No government standards measure how much protection sunscreens provide against UV-A rays.

Few studies have been conducted on sunscreens, despite their widespread use, which make it difficult to estimate the prevalence of allergies to sunscreens. Skin irritation, rather than an actual allergic reaction, is one of the more commonly reported adverse events (*87*). Because the majority of the commercially available sunscreens are a combination of agents from various chemical groups, persons who might experience adverse effects should be aware of the active ingredients and try sunscreens with different ingredients. In previous years, the most commonly reported allergen was para-aminobenzoic acid (PABA) (rarely used today), whereas the current two most frequently cited allergens are benzophenone-3 and dibenzoyl methanes (*22*).

Prevalence of Behavioral Risk Factors, Sun-Safe Behaviors, and Attitudes Related to Sun Safety

In the United States, sunbathing and tanning habits were established during the early to mid-1900s (*88,89*), most likely reflecting the increased availability of leisure time and fashion trends promoting tanned skin (*89,90*). In the late 1970s, the majority of the population had little knowledge concerning their personal susceptibility to skin cancer and believed that tanning enhanced appearance and was associated with better health (*91*). More recent reports indicate that many Americans feel healthier with a tan and believe that suntanned skin is more attractive (*36,92,93*).

In 1992, 53% of U.S. adults were "very likely" to protect themselves from the sun by practicing at least one protective behavior (using sunscreen, seeking shade, or wearing sun-protective clothing) (*94*). Among white adults, approximately one third used sunscreen (32%), sought shade (30%), and wore protective clothing (28%). Among black adults, 45% sought shade, 28% wore sun-protective clothing, and 9% used sunscreen (*95*). Sun-protective behaviors were more common among the more sun sensitive, females, and older age groups among both whites and blacks.

Sun-safety behaviors might be most difficult to change among preadolescents and adolescents (*96*). Teenagers spend a substantial amount of time outdoors, especially on weekends and during the summer (*97,98*). Many teenagers believe that a tan is desirable (*92*); only teenagers who know persons with skin cancer or who perceive an increased personal susceptibility to skin cancer are more likely to use sunscreen (*98*). However, teenagers who practice skin cancer prevention tend to only use sunscreen and to use it infrequently, inconsistently, and incorrectly (*97,98*). Girls tend to use sunscreen more than boys, but they also use tanning beds more frequently (*97–101*).

Sunscreen use by children is correlated positively with use by their parents (*87,102*). Some parents know the risks of skin cancer but do not realize that children are at risk (*103,104*). Some parents believe that a suntan is a sign of good health; others use sunscreen on their children as their only or preferred skin cancer prevention measure (*36,99,105–107*), even though other measures (e.g., using shade structures and wearing sun-protective clothing) are available. Sometimes parents apply sunscreen on their children incorrectly and inconsistently (*22*) (e.g., only after a child has experienced a painful sunburn) (*97,108*).

Concerns Regarding Promoting Protection from UV Radiation

Sun-safety measures should not reduce student participation in physical activity. Regular physical activity reduces morbidity and mortality for multiple chronic diseases. Promoting lifelong physical activity in schools is a critically important public health and educational priority (*8*). Schools might find it difficult to avoid scheduling outdoor physical activity programs around the midday hours. These schools can focus their efforts on other sun-safety measures (e.g., seeking shade; and wearing a hat, protective clothing, or sunscreen), which can be implemented without compromising physical activity while gradually making feasible scheduling changes.

In addition, because UV radiation plays a role in the synthesis of vitamin D, the limitation of UV exposure might be of some concern. This limitation might lead to a decrease in levels of vitamin D and increase the likelihood that rickets, a disorder involving a weakening of the bones, will develop in susceptible infants and children. However, the average age for presentation of rickets is 18 months, and the age groups of concern are typically infants and toddlers, not school-aged children between 5 and 18 years. Although the major source of vitamin D is through skin exposure to sunlight, supplementing the diet with foods (e.g., flesh of fatty fish, eggs from hens fed vitamin D, and vitamin D-fortified milk and breakfast cereal) can provide enough vitamin D to meet adequate intake requirements (*109,110*). The American Academy of Pediatrics (*111*) recommends vitamin D supplementation for breast-fed infants whose mothers are vitamin D deficient or for infants who are not exposed to adequate sunlight. Infants consuming at least 500ml of vitamin D-fortified formula per day and older children consuming at least 16 ounces of vitamin D-fortified milk per day will meet the adequate intake of vitamin D.

Guidelines for School Programs To Prevent Skin Cancer

Schools as Settings for Skin Cancer Prevention Efforts

Epidemiologic data suggest that several skin cancers can be prevented if children and adolescents are protected from UV radiation (*26–32*). Schools can participate in reducing exposure of young persons to UV radiation from the sun during school-related activities by offering education and skill-building activities to reinforce the development of healthful behaviors. School-based efforts to prevent skin cancer can be more effective in the framework of a coordinated school health program (*112,113*) that includes family and community participation (*114*) and builds on the context and current practices in the school and community. Coordinated school health programs aim to create and support environments where young persons can gain the knowledge, attitudes, and skills required to make and maintain healthy choices and habits. These programs integrate health education, a healthy school environment, physical education, nutrition services, health services, mental health and counseling services, health promotion programs for faculty and staff, and efforts to integrate school activities with family and community life (*113*).

Being aware of existing practices for sun exposure and sun protection among teachers, staff, and students might help define gaps in optimal sun-safety practices. Careful observations for a few days might also provide important information concerning students' use of shade areas and sunscreen at recess or lunch time, and staff's use of hats, shirts, and sunglasses. Discussions with students and staff who practice sun-safe behaviors might prove useful in planning and improving implementation of sun-safety practices.

Skin cancer prevention measures vary in both their ease of adoption and relevance. Schools should not allow an "all or nothing" approach to undermine the effectiveness of their skin cancer prevention efforts. For sun-safety protection, a short-sleeve shirt and cap might be better than no hat and a sleeveless top. Being flexible is important while moving in the direction of optimal skin cancer prevention environments, policies, and programs.

Skin Cancer Prevention Guidelines

These guidelines provide recommendations for skin cancer prevention activities within a coordinated school health program. In addition, these guidelines are based on scientific literature, national policy documents, current practice, and theories and principles of health behavioral change (*115*). Schools and community organizations can work together to develop plans that are relevant and achievable. Sustained support from school staff, students, communities, state and local education and health agencies, families, institutions of higher education, and national organizations are necessary to ensure the effectiveness of school skin cancer prevention activities (*116*).

In this report, seven broad guidelines are included that school programs can use to reduce the risk for skin cancer among students: 1) policy, 2) environmental change, 3) education, 4) families, 5) professional development, 6) health services, and 7) evaluation (Box 2). Each guideline includes suggestions regarding key elements, steps for implementation, and realistic expectations for change.

- **Guideline 1: Policy** — Establish policies that reduce exposure to UV radiation.

BOX 2. Recommendations for skin cancer prevention in schools

1. Establish **policies** that reduce exposure to ultraviolet radiation.
2. Provide an **environment** that supports sun-safety practices.
3. Provide health **education** to teach students the knowledge, attitudes, and behavioral skills they need to prevent skin cancer.
4. Involve **family** members in skin cancer prevention efforts.
5. Include skin cancer prevention with **professional development** of staff (e.g., preservice and inservice education).
6. Complement and support skin cancer prevention with school **health services**.
7. Periodically **evaluate** whether schools are implementing the guidelines on policies, environmental change, education, families, professional development, and health services.

- **Guideline 2: Environmental change** — Provide and maintain physical and social environments that support sun safety and that are consistent with the development of other healthful habits.
- **Guideline 3: Education** — Provide health education to teach students the knowledge, attitudes, and behavioral skills they need to prevent skin cancer. The education should be age-appropriate and linked to opportunities for practicing sun-safety behaviors.
- **Guideline 4: Family Involvement** — Involve family members in skin cancer prevention efforts.
- **Guideline 5: Professional development** — Include skin cancer prevention knowledge and skills in preservice and inservice education for school administrators, teachers, physical education teachers and coaches, school nurses, and others who work with students.
- **Guideline 6: Health services** — Complement and support skin cancer prevention education and sun-safety environments and policies with school health services.
- **Guideline 7: Evaluation** — Periodically evaluate whether schools are implementing the guidelines on policies, environmental change, education, families, professional development, and health services.

The recommendations represent the state-of-the-science in school-based skin cancer prevention. However, every recommendation is not appropriate or feasible for every school to implement nor should any school be expected to implement all recommendations. Schools should determine which recommendations have the highest priority based on the needs of the school and available resources. As more resources become available, schools could implement additional recommendations to support a coordinated approach to preventing skin cancer.

Guideline 1: Policy — Establish Policies that Reduce Exposure to UV Radiation.

Policies can provide sun protection for all persons in a defined population (e.g., a school), not just those who are most motivated (*117*). In addition, policies can involve formal organizational rules and standards or legal requirements and restrictions related to skin cancer prevention measures. Policies may be developed by a school, school board, or by other legal entities (e.g., municipal, state, and federal governments). To be effective, policies need to be communicated to school personnel, announced to affected constituents (e.g., students and their parents), managed and implemented, enforced and monitored, and reviewed periodically (*118,119*).

Before establishing healthy skin cancer prevention policies, identify any existing policies that might deter skin cancer prevention. These existing policies might include outdoor activity schedules, prohibitions on wearing sunglasses or caps and hats at school, and rules that limit the use or provision of sunscreen at school (e.g., requiring parental permission, defining sunscreen as "medicine", and restricting teachers from applying sunscreen on children). California enacted a law (effective January 2002) that requires their schools to allow students, when outdoors, to wear school-site approved sun-protective hats and clothing. This legislation was deemed necessary because several school districts had banned hats because some styles or colors are connected with gang affiliation.

An effectively crafted skin cancer prevention policy provides a framework for implementing the other six guidelines. The policy demonstrates institutional commitment and guides school and community groups in planning, implementing, and evaluating skin cancer prevention activities. Such a policy creates a supportive environment for students to learn about and adopt sun-protection practices. Although a comprehensive policy is preferable, more limited policies addressing certain aspects of skin cancer prevention also can be useful.

Developing the Policy or Policies

Skin cancer prevention can be part of a larger school health policy. Although policies might be initiated by a person or small group, the most effective policies are developed with input from all relevant constituents. In schools, the constituents include students, teachers, parents, administrators, coaches, school nurses, health educators and other relevant

personnel as well as community leaders and residents. Schools can also work with community partners (e.g., recreation and parks departments, health departments, after-school programs, camps, families, and youth advocacy groups) and others who organize outdoor activities for youth.

Policies require time for development and implementation and might not be as visible as educational programs (*120*). Increased effort in the early stages of policy development might result in increased adoption (*121*). In Australia, health and cancer prevention specialists developed a sun-protection policy kit for schools and a related staff development module (*120*). Elementary schools were twice as likely to formally adopt a comprehensive sun-protection policy if they also received the staff development module (44% [kit and module] versus 21% [kit only]). However, few high schools adopted policies whether they received just the kit or the kit and the module (11% and 6%, respectively) (*120*). Policy development requires a long-term commitment and sustained efforts and cooperation among all concerned parties.

Policy Options

Components of skin cancer prevention policies for a school or community to consider include 1) statement of purpose and goals; 2) schedule and physical environment policies; 3) policies related to personal protective clothing and sunglasses; 4) sunscreen policies; 5) education policies; 6) policies on outreach to families; and 7) policies on resource allocation and evaluation. When implementing a comprehensive policy (which would include all of these components) is not feasible, schools can start with some of these components and add others over time.

Policy 1: Statement of Purpose and Goals. Policies usually begin with a statement of purpose and goals that establish sun safety as a priority and highlight the importance of skin cancer prevention. In addition, the statement can 1) describe the influence of childhood sun exposure on the risk for developing skin cancer later in life; 2) identify actions that persons and institutions can take to reduce the risk for skin cancer; 3) highlight the importance of establishing a physical, social, and organizational environment that supports skin cancer prevention; and 4) specify dedicated financial and human resources for skin cancer prevention and for the other policy options described here.

Policy 2: Schedule and Structure Policies. Policies can provide the basis for across-the-board reduction of UV radiation exposure for children and adults in schools and communities by establishing 1) rules that encourage the scheduling of outdoor activities (including athletic and sporting events) during times when the sun is not at its peak intensity and 2) building and grounds codes to increase the availability of shade in frequently used outdoor spaces.

Eliminating the scheduling of outdoor activities during peak sun hours will be difficult, if not impossible, for many schools to do. For these schools, the best strategy might be to work toward a gradual shift in scheduling. School board policies could require architects to design new school buildings with adequate shade coverage adjacent to play and sports fields. Play and sports fields can be reviewed for existing and potential shade. School and community organization staff could evaluate frequently used spaces in the community for their UV protection status and add signs, reminders, or prompts to encourage sun safety. Finally, volunteer, business, health department, and political support can be secured by school and community organization staff to generate resources for improving the sun-safety environment, especially for providing sunscreen and shade.

Policy 3: Policies for Personal Protective Clothing and Sunglasses. Schools can develop policies that encourage or require students to wear protective clothing, hats, and sunglasses to prevent excessive sun exposure. These measures could be employed during physical education classes, recess, field trips, outdoor sports or band events, and camping or field trips. Some schools, especially in Australia, have a "no hat/no play" policy stating that students cannot play outdoors if they are not wearing hats (*119*). Related policy initiatives could require the use of athletic, band, and physical education uniforms that reduce or minimize excessive sun exposure (e.g., long sleeves and broad-brimmed hats). Strategies that can be implemented to promote the adoption of these policies include gradually phasing-in new policies that involve students and sports teams designing new uniforms, securing business sponsorship for sun-safe uniforms, and conducting discussions that promote the use of hats and sunglasses.

Some schools might have policies that prohibit or discourage students and staff from wearing hats and sunglasses on school grounds (e.g., because they are associated with contraband or gang-related items). Possible transmission of head lice among younger children who share hats might also be a concern; however, policies can be implemented that address these concerns (e.g., prohibiting both sharing hats and wearing gang-related symbols).

Policy 4: Sunscreen Policies. Policies on sunscreen use at school or for after-school activities can range from encouraging parents to include sunscreen in required school-supply kits, using permission slips for students to be able to apply sunscreen at school (*122*), and establishing a sunscreen use routine before going outside. Policies also might require teachers and coaches to use sunscreen for outside activities and require that sunscreen be provided at official school-sponsored

events that occur during midday. Necessary steps that might be implemented include modifying existing policies that restrict school-based sunscreen application (*123*), seeking support for purchasing sunscreen supplies, and supervising sunscreen use.

Policy 5: Education Policies. The ideal education policy should support planned and sequential health education to provide students with the knowledge, attitudes, and behavioral skills needed for skin cancer prevention (Guideline 3). Policies that require teaching skin cancer prevention within health education courses will need to be balanced with the overall educational mission of the school.

Policy 6: Policies for Outreach to Families. Schools and other organizations that serve youth have established methods of communicating with parents and other caregivers. Policies can ensure that these organizations routinely provide to their youth advice and information concerning skin cancer prevention. For example, information concerning skin cancer prevention might be distributed along with other health forms to parents at the beginning of the year or at parent and teacher visits.

Policy 7: Resource Allocation and Evaluation. Skin cancer prevention efforts will most likely be sustained if policies exist to guide the allocation of resources for skin cancer prevention. A funding policy usually includes accountability and ongoing evaluation, thus providing for periodic review and reconsideration of how effective the resources dedicated to skin cancer prevention are being used.

Guideline 2: Environmental Change — Provide and Maintain Physical and Social Environments that Support Sun Safety and that are Consistent with the Development of Other Healthful Habits.

Policies can promote the provision of supportive resources for skin cancer prevention (e.g., shade, protective clothing and hats, sunscreen at a reduced price or free, and highly visible information and prompts for sun protection) in the physical and social environment. These policies help establish routine personal behaviors and social norms that promote skin cancer prevention in the context of organized group activities.

Physical Environments

The majority of schools in the United States were not designed with sun safety in mind. Sun protection should be considered in the design of new schools. The design of school buildings and adjacent grounds, and the availability of natural shade (e.g., trees and mountains) or constructed shade (e.g., awnings, pavilions, and tall buildings that cast a shadow) influence potential sun exposure. Students, teachers, and families can identify opportunities to extend or create new shaded areas. These areas can be temporary or permanent, natural or constructed. Students might participate in planting trees as part of their science instruction, in which they learn which trees provide good shade cover, how and where to plant them, and how long they will need to yield valuable protection. Existing structures can be modified by constructing roofs on dugouts, installing covers for bleachers, and using awnings and tarps. An increasing selection of portable or add-on shade structures are available that school groups can purchase and install. Major construction projects to build permanent pavilions and play areas can require substantial funding, but they might be the best option in some settings. School and community partnerships can support these endeavors.

School and community partnerships can facilitate provision of sunscreen that is at a reduced price or free for staff and students (through sunscreen manufacturers, pharmaceutical companies, local dermatologist offices, or hospitals) and can make sun safety more accessible during the school day or recreation period. An alternative school policy could encourage parents to apply sunscreen to their children in the morning and include it in their children's supply kits. In addition, schools and community organizations can provide hats and protective clothing (e.g., jackets) for persons who forget to bring their own on days with midday outdoor activity or field trips. Both hygiene, size, and acceptability are important considerations. However, if the school has a laundry facility for band and sports uniforms, a laundering system for emergency sun-safe protective clothing could be instituted.

Information and prompts or reminders can reinforce sun-safety awareness and serve as reminders to engage in skin cancer preventive practices. Both visual and audio messages (e.g., sun-safe posters or public address system announcements) can serve as cues to action for students as well as for families, teachers, and other professionals. After students have learned about the UV index (an indicator of the intensity of the sun's rays on a given day) (*124*), schools can post and announce the daily UV index to encourage students to practice sun-protection measures. Some schools and recreation settings also use signs that indicate the number of minutes a person can be in the sun before sustaining a sunburn.

Social Environments

A supportive social environment involves establishing social norms favoring skin cancer prevention and including personal preventive behaviors as a part of organized group activities. Program planners and advocates for skin cancer prevention should serve as role models, and adults should be in-

vited to lead by example. Schools can also create a social environment that encourages sun-safety practices through existing peer education groups by having peer educators teach other students about sun safety and by using periodic recognition or a special designation to reward teachers, staff, or students who practice sun safety.

Guideline 3: Education — Provide Health Education To Teach Students the Knowledge, Attitudes, and Behavioral Skills They Need To Prevent Skin Cancer. The Education Should be Age-Appropriate and Linked to Opportunities for Practicing Sun-Safety Behaviors.

Health education that is designed effectively and implemented for youth can increase their health-related knowledge and contribute to the development of healthy changes in attitudes and behaviors (*125*). Skin cancer prevention is likely to be most effective when it is taught as part of a comprehensive health education curriculum that focuses on understanding the relations between personal behavior and health (*126*) and that provides students with the knowledge and skills outlined by the National Health Education Standards (*112*).

The yearly timing of skin cancer prevention education can be tailored to the climate and linked with opportunities for sun exposure and sun protection. Therefore, in an area with high altitude where outdoor winter sports are common (e.g., Colorado), skin cancer prevention could be introduced before winter vacation. In northeastern coastal areas, skin cancer prevention might be most relevant before summer break. And during the school day, sun-safety lessons could directly precede recess or outdoor physical education, allowing the class session to be followed by an opportunity to practice positive sun-safety habits.

Skin cancer prevention can be included as part of a comprehensive health education curriculum because of the following characteristics:

- Behaviors that lead to UV radiation exposure might be related to other health risk factors;
- Skin cancer prevention shares many of the key goals of other health education content areas (e.g., increasing the value placed on health, taking responsibility for one's health, and increasing confidence in one's ability to make healthy behavioral changes); and
- Skin cancer prevention efforts can incorporate several of the social learning behavioral change techniques used in other health education domains (*126*).

In addition to health education classes, skin cancer prevention can be integrated into other subject areas. For example, a math exercise for students could be to calculate the length of safe-sun exposure when sunscreen is used at a certain SPF. In history or social studies classes, students could discuss the social value placed on tanning and fair skin and media portrayal of tanning. Science classes could explore the light spectrum and discuss how it relates to the risk for skin cancer, or discuss depletion of the ozone and its effect on UV exposure. This type of integrated approach requires collaborative planning and curriculum development among teachers to optimize skin cancer prevention education and to ensure consistency of messages and practices.

Scope and Sequence

Health education is most effective in promoting positive behavioral changes when it is repeated and reinforced over time (*114*). Short-duration or single-presentation efforts can increase students' knowledge regarding sun safety and, in some cases, improve attitudes and sun-protection behavior immediately after the program. However, these changes are likely to be short-lived and cannot be expected to translate into sustained positive health behaviors (*125*). Multiunit presentations have been more effective in achieving higher increases in knowledge and skill acquisition (*125*).

School-based health education to promote skin cancer prevention is most effective when it is provided consistently and sequentially and included periodically in every grade, from prekindergarten through 12th grade. Sequential instruction can build on information and skills learned previously. Resources for skin cancer prevention programs targeting youth are included in this report (Appendix C).

Active Learning and Behavioral Focus

In the previous decade, educational programs to encourage children to adopt sun-safety habits have been implemented and evaluated. Among the school-based studies reported, interventions have included one-time didactic formats and special events (*97,127,128*); skin cancer prevention that is integrated into classroom curricula over time (*126,129,130*); and peer-education programs (*131,132*). A majority of these studies have demonstrated that these interventions increased knowledge and favorable attitudes toward preventive behaviors. In addition, some of the programs that have multiple lessons and that occur over a longer period (e.g., 1 year) have yielded improvements in sun-protection behaviors (*125*).

Actively engaging children and adolescents in the learning process increases the likelihood for a positive effect. Youth are more likely to consider and adopt new or improved behaviors when they learn about them through fun, participatory activi-

ties rather than through lectures. For example, a recent study demonstrated increased improvement in knowledge of the effects of UV radiation among elementary school students who used an interactive computer-based program than among those who received the same information in a didactic format led by a teacher (*133*). The students who completed the interactive CD-ROM program also exhibited significant positive changes in attitudes and a trend toward improvements in sun-safety behavioral scores (*133*). The U.S. Environmental Protection Agency offers an Internet learning site where students can report and interpret daily measurements of UV radiation, relate the UV index information to their own community, and correspond with other participating schools (*124,134*).

Health education activities should be tailored to the cognitive and behavioral level of the students (*135*). For example, students in kindergarten through third grades might learn effectively through repetitious rhyming and learning the ABCs of skin cancer prevention. Games, puzzles, and contests make learning fun for students of most ages. More intellectually challenging activities might appeal to high school students, ranging from understanding the scientific basis of solar radiation and global climates, to making their own video to communicate sun-protection messages to their peers and communities. Teenagers can learn about media literacy and different cultures by analyzing images of models in popular magazines and discussing what sun exposure and a tan means to both white and non-white racial groups in the United States and worldwide.

School Programs in a Broader Context

The most important long-term objective of skin cancer prevention education in schools is the adoption and maintenance of sun-protection practices. Therefore, the transmission of detailed, factual information to students is the foundation of sun-safety practices. In addition, educational programs and curricula in schools are part of the broader mix of skin cancer prevention efforts and should not be expected to solely prevent skin cancer. Skin cancer prevention interventions in recreation, sports, and community settings can complement and reinforce efforts in the schools (*120,136–140*). Supportive policies, environments, teachers, and families are essential adjuncts to effectively planned and consistently implemented health education to prevent skin cancer.

Guideline 4: Family Involvement — Involve Family Members in Skin Cancer Prevention Efforts.

The sun-safety practices of parents are the single most important determinant of the sun-protection behaviors of children (*121,141*). For younger children, adult family members can assist and provide sun-protection resources. For adolescents, the direct influence of parents might decrease and be subordinated by peer influence. Nonetheless, family support plays a key role in extending the desirable effects of school skin cancer prevention efforts.

Involving family members in skin cancer prevention efforts increases the likelihood that they will adopt and thus model healthful sun-protection behaviors, and also appears to favorably influence the sun-protection behaviors of students (*122*). At a minimum, parents or guardians can be informed concerning school initiatives and policies and knowledgeable regarding how their cooperation is needed to ensure child health. Parents and guardians also can be encouraged to provide children with sun-protective clothing and sunglasses for outdoor activities. In addition, parents and guardians can serve as advocates for sun-protective policies and practices in schools and can also provide volunteer labor for health and recreation events. Their input and direct assistance can provide support for funding needed for environmental improvements and educational materials.

Guideline 5: Professional Development — Include Skin Cancer Prevention Knowledge and Skills in Preservice and Inservice Education for School Administrators, Teachers, Physical Education Teachers and Coaches, School Nurses, and Others Who Work with Students.

Even effectively designed skin cancer prevention programs cannot succeed if they are not implemented as designed. Therefore, appropriate and effective professional development efforts should be conducted for decision makers and caregivers at all levels. Professional development activities, including certification programs and inservice education, are provided routinely for teachers and other school staff (e.g., coaches and school nurses). Skin cancer prevention can be integrated into these activities.

All school staff should receive basic information concerning the importance of sun safety and key strategies for skin cancer prevention. The type of additional professional development needed will vary, depending on the responsibilities of the various caregivers. Inservice education for principals might address policy implementation and monitoring, whereas school nurses might highlight proper sunscreen use. Classroom teachers who implement curricula should receive training that addresses both content areas and teaching strategies.

As principals, teachers, and other school staff adopt sun-protection behaviors, they can serve as role models for students. A brief training program, along with participation in conducting skin cancer prevention activities for children, can result in improved sun-protection practices among recreation leaders (*142*).

Guideline 6: Health Services — Complement and Support Skin Cancer Prevention Education and Sun-Safety Environments and Policies with School Health Services.

School health services provide an opportunity for nurses, health educators, and school health resource specialists to promote and reinforce skin cancer prevention practices. A child's school health record can include parental permission for the child to use sunscreen provided by the school as well as a list of possible allergies to sunscreens or their ingredients.

School health services staff also may conduct physical examinations for sports team eligibility, assist in managing and notifying parents concerning the long-term dangers of a severe sunburn, and prepare students for field trips. Each of these situations provides an opportunity to educate and remind students about skin cancer prevention.

Health professionals in the community, including pediatricians, primary care providers, nurses, pharmacists, and dermatologists are credible sources of information and guidance for skin cancer prevention. They can be advocates for skin cancer prevention policies, environmental changes, and programs, and support school programs through presentations, professional training, demonstrations, and classroom visits. During their consultation with children and parents, these health-care professionals can also assess sun-exposure patterns, reinforce sun-protective behaviors, and provide counseling to persons with sunburns (*138,143*).

Guideline 7: Evaluation — Periodically Evaluate Whether Schools are Implementing the Guidelines on Policies, Environmental Change, Education, Families, Professional Development, and Health Services.

Local school boards and administrators can use evaluation questions to determine whether their programs are consistent with CDC's *Guidelines for School Programs To Prevent Skin Cancer*. Personnel in federal, state, and local education and health agencies also can use these questions to 1) assess whether schools in their jurisdiction are providing effective education to prevent skin cancer and 2) identify schools that would benefit from additional training, resources, or technical assistance. The following questions can serve as a guide for assessing program effectiveness:

1. Do schools have a comprehensive policy on skin cancer prevention and is it implemented and enforced as written?
2. Does the skin cancer prevention program support physical and social environmental changes that promote sun safety and that are consistent with the development of other healthful habits?
3. Does the skin cancer prevention education program foster the necessary knowledge, attitudes, and skills to reduce UV exposure and prevent skin cancer?
4. Is education to reduce UV exposure provided, as planned, in prekindergarten through 12th grade?
5. Is inservice training provided, as planned, for education staff responsible for implementing skin cancer prevention programs?
6. Do school health services support skin cancer prevention?
7. Are parents or families, teachers, students, school health personnel, school administrators, and appropriate community representatives involved in planning, implementing, and assessing programs and policies to prevent skin cancer?
8. Does the skin cancer prevention program encourage and support sun-safety efforts by students and school staff?

Conclusion

Schools can play a substantial role in protecting students from unnecessary exposure to UV, thereby reducing their future risk for skin cancer. A comprehensive school approach to skin cancer prevention includes policies, environmental change, educational curricula, family involvement, professional development, integration with health services, and evaluation. The exposure of youth to harmful UV radiation today contributes to their risk for skin cancer later in life. Unlike many diseases, skin cancer is primarily preventable. Schools, in partnership with community groups and other national, federal, state, and voluntary agencies, can develop, implement, and promote initiatives that help protect youth from UV exposure (*144,145*). These guidelines serve as a framework for such initiatives.

References

1. National Cancer Institute. SEER Cancer Statistics Review, 1973–1998. Available at http://seer.cancer.gov/Publications/CSR1973_1998/melanoma.pdf.

2. Weinstock MA, Colditz GA, Willett WC, Stampfer MJ, Bronstein BR Jr, Speizer FE. Nonfamilial cutaneous melanoma incidence in women associated with sun exposure before 20 years of age. Pediatrics 1989;84:199–204.
3. Stern RS, Weinstein MC,Baker SG. Risk reduction for nonmelanoma skin cancer with childhood sunscreen use. Arch Dermatol 1986;122:537–45.
4. Gilchrest BA, Eller MS, Geller AC, Yaar M. The pathogenesis of melanoma induced by ultraviolet radiation. N Engl J Med 1999;340:1341–8.
5. CDC. Guidelines for effective school health education to prevent the spread of AIDS. MMWR 1988;37(S-2):1–14.
6. CDC. Guidelines for school health programs to prevent tobacco use and addiction. MMWR 1994;43(RR-2):1–18.
7. CDC. Guidelines for school health programs to promote lifelong healthy eating. MMWR 1996; 45(RR-9):1–41.
8. CDC. Guidelines for school and community programs to promote lifelong physical activity among young people. MMWR 1997;46(RR-6):1–36.
9. CDC. Community guidelines. Available at http://www.thecommunityguide.org/home_f.html.
10. US Department of Health and Human Services. Objectives for Improving Health (Part A: Focus Areas 1–14), Cancer. In: Healthy people 2010 (conference ed, Vol 1). Washington, DC: US Department of Health and Human Services, 2000:3-18–3-19. Available at http://www.health.gov/healthypeople/Document/pdf/Volume1/03Cancer.pdf.
11. Greenlee RT, Murray T, Bolden S, Wingo PA. Cancer statistics, 2000. CA Cancer J Clin 2000;50:7–33.
12. American Cancer Society. Cancer prevention and early detection— cancer facts & figures 2002. Atlanta, GA: American Cancer Society, 2002.
13. Preston DS, Stern RS. Nonmelanoma cancers of the skin. N Engl J Med 1992;327:1649–62.
14. Armstrong BK, English DR. Cutaneous malignant melanoma. In: Schottenfeld D, Fraumeni JF, eds. Cancer epidemiology and prevention. 2nd ed. New York, NY: Oxford University Press, 1996.
15. Green A, MacLennan R, Youl P, Martin N. Site distribution of cutaneous melanoma in Queensland. Int J Cancer 1993;53:232–6.
16. Ries LA, Wingo PA, Miller DS, et al. The annual report to the nation on the status of cancer, 1973–1997, with a special section on colorectal cancer. Cancer 2000;88:2398–424.
17. Jemal A, Devesa SS, Hartge P, Tucker MA. Recent trends in cutaneous melanoma incidence among whites in the United States. J Natl Cancer Inst 2001;93:678-83.
18. Jemal A, Devesa SS, Fears TR, Hartge P. Changing patterns of cutaneous malignant melanoma mortality rates among whites in the United States. J Natl Cancer Inst 2000;92:811–8.
19. Hall HI, Miller DR, Rogers JD, Bewerse B. Update on the incidence and mortality from melanoma in the United States. J Am Acad Dermatol 1999;40:35–42. Available at http://seer.cancer.gov/Publications/CSR1973_1998/melanoma.pdf.
20. Armstrong BK, Kricker A. How much melanoma is caused by sun exposure?. Melanoma Res 1993;3:395–401.
21. Diffey BL. Solar ultraviolet radiation effects on biological systems. Phys Med Biol 1991;36:299–328.
22. IARC Working Group on the Evaluation of Cancer-Preventive Agents. Sunscreens. In: IARC Handbooks of Cancer Prevention. Vol 5. Lyon, France: International Agency for Research on Cancer, 2001.
23. Taylor HR, West SK, Rosenthal FS, et al. Effect of ultraviolet radiation on cataract formation. N Engl J Med 1988;319:1429–33.
24. West SK, Duncan DD, Munoz B et al. Sunlight exposure and risk of lens opacities in a population-based study: the Salisbury Eye Evaluation project. JAMA 1998;280:714–8.
25. Rosmini F, Stazi MA, Milton Rc, Sperduto RD, Pasquini P, Maraini G. A dose-response effect between a sunlight index and age-related cataracts. Italian-American Cataract Study Group. Ann Epidemiol 1994;4:266–70.
26. Whiteman DC, Whiteman CA, Green AC. Childhood sun exposure as a risk factor for melanoma: a systematic review of epidemiologic studies. Cancer Causes Control 2001;12:69–82.
27. Westerdahl J, Olsson H, Ingvar C. At what age do sunburn episodes play a crucial role for the development of malignant melanoma. Eur J Cancer 1994;30A:1647–54.
28. Elwood JM, Jopson J. Melanoma and sun exposure: an overview of published studies. Int J Cancer 1997;73:198–203.
29. Kricker A, Armstrong BK, English DR. Sun exposure and non-melanocytic skin cancer. Cancer Causes Control 1994;5:367–92.
30. Kricker A, Armstrong BK, English DR, Heenan PJ. Does intermittent sun exposure cause basal cell carcinoma? A case-control study in Western Australia. Int J Cancer 1995;60:489–94.
31. Gallagher RP, Hill GB, Bajdik CD, et al. Sunlight exposure, pigmentary factors, and risk of nonmelanocytic skin cancer I. Basal cell carcinoma. Arch Dermatol 1995;131:157–63.
32. Gallagher RP. Sun exposure and non-melanocytic skin cancer. In: Grob JJ, Stern RS, MacKie RM, Weinstock WA, eds. Epidemiology, causes and prevention of skin diseases. 1st ed. London, England: Blackwell Science, 1997:72–7.
33. Armstrong BK. Melanoma: childhood or lifelong sun exposure. In: Grob JJ, Stern RS, Mackie RM, Weinstock WA, eds. Epidemiology, causes and prevention of skin diseases. 1st ed. London, England: Blackwell Science, 1997:63–6.
34. Whiteman D, Green A. Melanoma and sunburn. Cancer Causes Control 1994;5:564–72.
35. Autier P, Dore JF, Cattaruzza MS, et al. Sunscreen use, wearing clothes, and number of nevi in 6- to 7-year-old European children. European Organization for Research and Treatment of Cancer Melanoma Cooperative Group. J Nat Cancer Inst 1998;90:1873–80.
36. Buller DB, Callister MA, Reichert T. Skin cancer prevention by parents of young children: health information sources, skin cancer knowledge, and sun-protection practices. Oncol Nurs Forum 1995;22:1559–66.
37. Foltz AT. Parental knowledge and practices of skin cancer prevention: a pilot study. J Pediatr Health Care 1993;7:220–5.
38. Hurwitz S. The sun and sunscreen protection: recommendations for children. J Dermatol Surg Oncol 1988;14:657–60.
39. Taylor CR, Stern RS, Leyden JJ, Gilchrest BA. Photoaging/photodamage and photoprotection. J Am Acad Dermatol 1990;22:1–15.
40. Autier P, Dore JF. Influence of sun exposures during childhood and during adulthood on melanoma risk. EPIMEL and EORTC Melanoma Cooperative Group. European Organization for Research and Treatment of Cancer. Int J Cancer. 1998;77:533–7.
41. Williams ML, Pennella R. Melanoma, melanocytic nevi, and other melanoma risk factors in children. J Pediatr 1994;124:833–45.
42. Parkin DM, Muir CS, Whelan SL, Gao YT, Ferlay J, Powell J. Cancer incidence in five continents. Vol 6. Lyon, France: International Agency for Research on Cancer, 1992.

43. Scotto J, Fears TR, Freaumeni JF Jr. Incidence of nonmelanoma skin cancer in the United States. Washington, DC: US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute, 1981; DHHS publication no. (NIH) 83-2433.
44. Pennello G, Devesa S, Gail M. Association of surface ultraviolet B radiation levels with melanoma and nonmelanoma skin cancer in United States blacks. Cancer Epidemiol Biomarkers Prev 2000;9: 291–7.
45. Rhodes AR, Weinstock MA, Fitzpatrick TB, Mihm MC Jr, Sober AJ. Risk factors for cutaneous melanoma. A practical method of recognizing predisposed individuals. JAMA 1987;258:3146–54.
46. Scotto J, Fears TR, Kraemer KH, Fraumeni JF. Nonmelanoma skin cancer. In: Schottenfeld D, Fraumeni JF, eds. Cancer epidemiology and prevention. 2nd ed. New York, NY: Oxford University Press, 1996.
47. Kricker A, Armstrong BK, English DR, Heenan PJ. Pigmentary and cutaneous risk factors for non-melanocytic skin cancer—a case-control study. Int J Cancer 1991;48:650–62.
48. Holly EA, Kelly JW, Shpall SN, Chiu SH. Number of melanocytic nevi as a major risk factor for malignant melanoma. J Am Acad Dermatol 1987;17;459–68.
49. Holly EA, Kelly JW, Ahn DK, Shpall SV, Rosen JI. Risk of cutaneous melanoma by number of melanocytic nevi and correlation of nevi by anatomic site. In: Gallagher RP, Elwood JM, eds. Epidemiological aspects of cutaneous malignant melanoma. Boston, MA: Kluwer Academic Publishers, 1994:159–72.
50. Goldstein AM, Tucker MA. Genetic epidemiology of familial melanoma. Dermatol Clin 1995;35:605–12.
51. National Cancer Institute. Canques. Available at http://seer.cancer.gov/ScientificSystems/CanQues.
52. International Agency for Research on Cancer. Solar and ultraviolet radiation. IARC Monogr Eval Carcinog Risks Hum 1992;55:1–316.
53. Koh HK, Sinks TH, Geller AC, Miller DR, Lew RA. Etiology of melanoma. In: Nathanson L, ed. Current research and clinical management of melanoma. Boston, MA: Kluwer Academic Publishers,1993:1–27.
54. Diffey BL. Ozone Depletion and skin cancer. In: Grob JJ, Stern RS, Mackie RM, Weinstock WA, eds. Epidemiology, causes and prevention of skin diseases. 1st ed. London, England: Blackwell Science, 1997:77–85.
55. National Institute of Environmental Health Sciences. Report on carcinogens: solar UV radiation and exposure to sunbeds and sunlamps. 9th ed. Research Triangle Park, NC, 2000:48–50.
56. Swerdlow AJ, Weinstock MA. Do tanning lamps cause melanoma? An epidemiologic assessment. J Am Acad Dermatol 1998;38:89–98.
57. Miller SA, Hamilton SL, Wester UG, Cyr WH. An analysis of UVA emissions from sunlamps and the potential importance for melanoma. Photochem Photobiol 1998;68:63–70.
58. Spencer JM, Amonette RA. Indoor tanning: risks, benefits, and future trends. J Am Acad Dermatol 1995;33:288–98.
59. Saraiya M, Frank E, Elon L, Baldwin G, McAlpine BE. Personal and clinical skin cancer prevention practices of U.S. women physicians. Arch Derm 2000;136:633–42.
60. McDonald CJ. American Cancer Society perspective on the American College of Preventive Medicine's policy statements on skin cancer prevention and screening. CA Cancer J Clin 1998;48:229–31.
61. Committee on Guidelines of Care, American Academy of Dermatology. Guidelines of care for cutaneous squamous cell carcinoma. J Am Acad Dermatol 1993;28:628–31.
62. Committee on Guidelines of Care, American Academy of Dermatology. Guidelines of care for nevi I (nevocellular nevi and seborrheic keratoses). J Am Acad Dermatol 1992;26:629–31.
63. Committee on Environmental Health, American Academy of Pediatrics. Ultraviolet light: a hazard to children. Pediatrics 1999;104:328–33.
64. Council on Scientific Affairs. Harmful effects of ultraviolet radiation. JAMA 1989;262:380–4.
65. National Cancer Institute. Skin cancer (PDQ®): Prevention. Available at http://www.cancer.gov/cancer_information/doc_pdq.aspx?version=patient&viewid=dd7fa1a5-9c70-4625-9112-d2db13af013d.
66. Autier P, Dore JF, Shifflers E, et al. Melanoma and use of sunscreens: an EORTC case-control study in Germany, Belgium, and France. The EORTC Melanoma Cooperative Group. Int J Cancer 1995;61: 749–55.
67. Welsh C, Diffey BL. The protection against solar actinic radiation afforded by common clothing fabrics. Clinical Exp Dermatol 1981;6:577–82.
68. Pailthorpe M. Apparel textiles and sun protection: a marketing opportunity or a quality control nightmare? Mutat Res 1998;422:175–83.
69. Diffey BL, Cheeseman J. Sun protection with hats. Br J Dermatol 1992;127:10–12.
70. American Sun Protection Organization. Sun safety info: clothing. Available at http://www.americansun.org/pages/clothing.htm.
71. Gies HP, Roy CR, Elliott G, Zongli W. Ultraviolet radiation protection factors for clothing. Health Phys 1994;67:131–9.
72. American Academy of Ophthalmology. Sunglasses. San Francisco, CA: American Academy of Ophthalmology, 1995.
73. Gies HP, Roy CR, Elliot G. Ultraviolet radiation protection factors for personal protection in both occupational and recreational situations. Radiat Prot Aust 1992;10:59–66.
74. Greenwood JS, Soulos GP, Thomas ND. Under cover: guidelines for shade planning and design. Sydney, Australia: New South Wales Cancer Council and New South Wales Health Department, 1998.
75. Parsons PG, Neale R, Wolski P, Green A. The shady side of solar protection. Med J Aust 1998;168:327–30.
76. Vainio H, Miller AB, Bianchini F. An international evaluation of the cancer-preventive potential of sunscreens. Int J Cancer 2000 88: 838–42.
77. Thompson SC, Jolley D, Marks R. Reduction of solar keratoses by regular sunscreen use. N Engl J Med 1993;329:1147–51.
78. Naylor MF, Boyd A, Smith DW, Cameron GS, Hubbard D, Neldner KH. High sun protection factor sunscreens in the suppression of actinic neoplasia. Arch Dermatol 1995;131:170–5.
79. Green A, Williams G, Neale R, et al. Daily sunscreen application and betacarotene supplementation in prevention of basal-cell and squamous-cell carcinomas of the skin: a randomised controlled trial. Lancet 1999;354:723–9.
80. Gallagher RP, Rivers JK, Lee TK, Bajdik CD, McLean DI, Coldman AJ. Broad-spectrum sunscreen use and the development of new nevi in white children: a randomized controlled trial. JAMA 2000;283:2955–60.
81. Weinstock MA. Do sunscreens increase or decrease melanoma risk: an epidemiologic evaluation. J Invest Dermatol Symp Proc 1999;4: 97–100.

82. McLean DI, Gallagher R. Sunscreens: use and misuse. Dermatol Clin 1998;16:219–26.
83. Odio MR, Veres DA, Goodman JJ, et al. Comparative efficacy of sunscreen reapplication regimens in children exposed to ambient sunlight. Photodermatol Photoimmunol Photomed 1994;10:118–25.
84. Baade PD, Balanda KP, Lowe JB. Changes in skin protection behaviors, attitudes, and sunburn: in a population with the highest incidence of skin cancer in the world. Cancer Detect Prev 1996;20:566–75.
85. Bech-Thomsen N, Wulf HC. Sunbathers' application of sunscreen is probably inadequate to obtain the sun protection factor assigned to the preparation. Photodermatol Photoimmunol Photomed 1992–1993;9:242–44.
86. Sayre RM, Kollias N, Ley RD, Baqer AH. Changing the risk spectrum of injury and the performance of sunscreen products throughout the day. Photodermatol Photoimmnol Photomed 1994;10:148–53.
87. Foley P, Nixon R, Marks R, Frower K, Thompson S. The frequency of reactions to sunscreens: results of a longitudinal population-based study on the regular use of sunscreens in Australia. Br J Dermatol 1993;128:512–8.
88. Keesling B,Friedman HS. Psychosocial factors in sunbathing and sunscreen use. Health Psychol 1987;6:477–93.
89. Randle HW. Suntanning: differences in perceptions throughout history. Mayo Clinic Proc 1997;72:461–6.
90. Chapman S, Marks R, King M. Trends in tans and skin protection in Australian fashion magazines, 1982 through 1991. Am J Public Health 1992;82:1677–80.
91. Johnson EY, Lookingbill DP. Sunscreen use and sun exposure: trends in a white population. Arch Dermatol 1984;120:727–31.
92. Banks BA, Silverman RA, Schwartz RH, Tunnessen WW Jr. Attitudes of teenagers toward sun exposure and sunscreen use. Pediatrics 1992;89:40–2.
93. Lescano CM, Rodrique JR. Skin cancer prevention behaviors among parents of young children. Children's Health Care 1997;26:107–14.
94. Hall HI, May DS, Lew RA, Koh HK, Nadel M. Sun protection behaviors of the U.S. white population. Prev Med 1997;26:401–7.
95. Hall HI, Rogers JD. Sun protection behaviors among African Americans. Ethn Dis 1999;9:126–31.
96. Marks R. Role of childhood in the development of skin cancer. Aust Paediatr J 1988;24:337–8.
97. Mermelstein RJ, Riesenberg LA. Changing knowledge and attitudes about skin cancer risk factors in adolescents. Health Psychol 1992:11:371–6.
98. Reynolds KD, Blaum JM, Jester PM, Weiss H, Soong SJ, Diclemente RJ. Predictors of sun exposure in adolescents in southeastern U.S. population. J Adolesc Health 1996;19:409–15.
99. Robinson JK, Rigel DS, Amonette RA. Trends in sun exposure knowledge, attitudes, and behaviors: 1986 to 1996. J Am Acad Dermatol 1997;37:179–86.
100. Jorgensen CM, Wayman J, Green C, Gelb CA. Using health communications for primary prevention of skin cancer: CDC's Choose Your Cover campaign. J Womens Health Gend Based Med 2000;9:471–5.
101. Hall HI, Jones SE, Saraiya M. Prevalence and correlates of sunscreen use among US high school students. J Sch Health 2001;71:453–7.
102. Glanz K, Lew R, Song V, Ah Cook VA. Factors associated with skin cancer prevention practices in a multiethnic population. Health Educ Behav 1999;26:344–59.
103. Maducdoc LR, Wagner RF Jr, Wagner KD. Parents' use of sunscreen on beach-going children: the burnt child dreads the fire. Arch Dermatol 1982;128:628–9.
104. Grob JJ, Guglielmina C, Gouvernet J, Zarour H, Noe C, Bonerandi JJ. Study of sunbathing habits in children and adolescents: application to the prevention of melanoma. Dermatology 1993;186:94–8.
105. Vail-Smith K, Watson CL, Felts WM, Parrillo AV, Knight SM, Hughes JL. Childhood sun exposure: parental knowledge, attitudes, and behaviors. J Health Educ 1997;28:149–55.
106. Olson AL, Dietrich AJ, Sox CH, Stevens MM, Winchell CW, Ahles TA. Solar protection of children at the beach. Pediatrics 1997;99;E1.
107. Hall HI, McDavid K, Jorgensen CM, Kraft JM. Factors associated with sunburn in white children aged 6 months to 11 years. Am J Prev Med 2001;20:9–14.
108. Robinson JK, Rigel DS, Amonette RA. Summertime sun protection used by adults for their children. J Am Acad Dermatol 2000;42: 746–53.
109. Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Institute of Medicine. Dietary reference intakes for calcium, phosphorus, magnesium, vitamin D, and fluoride. Washington, DC: National Academy Press, 1997.
110. Vieth R. Vitamin D supplementation, 25-hydroxyvitamin D concentrations and safety. Am J Clin Nutr 1999;69:842–56.
111. American Academy of Pediatrics. Vitamins: vitamin D. In: Kleinman RE, ed. Pediatric nutrition handbook, 4th ed. Elk Grove Village, IL: American Academy of Pediatrics, 1998:275–7.
112. Joint Committee on National Health Education Standards. National health education standards: achieving health literacy—an investment in the future. Atlanta, GA: American Cancer Society, 1995.
113. McKenzie FD, Richmond JB. Linking health and learning: an overview of coordinated school health programs. In: Marx E, Wooley SF, eds. Health is academic: a guide to coordinated school health programs. New York, NY: Teachers College Press, 1998.
114. Carlyon P, Carlyon W, McCarthy AR. Family and community involvement in school health. In: Marx E, Wooley SF, eds. Health is academic: a guide to coordinated school health programs. New York, NY: Teachers College Press, 1998.
115. Glanz K, Lewis FM, Rimer BK, eds. Health behavior and health education: theory, research and practice. 2nd ed. San Francisco, CA: Jossey-Bass Inc, 1997.
116. Henderson A, Rowe DE. A healthy school environment. In: Marx E, Wooley SF, eds. Health is academic: a guide to coordinated school health programs. New York, NY: Teachers College Press, 1998.
117. Glanz K, Lankenau B, Foerster S, Temple S, Mullis R, Schmid T. Environmental and policy approaches to cardiovascular disease prevention through nutrition: opportunities for state and local action. Health Educ Qtly 1995;22:512–27.
118. Sallis JF, Owen N. Ecological models. In: Glanz K, Lewis FM, Rimer BK, eds. Health behavior and health education: theory, research and practice. 2nd ed. San Francisco, CA: Jossey-Bass Inc, 1997:403–24.
119. Queensland Cancer Fund. Working towards a SunSmart Queensland. Queensland, Australia: Queensland Cancer Fund, 1997.
120. Schofield MJ, Edwards K, Pearce R. Effectiveness of two strategies for dissemination of sun-protection policy in New South Wales primary and secondary schools. Aust N Z J Public Health 1997;21:743–50.
121. Glanz K, Carbone E, Song V. Formative research for developing targeted skin cancer prevention programs for children in multiethnic Hawaii. Health Education Research 1999;14:155–66.

122. Glanz K, Lew RA, Song V, Murakami-Akatsuka L. Skin cancer prevention program in outdoor recreation settings: effects of the Hawaii SunSmart Program. Effective Clinical Practice 2000;3:53–61.
123. Wolf SM, Swanson LA, Manning R. PROJECT SPF (Sun Safety, Protection and Fun): Arizona Department of Health Services Early Childhood Skin Cancer Prevention Education Program. Health Educ Behav 1999;26:301–5.
124. United States Environmental Protection Agency. The SunWise School Program Guide. Available at http://www.epa.gov/sunwise/guide.pdf.
125. Buller DB, Borland R. Skin cancer prevention for children: a critical review. Health Educ Behav 1999;26:317–43.
126. Buller MK, Loescher LJ, Buller DB. Sunshine and Skin Health: a curriculum for skin cancer prevention education. J Cancer Educ 1994;9:155–62.
127. Buller MK, Goldberg G, Buller DB. Sun Smart Day: a pilot program for photoprotection education. Pediatric Dermatol 1997;14:257–63.
128. Thornton CM, Piacquadio DJ. Promoting sun awareness: evaluation of an educational children's book. Pediatrics 1996; 98:52–5.
129. Buller DB, Buller MK, Beach B, Ertl G. Sunny days, healthy ways: evaluation of a skin cancer prevention curriculum for elementary school-aged children. J Am Acad Dermatol 1996;35:911–22.
130. Girgis A, Sanson-Fisher RW, Tripodi DA, Golding T. Evaluation of interventions to improve solar protection in primary schools. Health Educ Qtly 1993;20:275–87.
131. Fork HE, Wagner RF, Wagner KD. The Texas peer education sun awareness project for children: primary prevention of malignant melanoma and nonmelanocytic skin cancers. Cutis 1992;50:363–4.
132. Reding DJ, Fischer V, Gunderson P, Lappe K. Skin cancer prevention: a peer education model. Wisc Med J 1995;94:75–9.
133. Hornung RL, Lennon PA, Garrett JM, DeVellis RF, Weinberg PD, Strecher VJ. Interactive computer technology for skin cancer prevention targeting children. Amer J Prev Med 2000;18:69–76.
134. Cantor MA, Rosseel K. The United States Environmental Protection Agency SunWise School Program. Health Educ Behav 1999;26: 303–4.
135. Perry CL. Creating health behavior change: how to develop community-wide programs for youth. Thousand Oaks, CA: Sage, 1999.
136. Mayer JA, Slymen DJ, Eckhardt L, et al. Reducing ultraviolet radiation exposure in children. Prev Med 1997;26:516–22.
137. Parrott R, Duggan A, Cremo J, Eckles A, Jones K, Steiner C. Communicating about youth's sun exposure risk to soccer coaches and parents: a pilot study in Georgia. Health Educ Behav 1999; 26:385–95.
138. Dietrich AJ, Olson AL, Sox CH, et al. A community-based randomized trial encouraging sun protection for children. Pediatrics 1998;102:E64.
139. Dietrich AJ, Olson AL, Sox CH, Tosteson TD, Grant-Petersson J. Persistent increase in children's sun protection in a randomized controlled community trial. Prev Med 2000;31:569–74.
140. Miller DR, Geller AC, Wood MC, Lew RA, Koh HK. The Falmouth Safe Skin Project: evaluation of a community program to promote sun protection in youth. Health Educ Behav 1999 26:369–84.
141. Arthey S, Clarke VA. Suntanning and sun protection: a review of the psychological literature. Soc Sci Med 1995 40:265–74.
142. Glanz K, Maddock J, Lew RA, Murakami-Akatsuka L. A randomized trial of the Hawaii SunSmart program's impact on outdoor recreation staff. J Am Acad Dermatol 2001;44:973–8.
143. Easton AN, Price JH, Boehm K, Telljohann SK. Sun protection counseling by pediatricians. Arch Pediatr Adolesc Med 1997; 151:1133–8.
144. Green LW, Kreuter MW. Health promotion planning: an educational and ecological approach. 3rd ed. Mountain View, CA: Mayfield Publishing, 1999.
145. Hill D, Dixon H. Promoting sun protection in children: rationale and challenges. Health Educ Behav 1999;26:409–17.

Appendix A

Public Health Action Steps from the International Agency for Research on Cancer

1. Protection of the skin from solar damage ideally involves various actions that include wearing tightly woven protective clothing that adequately covers the arms, trunk, and legs and a hat that provides adequate shade to the whole of the head; seeking shade whenever possible; avoiding outdoor activities during periods of peak insolation; and using sunscreens. Sunscreens should not be used as the sole agent for protection against the sun.
2. Sunscreens should not be used as a means of extending the duration of solar exposure (e.g., prolonging sunbathing) and it should not be used as a substitute for clothing on sites that are usually unexposed (e.g., the trunk and buttocks).
3. Daily use of sunscreen with a high sun protection factor (>15) on exposed skin is recommended for residents of areas of high insolation who work outdoors or enjoy regular outdoor recreation. Daily use of a sunscreen can reduce the cumulative solar exposure that causes actinic keratoses and squamous cell carcinoma.
4. Adequate solar protection is more important during childhood than any other time in life, and parents and school managers should assiduously apply the first two recommendations.

Source: The International Agency for Research on Cancer Working Group on the Evaluation of Cancer-Preventive Agents. Sunscreens. In: IARC Handbooks of Cancer Prevention. Vol 5. Lyon, France: International Agency for Research on Cancer, 2001.

Appendix B

Sunscreen: How To Select, Apply, and Use It Correctly

When To Apply Sunscreen

- Apply sunscreen approximately 30 minutes before being in the sun (for best results) so that it can be absorbed by the skin and less likely to wash off when you perspire.
- Remember to reapply sunscreen after swimming or strenuous exercise.
- Apply sunscreen often throughout the day if you work outdoors, and wear hats and protective clothing.

How To Apply Sunscreen

- Shake well before use to mix particles that might be clumped up in the container. Consider using the new spray-on or stick types of sunscreen.
- Be sure to apply enough sunscreen. As a rule of thumb, use an ounce (a handful) to cover your entire body.
- Use on all parts of your skin exposed to the sun, including the ears, back, shoulders, and the back of the knees and legs.
- Apply thickly and thoroughly.
- Be careful when applying sunscreen around the eyes.

What To Look for When You Buy Sunscreen

- Pick a broad-spectrum sunscreen that protects against UV-A and UV-B rays and has a sun protection factor (SPF) of at least 15.
- Read product labels. Look for a waterproof brand if you will be sweating or swimming. Buy a nonstinging product or one specifically formulated for your face.
- Buy a brand that does not contain para-aminobenzoic acid (PABA) if you are sensitive to that ingredient.
- Try a sunscreen with different chemicals if your skin reacts badly to the one that you are using. Not all sunscreens have the same ingredients.
- Use a water-based sunscreen if you have oily skin or are prone to acne.
- Be aware that more expensive does not mean better. Although a costly brand might feel or smell better, it is not necessarily more effective than a cheaper product.
- Be aware of the expiration date because some sunscreen ingredients might degrade over time.

Appendix C

Skin Cancer Education Resources

Skin cancer information and resources are available from various governmental agencies, voluntary organizations, medical associations, and corporations. Information is often available in your state or local area. At the national level, information is available from the sources listed below. The Internet address links take you directly to each organization's skin cancer information section.

American Academy of Dermatology
930 North Meacham Road
P.O. Box 681069
Schaumburg, IL 60173-4965
Phone: 847-330-0230
http://www.aad.org/skincnrUpdates.html

AMC Cancer Research Center
Phone: 800-321-1557
http://www.amc.org/html/market/h_market_sunnydays.html
email: products@amc.org

American Cancer Society
1599 Clifton Road, N.E.
Atlanta, GA 30329
Phone: 800-227-2345
http://www3.cancer.org/cancerinfo

Anti-Cancer Council of Victoria
100 Drummond Street
Carlton Victoria 3053 Australia
Phone: 61-3-9635-5152
Fax: 61-3-9635-5260
http://www.sunsmart.com.au

CDC
National Center for Chronic Disease
Prevention and Health Promotion
Division of Cancer Prevention and Control
4770 Buford Highway, N.E.; Mailstop K57
Atlanta, GA 30341-3724
Phone: 770-488-4751
http://www.cdc.gov/cancer/nscpep

National Cancer Institute
Cancer Information Service
Building 31, Room 10A16
31 Center Drive MSC-2580
Bethesda, MD 20892-2580
Phone: 800-422-6237
http://www.cancer.gov

National Council on Skin Cancer Prevention
http://www.skincancerprevention.org

Norris Cotton Cancer Center
The Sun Safe Project
Dartmouth Medical School
Department of Community
and Family Medicine
7250 Strasenburgh
Hanover, NH 03755
Phone: 603-650-1566
http://www.dartmouth.edu/dms/sunsafe

U.S. Environmental Protection Agency
Sun Wise School Program
EPA Stratospheric Ozone Information
401 M Street SW (6205J)
Washington, DC 20460
Phone: 800-296-1996
http://www.epa.gov/sunwise

Participating Agencies and Organizations

American Academy of Dermatology;* American Academy of Pediatrics,* American Association for Health Education;* American Cancer Society;* AMC Cancer Research Center and Foundation;* American Optometric Association;* American Pharmaceutical Association;* American School Health Association;* Council of Chief State School Officers; Dermatology Nurses' Association;* Environmental Protection Agency;* Melanoma Research Foundation;* National Association for Sport and Physical Education; National Association of School Nurses, Inc.;* National Association of State Boards of Education; National Cancer Institute;* National Education Association; National Safety Council;* National School Boards Association; President's Council on Physical Fitness and Sports; Skin Cancer Foundation;* Skin Cancer Prevention Program, California Department of Health Services;* Society of State Directors of Health, Physical Education and Recreation; Society for Public Health Education;* U.S. Department of Education.

Participants

Melissa Galvin, Ph.D., M.P.H., University of Alabama; Kim Reynolds, Ph.D., University of Alabama; Barbara Bewerse, M.N., M.P.H., University of North Carolina; Corinne Graffunder, M.P.H., CDC; Rebeca Lee-Pethel, M.P.A., CDC.

*Members of the National Council for Skin Cancer Prevention who independently have endorsed the *Guidelines for School Programs To Prevent Skin Cancer*.

The *Morbidity and Mortality Weekly Report (MMWR)* series is prepared by the Centers for Disease Control and Prevention (CDC) and is available free of charge in electronic format and on a paid subscription basis for paper copy. To receive an electronic copy on Friday of each week, send an e-mail message to *listserv@listserv.cdc.gov*. The body content should read *SUBscribe mmwr-toc*. Electronic copy also is available from CDC's Internet server at *http://www.cdc.gov/mmwr* or from CDC's file transfer protocol server at *ftp://ftp.cdc.gov/pub/Publications/mmwr*. To subscribe for paper copy, contact Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; telephone 202-512-1800.

Data in the weekly *MMWR* are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the following Friday. Address inquiries about the *MMWR* series, including material to be considered for publication, to Editor, *MMWR* Series, Mailstop C-08, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30333; telephone 888-232-3228.

☆U.S. Government Printing Office: 2002-733-100/69018 Region IV