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Preventing Skin Cancer

Findings of the Task Force on Community Preventive Services
on Reducing Exposure to Ultraviolet Light

Counseling to Prevent Skin Cancer

Recommendations and Rationale
of the U.S. Preventive Services Task Force



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Preventing Skin Cancer

Findings of the Task Force on Community Preventive Services on Reducing Exposure to Ultraviolet Light

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Summary

Rates of skin cancer, the most common cancer in the United States, are increasing. The most preventable risk factor for skin cancer is unprotected ultraviolet (UV) exposure. Seeking to identify effective approaches to reducing the incidence of skin cancer by improving individual and community efforts to reduce unprotected UV exposure, the Task Force on Community Preventive Services conducted systematic reviews of community interventions to reduce exposure to ultraviolet light and increase protective behaviors. The Task Force found sufficient evidence to recommend two interventions that are based on improvements in sun protective or “covering-up” behavior (wearing protective clothing including long-sleeved clothing or hats): educational and policy approaches in two settings—primary schools and recreational or tourism sites. They found insufficient evidence to determine the effectiveness of a range of other population-based interventions and recommended additional research in these areas: educational and policy approaches in child care centers, secondary schools and colleges, recreational or tourism sites for children, and workplaces; interventions conducted in health-care settings and targeted to both providers and children’s parents or caregivers; media campaigns alone; and communitywide multicomponent interventions. This report also presents additional information regarding the recommended community interventions, briefly describes how the reviews were conducted, provides resources for further information, and provides information that can help in applying the interventions locally. The U.S. Preventive Services Task Force conducted a systematic review of counseling by primary care clinicians to prevent skin cancer (CDC. Counseling to prevent skin cancer: recommendation and rationale of the U.S. Preventive Services Task Force. MMWR 2003;52[No. RR-15]:13–17), which is also included in this issue, the first jointly released findings from the Task Force on Community Preventive Services and the U.S. Preventive Services Task Force.

Background

In the United States, the incidence and mortality from cutaneous malignant melanoma (CMM) have increased rapidly in the last few decades (1,2). In 2003, approximately 54,200 persons will have new diagnoses of melanoma, and 7,600 will die from the disease (3). The incidence of the other two skin cancers, basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), is estimated to be >1 million new cases per year (3). According to the data from the Surveillance, Epidemiology and End Results (SEER) cancer registry of the National Cancer Institute, during 1995–1999, average annual age-adjusted incidence rates for melanoma per 100,000 population were 23.5 for men and 15.7 for women for non-Hispanic whites; 3.8 for men and 3.7 for women for Hispanics; 1.8 for men and 1.3 for women for Asians; 1.5 for men and 0.9 for Ameri-

can Indian/Alaska Natives; and 1.2 for men and 0.9 for women for non-Hispanic blacks (4). Well-established risk factors for skin cancer include family history of skin cancer, fair skin, red or blonde hair, propensity to burn, inability to tan, and preventable risk factors such as intermittent (for CMM and BCC) or cumulative exposure to ultraviolet (UV) radiation (for SCC) (5–8). Despite the adverse effects of unprotected UV exposure, approximately 32% of U.S. adults report having had a sunburn in the past year (9). Parents or caregivers reported that 72% of adolescents aged 11–18 years have had at least one sunburn (10), and 43% of white children aged <11 years experienced a sunburn in the past year (11). With respect to sun-protective behaviors, only one third of adults reported that they use sunscreen, seek shade, or wear protective clothing when out in the sun (12–13). Adolescents aged 11–18 years

were found to routinely practice sun-protective behaviors slightly less than adults (using sunscreen [31%], seeking shade [22%], and wearing long pants [21%]) (14). Among children aged <11 years, sunscreen use (62%) and shade seeking (26.5%) were the most frequently reported sun-protective behaviors (15).

The interventions reviewed in this article pertain to two objectives set in *Healthy People 2010* (16):

- Increase to 75% the proportion of persons who use at least one of the following protective measures that may reduce the risk of skin cancer: avoid the sun between 10 a.m. and 4 p.m.; wear sun-protective clothing when exposed to sunlight; use sunscreen with a sun-protection factor (SPF) of 15 or higher; and avoid artificial sources of ultraviolet light (Objective 3-9).
- Reduce melanoma deaths to 2.5 per 100,000 population (Objective 3-8).

By implementing interventions demonstrated to be effective in reducing exposure to UV light and increasing sun-protective behaviors, policy makers and public health providers can help their communities achieve these goals while using community resources efficiently. By producing additional research on other promising but as yet unproven interventions, researchers and communities can expand the portfolio of tested interventions. This report complements two reviews (17–18) and an updated Recommendation and Rationale statement (19) from the third U.S. Preventive Services Task Force (USPSTF) on the evidence for counseling and screening for skin cancer. This report and other related publications provide guidance from the Task Force on Community Preventive Services, an independent, nonfederal task force, to personnel in state and local health departments, education agencies, universities, community coalitions, organizations that fund public health programs, health-care systems, and others who have interest in or responsibility for reducing exposure to UV light and increasing protective behaviors for prevention of skin cancer.

Introduction

The Task Force on Community Preventive Services (the Task Force) is developing the *Guide to Community Preventive Services* (the *Community Guide*), a resource that will include multiple systematic reviews, each focusing on a preventive health topic. The *Community Guide* is being developed with the support of the U.S. Department of Health and Human Services (DHHS) in collaboration with public and private partners. Although CDC provides staff support to the Task Force for development of the *Community Guide*, the recommendations presented in this report were developed by the Task Force and are not necessarily the recommendations of DHHS or CDC.

This report is one in a series of topics included in the *Community Guide*. It provides an overview of the process used by the Task Force to select and review evidence and summarize its recommendations regarding interventions to reduce UV exposure and increase UV protective behaviors for prevention of skin cancer. A full report on the recommendations, additional evidence (i.e., discussions of applicability, additional benefits, potential harms, existing barriers to implementation, costs, cost benefit, and cost effectiveness of the interventions [when available]), and remaining research questions will be published in the *American Journal of Preventive Medicine*.

Community Guide topics are prepared and released as each is completed. The findings from systematic reviews on vaccine-preventable diseases, tobacco use prevention and reduction, motor vehicle occupant injury, physical activity, diabetes, oral health, and the effects of the social environment on health have already been published. A compilation of systematic reviews will be published in book form. Additional information regarding the Task Force and the *Community Guide* and a list of published articles are available on the Internet at <http://www.thecommunityguide.org>.

Methods

The methods used by the *Community Guide* for conducting systematic reviews and linking evidence to recommendations have been described elsewhere (20). In brief, for each *Community Guide* topic, a multidisciplinary team (the systematic review development team) conducts a review consisting of the following steps:

- developing an approach to organizing, grouping, and selecting the interventions;
- systematically searching for and retrieving evidence;
- assessing the quality of and summarizing the strength of the body of evidence of effectiveness;
- assessing cost and cost effectiveness evidence, identifying applicability and barriers to implementation (if the effectiveness of the intervention has been established);
- summarizing information regarding other evidence; and
- identifying and summarizing research gaps.

For each review of interventions regarding skin cancer prevention, the systematic review development team developed a conceptual model (or analytic framework) to show the relationship of the intervention to relevant intermediate outcomes (e.g., knowledge, attitudes and beliefs, and intentions regarding sun-protective behaviors), to implementing key sun-protective behaviors, and to the assumed relationships of improvements in sun-protective behaviors to skin cancer prevention. A representative example of an analytic framework for mass media interventions is illustrated (Figure). The

analytic frameworks for the other interventions were similar to this example except that they included environmental and policy components.

The analytic frameworks focused on key health outcomes (e.g., sunburn or nevi*) and sun-protective behaviors:

- avoiding peak sun;
 - seeking shade, and
 - avoiding the sun during peak UV hours.
- covering up;
 - wearing a hat,
 - wearing a long-sleeved shirt, and
 - wearing pants.
- sunscreen use.

The team also examined intermediate outcomes that were postulated to be associated with sun-protective behaviors (e.g., knowledge, attitudes, and intentions). Recommendations were based either on better health outcomes (rare with this subject matter because relevant cancer outcomes would become apparent long after the time of the intervention) or risk behaviors that were thought to be established proxies for

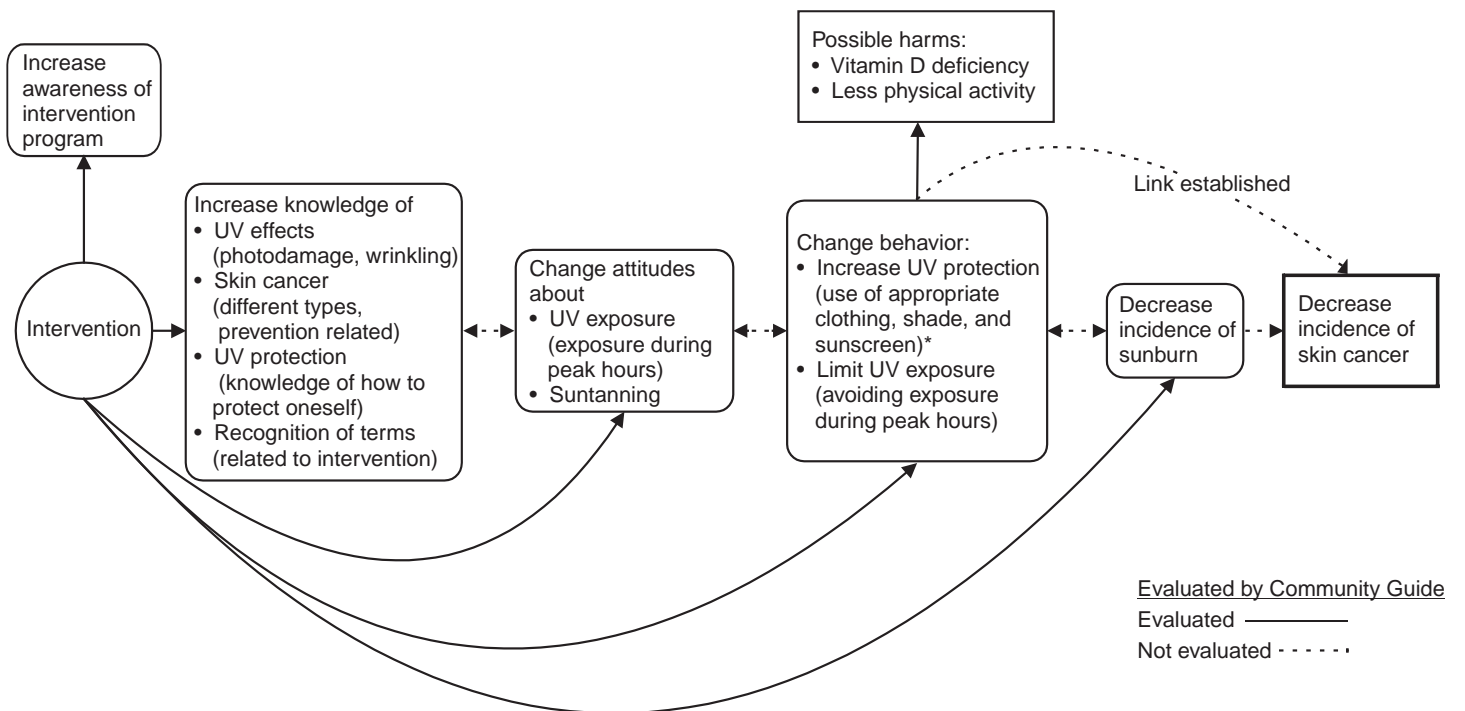
* Nevi are lesions of pigment-forming skin cells that can be a risk factor for melanoma.

cancer outcomes (in this case, avoiding peak UV hours or covering up).

The team considered sunscreen use to be a key secondary outcome of sun protection programs because sunscreens prevent sunburn (a marker of unprotected UV exposure and a health outcome associated with increased risk of skin cancer in epidemiologic studies) and reduce the incidence of SCC, and better alternatives are not always available (e.g., when swimming). Sunscreen’s role in preventing skin cancer has been demonstrated to be complex, according to information in recent reports from national and international groups (18,21) and summarized in the last section of this report.

Epidemiologic studies suggest that sunscreen use could be considered harmful if it increased a person’s total time in the sun and total UV exposure. Partly for that reason, sunscreen use alone might not protect against melanoma despite its protective effect on SCC. The International Agency for Research on Cancer (IARC) recommends that sunscreens not be used as the sole method for skin cancer prevention and not be used as a means to extend the duration of UV exposure (21). The team therefore did not consider sunscreen use, by itself, to be an established proxy for better health.

FIGURE. Analytic framework for media interventions to reduce ultraviolet (UV) exposure and increase sun-protective behaviors. Major stratification variables were type of media (e.g., small media [posters, brochures] versus large media [television, radio]); characteristics of target population (e.g., age, sex, skin color, skin type, baseline risk, socioeconomic status, sunburn incidence, occupation); intervention intensity (i.e., comparison, some intervention, high level of intervention); geographic or environmental characteristics (e.g., urban, rural, climate of location [e.g., sunny versus cloudy]); intervention characteristics (e.g., size, access to media).



* Change in sunscreen use alone will not result in recommendation outcome (see report).

The coordination team,[†] which conducted the systematic review, and their consultants[§] generated a comprehensive list of interventions to reduce skin cancer. From this, a priority list of interventions for review was developed through a process of polling the coordination team, the consultants, and other specialists in the field regarding their perception of the public health importance (number of persons affected), the practicality of application, and the need of those promoting UV protective behaviors for information regarding each intervention.

To conduct the review, the team organized interventions into three groups: setting-specific, target population-specific, and communitywide (Table). Setting was used as an organizing structure because it was a convenient proxy for key characteristics of the target populations and the implementers of the interventions. The majority of the interventions in this group involved diverse activities — provision of information, environmental approaches (e.g., planting shade trees), or policy

approaches (e.g., implementing a policy to reschedule outdoor activities or a requirement to wear hats when outside). Interventions in the setting-specific group consisted of educational and policy approaches in the following settings:

- child care centers,
- primary schools,
- secondary schools and colleges,
- recreational or tourism settings,
- occupational settings, and
- health-care settings and for health-care providers.

The target population of interest category included one intervention: children's parents or caregivers (some of these interventions might have already been examined in setting-specific groups).

The category of communitywide interventions included two types of interventions and a subgroup:

- media campaigns alone, and
- communitywide multicomponent interventions that include at least two interventions in an integrated manner. (Comprehensive communitywide programs, a subset of communitywide multicomponent interventions, include interventions at several levels [individual, setting, whole community] and last longer than 1 year.)

Interventions reviewed were either single component (i.e., using only one activity to achieve desired outcomes) or multicomponent (i.e., using more than one activity, such as a policy or environmental intervention with a media campaign). Certain studies provided results relevant to more than one intervention and were included in each of the reviews to which they were applicable. Studies and outcome measures were classified according to definitions developed as part of the review process. The nomenclature used in this report sometimes differs from that used in the original studies.

To be included in the reviews of effectiveness, studies had to 1) be primary investigations of interventions selected for evaluation rather than, for example, guidelines or reviews; 2) be published in English during the years 1966–2000; 3) be conducted in established market economies[¶]; and 4) compare outcomes among groups of persons exposed to the intervention with outcomes among groups of persons not exposed or less exposed to the intervention (i.e., the study design included a concurrent or before-and-after comparison.)

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[¶] Established market economies as defined by the World Bank are Andorra, Australia, Austria, Belgium, Bermuda, Canada, Channel Islands, Denmark, Faeroe Islands, Finland, France, Germany, Gibraltar, Greece, Greenland, Holy See, Iceland, Ireland, Isle of Man, Italy, Japan, Liechtenstein, Luxembourg, Monaco, the Netherlands, New Zealand, Norway, Portugal, San Marino, Spain, St. Pierre and Miquelon, Sweden, Switzerland, the United Kingdom, and the United States.

TABLE. Recommendations of the Task Force on Community Preventive Services regarding the use of selected interventions to prevent skin cancer by reducing exposure to ultraviolet light.

Intervention (no. of qualifying reports)	Task Force recommendation for use	Intervention description	Key findings
Setting-specific interventions			
Educational and policy approaches in primary schools* (n = 20)	Recommended: sufficient evidence of effectiveness in improving children's sun-protective "covering-up" behavior	Modified short-term curricula using didactic teaching, interactive class and home-based activities, interactive CD-ROM multimedia programs, peer education, and policy changes.	Sufficient evidence of improvement in children's sun-protective "covering-up" behavior (wearing protective clothing — hat, shirt, cover-up garment, or pants). Median relative increase of 25% (interquartile range: 1%–40%, 6 studies) for studies using a concurrent control group; larger among studies using a before-and-after design. Insufficient evidence to determine effectiveness in improving other sun-protective behaviors (e.g., avoiding the sun) because of inconsistent results. Insufficient evidence to determine effectiveness in decreasing sunburns because of only a single study, with limitations in design and execution.
Educational and policy approaches in recreational or tourism settings† (n = 11) (Studies in recreational and tourism settings that are oriented to children's parents and caregivers are addressed in that category.)	Recommended: sufficient evidence of effectiveness in improving adult sun-protective "covering-up" behavior Insufficient evidence§ to determine effectiveness in improving children's sun-protective behaviors	Single- and multicomponent interventions designed to increase knowledge; influence attitudes, beliefs, and intentions; and change behavior of adults and children. Included one or more of the following: educational brochures, including culturally relevant materials and photographs of skin cancer lesions; sun-safety training of and role-modeling by lifeguards, aquatic instructors, and outdoor recreation staff; sun-safety lessons, interactive activities, and incentives for parents and children; increasing available shaded areas; providing sunscreen; and point-of-purchase prompts.	Sufficient evidence of effectiveness in increasing adult sun-protective "covering-up" behavior (wearing protective clothing — hat, shirt, cover-up garment, or pants). Median net increase of 11.2% (interquartile range: 5.1%–12.9%, 5 studies). Insufficient evidence to determine effectiveness in improving children's sun-protective behavior because of inconsistent results.
Educational and policy approaches in child care centers¶ (n = 2)	Insufficient evidence§ to determine effectiveness	Ranged from a curriculum that included interactive classroom and take-home activities to staff education, brochures for parents, and a working session to develop skin protection plans for centers. All focused on some combination of increasing application of sunscreen, scheduling activities to avoid peak sun hours, increasing availability of shade and encouraging children to play in shady areas, and encouraging children to wear sun-protective clothing.	Insufficient evidence to determine effectiveness in decreasing sunburns or improving sun-protective behaviors because of limited number of studies with limitations in design and execution.
Educational and policy approaches in secondary schools and colleges** (n = 13)	Insufficient evidence§ to determine effectiveness	Didactic classroom teaching combined with some interactive class and home-based activities; internet-based activities; small media; and providing sunscreen sample, extra class credit, or money. One study used dissemination strategy and school staff support for implementing sun-protective policies and practices.	Insufficient evidence to determine effectiveness in decreasing sunburns or improving sun-protective behaviors because of limitations in design and execution of available studies, a limited number of studies that measured key behaviors or health outcomes, and limited number of policy approaches available for review.

TABLE. (Continued) Recommendations of the Task Force on Community Preventive Services regarding the use of selected interventions to prevent skin cancer by reducing exposure to ultraviolet light

Intervention (no. of qualifying reports)	Task Force recommendation for use	Intervention description	Key findings
Educational and policy approaches in occupational settings ^{††} (n = 8)	Insufficient evidence [§] to determine effectiveness	Single- and multicomponent interventions designed to increase knowledge; influence attitudes, beliefs, and intentions; and change behavior of workers. Included one or more of the following: surveys and questionnaires to assess knowledge, attitudes, beliefs, intentions, and behavior; sun-safety training of safety officers, managers, outdoor recreation and swimming pool staff; peer-leader modeling of sun-safe behaviors; brochures or didactic instruction; sun-safety lessons, interactive activities, and incentives for parents and children; provision or promotion of sun-protective gear or products (wide-brimmed hats, long-sleeved shirts, sunglasses, sunscreen, and shade structures); and screening and assessments by dermatologists.	Insufficient evidence to determine effectiveness in decreasing sunburns or improving sun-protective behaviors of workers because of inconsistent results and limited number of studies that measured key behavioral or health outcomes.
Educational and policy approaches in health-care settings and for providers ^{§§} (n = 11)	Insufficient evidence [§] to determine effectiveness	<p>Single- or multicomponent interventions designed to increase knowledge, attitudes, sun-protective behaviors, and counseling behaviors of providers (e.g., physicians, nurses, physician assistants, medical students, and pharmacists), with the ultimate aim of improving clients' sun-protective behaviors.</p> <p>Health-care settings (i.e., pharmacy, drugstore, clinic, physician's office, and medical schools) also used to recruit and change client's (patient's) knowledge, attitude, and sun-protective behaviors.</p> <p>Included provider education sessions, Internet-based education, videos, and role modeling. No policy approaches used in this setting.</p>	Insufficient evidence to determine effectiveness in decreasing sunburns or improving sun-protective behaviors of clients because of small numbers of studies, limitations in study designs and execution, and a limited number of studies measuring key behavioral or health outcomes.
Target population-specific interventions			
Interventions oriented to children's parents or caregivers ^{¶¶} (n = 9)	Insufficient evidence [§] to determine effectiveness	Single- and multicomponent interventions designed to increase knowledge; influence attitudes, beliefs, and intentions; and change behavior of parents or caregivers (including teachers and coaches) and children under their care. Included one or more of the following: surveys and questionnaires to assess knowledge, attitudes, beliefs, intentions, and behavior; educational brochures, newsletters, tip cards, and postcard reminders at end of summer; sun-safety lessons, interactive activities, and incentives for parents and children; increasing available shaded areas; providing sunscreen; point-of-purchase prompts and discount coupons for hats, sun-safety logo T-shirts, and sunscreen. Most studies conducted in recreational settings.	Insufficient evidence to determine effectiveness in decreasing sunburns or improving sun-protective behaviors of parents, caregivers, and children because of inconsistent results and a limited number of studies measuring key behavioral and health outcomes.
(See also Educational and policy interventions in recreational or tourism settings.)			

TABLE. (Continued) Recommendations of the Task Force on Community Preventive Services regarding the use of selected interventions to prevent skin cancer by reducing exposure to ultraviolet light

Intervention (no. of qualifying reports)	Task Force recommendation for use	Intervention description	Key findings
Communitywide interventions			
Media campaigns alone*** (n = 3)	Insufficient evidence [§] to determine effectiveness	Mass media with or without small media. Majority were low-intensity interventions using television programs, CD-ROM-based information kiosks, and reporting of UV index. Small media included brochures, flyers, newsletters, informational letters, or videos.	Insufficient evidence to determine effectiveness in improving sun-protective behaviors or decreasing sunburn prevalence because of limited numbers of studies with limitations in design and execution.
Communitywide multicomponent interventions†††§§§ (n = 8)	Insufficient evidence [§] to determine effectiveness	Combinations of individual-directed strategies, media campaigns, and environmental and policy changes, in an integrated effort in a defined geographic area (city, state, province, or country). Programs may also incorporate setting-specific strategies. Usually delivered with a defined theme, name or logo, and set of messages. Studies were included if they occurred in a defined geographic area and included at least two components and more than a single setting. Comprehensive communitywide interventions defined as multilevel (i.e., include multiple individual-directed, setting-specific, and communitywide components), addressing a substantial proportion of the population in a defined area, and lasting longer than 1 year.	Insufficient evidence to determine effectiveness in increasing sun-protective behaviors or reducing UV exposure of adults or children because of inconsistent results. Of seven studies that measured covering-up or sun-avoidance behaviors, four demonstrated generally desirable outcomes, one had results that were in the undesirable direction, and two others demonstrated essentially no change in the behaviors of interest. Longer term and more intensive comprehensive communitywide programs had generally more positive outcomes. All three studies reported desirable changes in covering-up or sun-avoidance. These results, all from Australia, are promising but, by themselves, still provide insufficient evidence because of small numbers of studies and limitations in study design and execution.

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- §§§ This evaluation assesses the effect of the multicomponent campaigns as a whole on population outcomes. Evaluations that assess the independent effect of one or more components (e.g., school-based or occupational programs) on a particular population are included in other reviews.

Searches of three computerized databases (MEDLINE, PsychINFO, CINAHL)** were conducted. Team members also reviewed reference lists and consulted with other specialists in the field (e.g., participants in a skin cancer prevention listserv) to identify relevant studies. Each included study was evaluated by using a standardized abstraction form and was assessed for suitability of the study design and threats to validity (22). Studies were characterized as having good, fair, or limited execution based on the number of threats to validity (20).

Results for each outcome of interest were obtained from each study that met the minimum quality criteria. Net effects were derived when appropriate by calculating the difference between the changes observed in the intervention and comparison groups relative to the respective baseline levels.†† The median was used to summarize a typical measure of effect across the body of evidence for each outcome of interest; both the median and the range are reported. For bodies of evidence consisting of four or more studies, an interquartile range was used to represent variability.

The strength of the body of evidence of effectiveness was characterized as strong, sufficient, or insufficient on the basis of the number of available studies, the suitability of study designs for evaluating effectiveness, the quality of execution of the studies as defined by the *Community Guide* (20), the consistency of the results, and the effect size.

The Task Force uses these systematic reviews to evaluate the evidence of intervention effectiveness and makes recommendations based on the findings of the reviews (20). The strength of each recommendation is based on the evidence of effectiveness (i.e., an intervention is recommended on the basis of either strong or sufficient evidence of effectiveness) (20). Other types of evidence can also affect a recommendation. For example, harms resulting from an intervention that outweigh benefits might lead to a recommendation that the

intervention not be used even if it is effective in improving some outcomes.

A finding of insufficient evidence to determine effectiveness should not be interpreted as evidence of ineffectiveness. Insufficient evidence may be found for any of a number of reasons, alone or in combination, including an insufficient number of studies; too many threats to the validity of the available studies based on their design, execution, or both; conflicts in the results of the studies that preclude a coherent summary of effectiveness; or no indication that the outcomes measured to date, by themselves, represent success in improving health. In all these situations, a finding of insufficient evidence to determine effectiveness is important for identifying areas of uncertainty and continuing research needs. In contrast, sufficient or strong evidence of ineffectiveness would lead to a recommendation against use of the intervention.

Results

Database searches and bibliographic reviews yielded a list of 6,373 potentially relevant titles. After review of the abstracts and consultation with specialists in the field, a total of 313 reports were retrieved. Of these, 154 were not used in the review because they did not provide results, did not refer to an intervention, or reported on noncomparative studies. The remaining 159 were retained for full review. On the basis of limitations in execution or design or because they provided only background information on studies that were already included, 74 of these were excluded and were not considered further. The remaining 85 studies were considered qualifying studies. The Task Force recommendations in this report are based on the systematic review and evaluation of these qualifying studies, all of which had good or fair quality of execution.

The Task Force recommended two interventions, both in the setting-specific category (Table):

- educational and policy approaches in primary schools — changing children's covering-up behavior (wearing protective clothing); and
- educational and policy approaches in recreational or tourism settings — changing adults' covering-up behaviors.

Interventions in primary school settings were designed to increase sun-protective knowledge, attitudes, intentions, and behavior among children from kindergarten through eighth grade. The interventions ranged from a curriculum that included interactive classroom and take-home activities to staff education, brochures for parents, and a working session to develop skin protection plans for schools. All interventions focused on some combination of increasing application of sunscreen, scheduling activities to avoid peak sun hours,

**These databases can be accessed as follows: MEDLINE: <http://www.ncbi.nlm.nih.gov/PubMed>; PsycINFO: DIALOG <http://www.dialogclassic.com> (requires id/password account), <http://www.apa.org/psycinfo/products/psycinfo.html>; CINAHL: DIALOG <http://www.dialogclassic.com> (requires id/password account), <http://www.cinahl.com/wpages/login.htm>.

††When information for both intervention and control groups was provided for times both before and after the intervention, net intervention effect was calculated as follows:

$$\frac{(I_{\text{post}} - I_{\text{pre}})/I_{\text{pre}}}{(C_{\text{post}} - C_{\text{pre}})/C_{\text{pre}}}$$

where:

I_{post} = last reported outcome rate in the intervention group after the intervention;

I_{pre} = reported outcome rate in the intervention group before the intervention;

C_{post} = last reported outcome rate in the comparison group after the intervention;

C_{pre} = reported outcome rate in the comparison group before the intervention.

If there was no concurrent comparison group, the net intervention effect was $(I_{\text{post}} - I_{\text{pre}})/I_{\text{pre}}$

and if there were no baseline measurements, the net intervention effect was calculated as $(I_{\text{post}} - C_{\text{post}})/C_{\text{post}}$.

increasing availability of shade and encouraging children to play in shady areas, and encouraging children to wear sun-protective clothing. Interventions in this category included at least one of the following activities:

- provision of information to children (e.g., instruction or small media [brochures, flyers, newsletters, informational letters or videos] or both);
- additional activities to influence children's behavior (e.g., modeling, demonstration, role playing);
- activities intended to change the knowledge, attitudes, or behavior of caregivers (i.e., teachers or parents); or
- environmental or policy approaches (e.g., provision of sunscreen, provision of shade, or scheduling outdoor activities to avoid hours of peak sunlight).

Single- and multicomponent interventions in recreational settings were designed to increase knowledge; influence attitudes, beliefs, and intentions; and change behavior of adults and children. Interventions included one or more of the following: educational brochures, including culturally relevant materials and photographs of skin cancer lesions; sun-safety training for lifeguards, aquatic instructors, and outdoor recreation staff and role-modeling by these groups; sun-safety lessons, interactive activities, and incentives for parents and children; increasing available shaded areas; providing sunscreen; and point-of-purchase prompts.

The recommended interventions had small to moderate behavior change scores. In primary schools, the median net relative increase was 25% (interquartile range: 1%–40%, six studies). In recreational settings, the median net relative increase was 11.2% (interquartile range: 5.1%–12.9%, five studies).

It should be noted that the interventions were targeted to populations rather than single persons. Small changes in behavior in large populations can result in substantial public health benefits.

The Task Force found insufficient evidence on which to make recommendations for or against the following interventions: educational and policy approaches in child care centers; educational and policy approaches in secondary schools and colleges; educational and policy approaches in recreational or tourism settings for children; educational and policy approaches in occupational settings; interventions oriented to health-care settings and providers; interventions oriented to children's parents or caregivers; media campaigns alone; and communitywide multicomponent interventions (Table). The finding of insufficient evidence to determine effectiveness was most often based on the limited numbers of studies that measured behavioral or health outcomes, inconsistent evidence among studies that measured changes in sun-protective behaviors, and limitations in the design and execution of available studies.

Summary tables of the reviews will be available at <http://www.thecommunityguide.org/cancer> when the full evidence is published in a supplement to the *American Journal of Preventive Medicine*.

Use of Recommendations in Communities and Health-Care Settings

Malignant melanoma is the deadliest of the skin cancers, and its incidence in the United States has increased rapidly in the past 2 decades. Melanoma accounts for approximately three fourths of all skin cancer deaths. Basal cell and squamous cell skin cancers are seldom fatal but, if advanced, can cause severe disfigurement and morbidity (3). UV exposure in childhood and intense intermittent UV exposures are the major environmental risk factors for melanoma and BCC, and cumulative UV exposure is the major preventable risk factor for SCC (23). National surveys indicate that only one third of Americans practice sun-protective behaviors, and their practices vary greatly, depending on age, sex, and their ability to tan and burn (9,12,13).

The two Task Force recommendations — educational and policy approaches in primary schools, and educational and policy approaches for adults in outdoor recreational or tourism settings — are based on improving covering-up behaviors. These recommendations represent tested interventions that promote decreased UV exposure at the community level. They can be used for planning interventions to promote UV protection or to evaluate existing programs.

Several of the studies reviewed included multiple components that could not be evaluated separately. For example, a school-based program might involve components of policy, such as establishing school guidelines, in tandem with implementation of one-on-one didactic and interactive sessions regarding adapting sun-protective behaviors. Although sun-protective behaviors were increased by school-based programs, the specific effect could not be attributed to one specific intervention characteristic. In selecting and implementing interventions, the potential for an unintended increase in the duration and intensity of UV exposure must be considered. Also, communities should strive to develop comprehensive programs that include a wide range of activities suitable for their local resources, population characteristics, and settings.

The other interventions reviewed, for which evidence was insufficient to determine effectiveness, could also prove useful. They provide a broader taxonomy of interventions that deserve further testing and evaluation, and the documentation of research gaps in these reviews could potentially help to improve the next generation of research. Additional

information on research gaps will be provided in the report in the *American Journal of Preventive Medicine*.

Choosing interventions that are well matched to local needs and capabilities, and then carefully implementing those interventions, are vital steps for increasing UV protection. Several factors can affect the attitudes, ability, and behaviors of a community regarding taking sun safety precautions. Some of the most important are program priorities, location of the community, and population. Establishing skin cancer prevention as a priority might be difficult because skin cancer is but one of many health topics, and for certain communities, may not be as high a priority as other cancers or diseases. Although it might be a higher priority in areas where UV radiation is more intense, even in areas with lower UV intensity, education about UV exposure during times of episodic exposure (e.g., during winter sports, when the sun comes out, and when traveling to higher UV intensity regions) could be helpful. Likewise, although skin cancer prevention might be a higher priority for populations at an increased risk (e.g., light-skinned, sun-sensitive), even darker-skinned or less sun-sensitive persons need to take precautions when exposed to UV radiation. To meet local objectives, recommendations and other evidence provided in the Community Guide should be supplemented with local information such as skin cancer incidence, skin cancer mortality, prevalence of sun-protective behaviors, latitude, UV index, resource availability, administrative structures, and economic and social environments of organizations and practitioners.

These reviews by themselves do not provide advice regarding implementation of effective programs; the referenced articles, however, provide additional detail. Implementation advice is also available elsewhere (24–28).

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Task Force on Community Preventive Services***April 1, 2003**

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Counseling to Prevent Skin Cancer

Recommendations and Rationale of the U.S. Preventive Services Task Force

Summary

This statement summarizes the current U.S. Preventive Services Task Force (USPSTF) recommendation on counseling to prevent skin cancer and the supporting scientific evidence, and updates the 1996 recommendation contained in the Guide to Clinical Preventive Services, Second Edition (U.S. Preventive Services Task Force. Screening for skin cancer. In: Guide to clinical preventive services, 2nd ed. Washington DC: US Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 1996:141–52). The USPSTF finds insufficient evidence to recommend for or against routine counseling by primary care clinicians to prevent skin cancer. Although counseling parents may increase children’s use of sunscreen, the USPSTF found little evidence to determine the effects of counseling on the sun protection behaviors of adults. These behaviors include wearing protective clothing, reducing excessive sun exposure, avoiding sun lamps and tanning beds, or practicing skin self-examination.

The USPSTF, an independent panel of private sector experts in primary care and prevention, systematically reviews the evidence of effectiveness of a wide range of clinical preventive services, including screening tests, counseling, and chemoprevention. Members of the USPSTF represent the fields of family medicine, gerontology, obstetrics/gynecology, pediatrics, nursing, and prevention research.

Introduction

This statement summarizes the current U.S. Preventive Services Task Force (USPSTF) recommendation on counseling to prevent skin cancer and the supporting scientific evidence, and updates the 1996 recommendation contained in the *Guide to Clinical Preventive Services*, Second Edition (1). The USPSTF, an independent panel of private sector experts in primary care and prevention, systematically reviews the evidence of effectiveness of a wide range of clinical preventive services, including screening tests, counseling, and chemoprevention. The Task Force grades its recommendations according to one of five classifications (A, B, C, D, I), reflecting the strength of evidence and magnitude of net benefit (benefits minus harms) (Box 1). The USPSTF grades the quality of the overall evidence for a service on a 3-point scale (good, fair, poor) (Box 2).

This recommendation and rationale statement and complete information on which this statement is based, including evidence tables and references, are available at <http://www.ahrq.gov/clinic/uspstfix.htm> (2) and in print by subscription

through the AHRQ Clearinghouse (1-800-358-9295 or e-mail at ahrqpubs@ahrq.gov) and through the National Guideline Clearinghouse™ at <http://www.guideline.gov>.

Summary of Recommendation

The U.S. Preventive Services Task Force concludes that the evidence is insufficient to recommend for or against routine counseling by primary care clinicians to prevent skin cancer.

I recommendation.

The USPSTF found insufficient evidence to determine whether clinician counseling is effective in changing patient behaviors to reduce skin cancer risk. Counseling parents may increase the use of sunscreen for children, but there is little evidence to determine the effects of counseling on other preventive behaviors (such as wearing protective clothing, reducing excessive sun exposure, avoiding sun lamps/tanning beds, or practicing skin self-examination) and little evidence on potential harms.

Clinical Considerations

- Using sunscreen has been shown to prevent squamous cell skin cancer. The evidence for the effect of sunscreen use in preventing melanoma, however, is mixed. Sunscreens that block both ultraviolet A (UV-A) and ultraviolet B (UV-B) light may be more effective in preventing squamous cell cancer and its precursors than those that block only UV-B light. However, people who use sunscreen alone could increase their risk for melanoma if they increase the time they spend in the sun.

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This report was written by the U.S. Preventive Services Task Force with editorial and technical support from the Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services. The standard MMWR format has been modified to accommodate other publications of the report.

- UV exposure increases the risk for skin cancer among people with all skin types, but especially fair-skinned people. Those who sunburn readily and tan poorly, namely those with red or blond hair and fair skin that freckles or burns easily, are at highest risk for developing skin cancer and would benefit most from sun protection behaviors. The incidence of melanoma among whites is 20 times higher than it is among blacks; the incidence of melanoma among whites is approximately four times higher than it is among Hispanics.
- Observational studies indicate that intermittent or intense sun exposure is a greater risk factor for melanoma than chronic exposure. These studies support the hypothesis that preventing sunburn, especially in childhood, may reduce the lifetime risk for melanoma.
- Other measures for preventing skin cancer include avoiding direct exposure to midday sun (between the hours of 10:00 a.m. and 4:00 p.m.) to reduce exposure to ultraviolet (UV) rays and covering skin exposed to the sun (by wearing protective clothing such as broad-brimmed hats, long-sleeved shirts, long pants, and sunglasses).
- The effects of sunlamps and tanning beds on the risk for melanoma are unclear because of limited study design and conflicting results from retrospective studies.
- Only a single case-control study of skin self-examination has reported a lower risk for melanoma among patients who reported ever examining their skin over 5 years. Although results from this study suggest that skin self-examination may be effective in preventing skin cancer, these results are not definitive.

Scientific Evidence

Epidemiology and Clinical Consequences

Melanoma is a leading cause of cancer death in the United States. The lifetime risk for dying of melanoma is 0.36% in white men and 0.21% in white women (3). Between 1973 and 1995, the age-adjusted incidence of melanoma increased more than 100%, from 5.7 per 100,000 people to 13.3 per 100,000 people. The increase in annual incidence rates is likely due to several factors, including increased sun exposure and possibly earlier detection of melanoma. Although primary prevention efforts have focused on young people, the elderly (especially elderly men) bear a disproportionate burden of morbidity and mortality from melanoma and nonmelanoma skin cancer. Men older than age 65 account for 22% of the newly diagnosed cases of malignant melanoma each year and women in the same age group account for 14%. Basal cell and squa-

mous cell carcinomas are more than 10 times as common as melanoma but account for less morbidity and mortality. Squamous cell cancers, however, may account for 20% of all deaths from skin cancer.

Effectiveness of Available Interventions

Preventive strategies include reducing sun exposure (e.g., by wearing protective clothing and using sunscreen regularly), avoiding sunlamps and tanning equipment, and practicing skin self-examination. There is little direct evidence, however, that any of these interventions reduce skin cancer morbidity or mortality.

Reducing Sun Exposure

Avoiding direct sunlight by staying indoors or in the shade or by wearing protective clothing is the most effective measure for reducing exposure to ultraviolet light, but there are no randomized trials of sun avoidance to prevent skin cancer. In numerous observational studies, increased sun exposure in childhood and adolescence is associated with increased risk for nonmelanoma skin cancer, which usually occurs in sun-exposed areas such as the face.

Recent studies provide a more complex picture of the relationship between sun exposure and melanoma, however. Although melanoma incidence is higher in regions near the equator where ultraviolet exposure is most intense, melanoma often occurs in areas of the body not exposed to the sun. In observational studies, intermittent or intense sun exposure was associated with increased risk for melanoma; chronic exposure was associated with lower risk, as was the ability to tan (4–7).

Sunlamp and Tanning Bed Avoidance

Six of 19 case-control studies found a positive association between use of sun lamps and melanoma risk, but most did not adjust for recreational sun exposure or for the dosage and timing of sunlamp exposure (8). Among nine studies that examined the duration, frequency, or timing of sunlamp or tanning bed exposure, four found a positive association, particularly if the dose of exposure was high and if it caused burning.

Sunscreen Use

Daily sunscreen use on the hands and face reduced the total incidence of squamous cell cancer in a randomized trial of 1,621 residents in Australia (rate ratio [RR]: 0.61; 95% confidence interval [CI] = 0.46–0.81) (9). Sunscreen had no effect on basal cell cancer. Based on this trial, 140 people would need to use sunscreen daily for 4½ years to prevent one case of squamous cell cancer. An earlier randomized trial demonstrated

that sunscreen use reduced solar keratoses, precursors of squamous cell cancers (10). There are no direct data about the effect of sunscreen on melanoma incidence. An unblinded randomized trial showed that children at high risk for skin cancers who used sunscreen developed fewer nevi than those who did not. Several epidemiologic studies have found higher risk for melanoma among users of sunscreens than among nonusers (11–13). A recent meta-analysis of population-based case-control studies found no effect of sunscreen use on risk for melanoma (14). The conflicting results may reflect the fact that sunscreen use is more common among fair-skinned people, who are at higher risk for melanoma, than it is among darker-skinned people; or, this finding may reflect the fact that sunscreen use could be harmful if it encourages longer stays in the sun without protecting completely against cancer-causing radiation.

Skin Self-Examination

The only evidence for the effectiveness of skin self-examination comes from a single case-control study (1,15). After adjustment for other risk factors, skin self-examination was associated with lower incidence of melanoma (odds ratio [OR]: 0.66; 95% CI = 0.44–0.99) and lower mortality from melanoma (OR: 0.37; 95% CI = 0.16–0.84), although the definition of “self-examination” was limited. This study did not provide sufficient evidence that skin self-examination would reduce the incidence of melanoma or improve outcomes of melanoma.

Effectiveness of Counseling

Community and worksite educational interventions have demonstrated effectiveness for increasing the use of skin protection measures, such as wearing hats and long-sleeve shirts and staying in the shade; however, evidence addressing the effectiveness of clinician counseling to prevent skin cancer is extremely limited. Most studies of counseling have examined intermediate outcomes such as knowledge and attitudes rather than changes in behavior. In a recent survey, 60% of pediatricians said that they usually or always counsel patients about skin protection, but advice to use sunscreen is more common than advice about wearing protective clothing or avoiding the midday sun (16).

Simple reminders and instructional materials for clinicians can overcome some of the barriers to regular counseling. A randomized trial of a community-based intervention involving 10 towns in New Hampshire suggests that office-based counseling by physicians may be an effective component of a multimodal program to promote skin protection (17). The proportion of children using some sun protection increased

significantly in the intervention towns (from 78% to 87%) compared to a decrease in the control communities (from 85% to 80%). More parents reported receiving some sun protection information from a clinician in the intervention towns. However, most of the change was due to increased sunscreen use rather than to reduced sun exposure.

Potential Harms of Skin Protection Behaviors

There are limited data regarding potential harms of counseling or of specific skin protection behaviors. Skin cancer counseling that focuses on the use of sunscreen could possibly lead to a false sense of security, which might lead to more time in the sun. For example, a randomized trial with young adults found that those who used sunscreen with a high sun protection factor (SPF) stayed longer in the sun than those who used sunscreen with a lower SPF (18). There has been some concern that use of SPF of 15 results in vitamin D deficiency. However, a randomized trial among people over 40 years of age found that sunscreen use over the summer had no effect on 25-hydroxyvitamin D3 levels. Concerns related to sun avoidance include reduced physical activity levels among children and negative effects on mental health. However, no studies have evaluated the effects of sun protection behaviors on these outcomes.

Recommendations Of Others

The American Cancer Society (19), the American Academy of Dermatology (20), the American Academy of Pediatrics (21), the American College of Obstetricians and Gynecologists (22), and a National Institutes of Health consensus panel (23) all recommend patient education concerning sun avoidance and sunscreen use. The American Academy of Family Physicians recommends sun protection for all with increased sun exposure (24). The American College of Preventive Medicine (ACPM) concluded that sun-protective measures (e.g., clothing, hats, opaque sunscreens) are probably effective in reducing skin cancer but that the evidence does not support discussion of sunscreen and sun protection with every patient. ACPM concluded that evidence is insufficient to advise patients that chemical sunscreens protect against malignant melanoma and that their use may actually lead to increased risk (25). Recently, the International Agency for Research on Cancer (IARC), part of the World Health Organization, qualified their recommendation for sunscreen use in ways that address the importance of learning more about potential harms of counseling for sunscreen use as follows:

Sunscreens probably prevent squamous-cell carcinoma of the skin when used mainly during unintentional sun exposure. No conclusion can be drawn about the cancer-preventive activity of topical use of sunscreens against basal-cell carcinoma and cutaneous melanoma. Use of sunscreens can extend the duration of intentional sun exposure, such as sunbathing. Such an extension may increase the risk for cutaneous melanoma (26).

The Task Force on Community Preventive Services found insufficient evidence to determine the effectiveness of a range of population-based interventions to reduce unprotected UV light exposure and recommended additional research on educational policy approaches, media campaigns, and both health-care setting and community-based interventions (27).

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BOX 1. U.S. Preventive Services Task Force (USPSTF) recommendations and ratings

The Task Force grades its recommendations according to one of five classifications (A, B, C, D, I) reflecting the strength of evidence and magnitude of net benefit (benefits minus harms):

- A.** The USPSTF strongly recommends that clinicians routinely provide [the service] to eligible patients. *The USPSTF found good evidence that [the service] improves important health outcomes and concludes that benefits substantially outweigh harms.*
- B.** The USPSTF recommends that clinicians routinely provide [the service] to eligible patients. *The USPSTF found at least fair evidence that [the service] improves important health outcomes and concludes that benefits outweigh harms.*
- C.** The USPSTF makes no recommendation for or against routine provision of [the service]. *The USPSTF found at least fair evidence that [the service] can improve health outcomes but concludes that the balance of benefits and harms is too close to justify a general recommendation.*
- D.** The USPSTF recommends against routinely providing [the service] to asymptomatic patients. *The USPSTF found at least fair evidence that [the service] is ineffective or that harms outweigh benefits.*
- I.** The USPSTF concludes that the evidence is insufficient to recommend for or against routinely providing [the service]. *Evidence that [the service] is effective is lacking, of poor quality, or conflicting and the balance of benefits and harms cannot be determined.*

BOX 2. U.S. Preventive Services Task Force (USPSTF). Strength of overall evidence

The USPSTF grades the quality of the overall evidence for a service on a 3-point scale (good, fair, poor):

Good: Evidence includes consistent results from well-designed, well-conducted studies in representative populations that directly assess effects on health outcomes.

Fair: Evidence is sufficient to determine effects on health outcomes, but the strength of the evidence is limited by the number, quality, or consistency of the individual studies, generalizability to routine practice, or indirect nature of the evidence on health outcomes.

Poor: Evidence is insufficient to assess the effects on health outcomes because of limited number or power of studies, important flaws in their design or conduct, gaps in the chain of evidence, or lack of information on important health outcomes.

U.S. Preventive Services Task Force

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