THE SURGEON GENERAL'S CALL TO ACTION TO PREVENT SKIN CANCER

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

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THE SURGEON GENERAL'S CALL TO ACTION TO PREVENT SKIN CANCER

Message from the Assistant Secretary for Health, U.S. Department of Health and Human Services

Skin cancer is the most commonly diagnosed cancer in the United States, yet most cases are preventable. Every year in the United States, nearly 5 million people are treated for skin cancer, at an estimated cost of $8.1 billion. Melanoma, the most deadly form of skin cancer, causes nearly 9,000 deaths each year. Despite recent efforts to address risk factors, skin cancer rates continue to rise.

While those with lighter skin are more susceptible, *anyone* can get skin cancer—and it can be serious, even deadly. As a skin oncologist who worked in this field for many years, I have cared for both young and old with skin cancers. Almost all of the conditions were caused by unnecessary ultraviolet (UV) radiation exposure, usually from excessive time in the sun or from the use of indoor tanning devices.

It is alarming that every year, nearly one out of every three young white women aged 16–25 engages in indoor tanning. It's important to shatter the myth that tanned skin is a sign of health. And a "base" tan is not a "safe" tan. Tanned skin is damaged skin. Understanding the risk of UV exposure is crucial to protecting ourselves and our loved ones.

That is why *The Surgeon General's Call to Action to Prevent Skin Cancer* is important for all of us. It outlines action steps we can all take—as individuals, parents, educators, employers, policy makers, health care professionals, and communities—to reverse this alarming trend.

As a nation, we can all do more to address skin cancer as a serious public health challenge. I urge everyone to find out more about the risk of skin cancer—and what we all can do to prevent it.

Howard K. Koh, M.D., M.P.H.
Assistant Secretary for Health
U.S. Department of Health and Human Services

Foreword from the Acting Surgeon General, U.S. Department of Health and Human Services

The rates of skin cancer in our nation are increasing, creating a serious public health concern we cannot ignore. As both a medical doctor and a public health official, I see that now is the time for a comprehensive approach to prevent skin cancer, bringing together community partners, business leaders, government agencies, and individuals for a common cause. As a dermatologist, I consider myself fortunate to be a part of this effort and am proud to release this *Call to Action to Prevent Skin Cancer*.

By acknowledging that most skin cancers can be prevented and bringing together partners with a unified, dynamic approach, we are taking concrete steps to support a healthier country. We know there are many strategies that work to protect us from ultraviolet (UV) radiation from the sun, and we need to use them. For example, we recommend that communities provide shade in recreational and play areas to help protect children from overexposure to UV radiation, that businesses increase availability of sun protection for outdoor workers, that policy makers promote policies for shade planning in land use development, and that health providers counsel patients on the importance of using sun protection.

Each day, thousands of teens are exposing themselves, unprotected, to harmful UV radiation from tanning beds, but only 10 states currently have laws in place to prevent this practice for youth younger than age 18 years. Together, we must communicate the risks in a clear and effective way to family, friends, and others to help them understand their role in preventing skin cancer. We must also support policy and environmental changes that protect both children and adults. These types of strategies, and many more, are described in the *Call to Action*.

The word *prevention* cannot be emphasized enough with our efforts. In a world of epidemics, outbreaks, and growing rates of cancer and other chronic diseases, we can sometimes feel that good health eludes us. With this *Call to Action*, we are promoting straightforward steps that will incorporate skin cancer prevention into our everyday lives. The potential exists for a large return on our investment; the cost both in illness and death and in dollars is great. With strategies that improve our understanding of the risks and support increased opportunities for skin cancer protection, we can truly have a significant impact on skin cancer-related illness, death, and health care costs.

Join me in promoting and sustaining our efforts to make skin cancer prevention a reality. We can be a nation that is active, healthy, and safe from skin cancer.

Boris D. Lushniak, M.D., M.P.H.
Rear Admiral, U.S. Public Health Service
Acting Surgeon General
U.S. Department of Health and Human Services

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Skin Cancer as a Major Public Health Problem

Why We Must Act Now

Skin cancer is the most commonly diagnosed cancer in the United States, and most cases are preventable.[1-3] Skin cancer greatly affects quality of life, and it can be disfiguring or even deadly.[1,4-6] Medical treatment for skin cancer creates substantial health care costs for individuals, families, and the nation. The number of Americans who have had skin cancer at some point in the last three decades is estimated to be higher than the number for all other cancers combined,[1,7,8] and skin cancer incidence rates have continued to increase in recent years.[1,9]

Each year in the United States, nearly 5 million people are treated for all skin cancers combined, with an annual cost estimated at $8.1 billion.[10] Melanoma is responsible for the most deaths of all skin cancers, with nearly 9,000 people dying from it each year.[11] It is also one of the most common types of cancer among U.S. adolescents and young adults.[12] Annually, about $3.3 billion of skin cancer treatment costs are attributable to melanoma.[10]

Despite efforts to address skin cancer risk factors, such as inadequate sun protection and intentional tanning behaviors, skin cancer rates, including rates of melanoma, have continued to increase in the United States and worldwide.[1,13-17] With adequate support and a unified approach, comprehensive, communitywide efforts to prevent skin cancer can work. Although such success will require a sustained commitment and coordination across diverse partners and sectors, significant reductions in illness, deaths, and health care costs related to skin cancer can be achieved.

This document is a *Call to Action* to partners in prevention from various sectors across the nation to address skin cancer as a major public health problem. Many partners are essential to this effort, including federal, state, tribal, local, and territorial governments; members of the business, health care, and education sectors; community, nonprofit, and faith-based organizations; and individuals and families. The goal of this document is to increase awareness of skin cancer and to call for actions to reduce its risk.

The first section describes the problem of skin cancer and its major risk factors. It also discusses the relationship between exposure to ultraviolet (UV) radiation and health. The second section describes the current evidence on preventing skin cancer, including current initiatives in the United States and in other countries. The third section describes the gaps in research related to skin cancer prevention, highlighting areas of research where more work is needed. The fourth section identifies specific opportunities to prevent skin cancer by reducing UV exposure in the U.S. population and calls for nationwide action.

This document also includes six appendices, which provide further detail about specific topics. For more information about the scope of this document and definitions of commonly used terms, see Appendix 1. Appendix 2 describes symptoms of skin cancer. Appendix 3 provides a brief discussion of skin cancer screening. Success stories in skin cancer prevention are discussed in Appendix 4, and current federal efforts on skin cancer prevention are summarized in Appendix 5. Abbreviations and acronyms are listed in Appendix 6.

Why a Focus on UV Radiation?

Although genetic factors, such as being fair-skinned or having a family history of skin cancer, contribute to a person's risk,[18-24] the most common types of skin cancer (see Appendix 1) are also strongly associated with exposure to UV radiation.[3,25-30] UV exposure is also the most preventable cause of skin cancer. This *Call to Action* focuses on reducing UV exposure, with an emphasis on addressing excessive, avoidable, or unnecessary UV exposures (such as prolonged sun exposure without adequate sun protection) and intentional exposure for the purpose of skin tanning (whether indoors using an artificial UV device or outdoors while sunbathing).

This document focuses on primary prevention of skin cancer through reducing overexposure to UV, not on early detection or screening. The evidence on skin cancer screening is growing, and ongoing examinations of the evidence are important. Melanomas diagnosed at earlier stages are much more treatable than those diagnosed at later stages.[6,31] It is important for the public to understand that anyone can get skin cancer and to know the signs, which can be found in Appendix 2 and at http://www.cdc.gov/cancer/skin/basic_info/symptoms.htm. Information on screening is available in Appendix 3.

Factors other than UV exposure can increase the risk of skin cancer in certain populations. Certain uncommon genetic mutations, such as those linked to familial melanoma and xeroderma pigmentosum, can strongly increase a person's risk of melanoma.[32] Occupational exposures to ionizing radiation, high doses of UV radiation, or exposure to certain chemicals during manufacturing processes may increase skin cancer risk beyond that of the general public.[32] However, this document focuses on reducing the risk of skin cancer in the general U.S. population.

Sources of UV Radiation Addressed in This Document

UV radiation is a type of electromagnetic radiation emitted by the sun and from some man-made lights, with wavelengths longer than X-rays but shorter than visible light.[33,34] For most people in the United States, the sun is the most common source of exposure to UV radiation. UV radiation from indoor tanning devices is a less common but more easily avoidable source of UV radiation exposure than from the sun. More information about UV radiation, including the different types, is provided in the "Exposure to UV Radiation" section (see page 11). This *Call to Action* discusses important steps that can be taken to reduce exposure to the most common sources of UV radiation at the population level.

UV Exposure and Overexposure

UV exposure stimulates melanocytes to produce melanin, often resulting in a tan or sunburn, both of which indicate overexposure[a] and damage to the skin, skin cells, and DNA within those skin cells.[35,36] The underlying biology of skin cancer risk is directly related to damage to the skin and its genetic material.[37] Although all UV exposures can affect skin cancer risk, entirely avoiding UV rays from the sun is neither realistic nor advisable for most Americans. Spending time outdoors is associated with positive health benefits, such as increased levels of physical activity and improved mental health.[38-40]

[a] See Appendix 1 for a definition and discussion of overexposure and for definitions of different types of UV exposure.

Skin Cancer Incidence and Mortality

This document focuses on the three most common types of skin cancers: basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and melanoma, which together account for more than 99% of skin cancers (Figure 1).[41,42] These three types of cancer are described in greater detail in Appendix 1. BCC and SCC are the most common types of nonmelanoma skin cancers (NMSCs).

Figure 1. Types of Skin Cancer

Nonmelanoma skin cancers

Basal cell carcinoma

Squamous cell carcinoma

Melanoma skin cancers

Lentigo maligna melanoma

Acral lentiginous melanoma

Nonmelanoma Skin Cancers

In the United States, information on BCC and SCC of the skin is not routinely collected in population-based central cancer registries, so information on these cancers comes from medical claims data, survey data, and special studies.[2,10,43] Of the 5 million U.S. adults treated for skin cancer on average each year, an estimated 4.3 million (1.9% of the adult population) are treated for NMSCs (BCC, SCC, and other rare skin cancers), according to an analysis of the Agency for Healthcare Research and Quality's Medical Expenditure Panel Survey.[10] Among those aged 65 years or older, an estimated 6.9% (9.3% of men and 5.0% of women) are treated for NMSCs on average each year.[10] Medicare data for 2002–2006 showed that the number of procedures used to treat NMSCs in the Medicare population increased by 16.0% during that period.[2] A special study that examined deaths from SCC and BCC in Rhode Island during 1988–2000 showed death rates of 0.29 and 0.08 per 100,000 per year for nongenital SCC and BCC; the rate for melanoma during the same period was 2.6 per 100,000.[5,44]

Basal Cell Carcinomas

BCCs are thought to be more common than any other type of cancer and are generally treatable.[1,7] Although national rates are not available, studies have estimated BCC incidence rates in some states. For example, incidence rates for BCC during 1993–1994 in New Hampshire were 309.9 per 100,000 among men and 165.5 per 100,000 among women.[45] Arizona had an estimated rate of more than 900 per 100,000 among men and nearly 500 per 100,000 among women in 1996.[46] The incidence of BCC appears to be increasing at a rate of about 2% per year in the United States.[1,13,47] About 70%–80% of NMSCs among males and 80%–90% of NMSCs among females are BCCs.[43]

Squamous Cell Carcinomas

SCCs account for about 20% of NMSCs and are the second most common form of skin cancer. Although both SCCs and BCCs are generally treatable, SCCs are deadly more often than BCCs.[43] A recent study estimated that at least 4,000 Americans died from SCC of the skin in 2012.[48]

Melanoma

Melanoma is the third most common type of skin cancer and is responsible for most skin cancer deaths.[9,14,32] In the United States, according to federal data for 2007–2011, more than 63,000 people are diagnosed with melanoma, and nearly 9,000 people die from this disease each year (Tables 1 and 2).[11,49] Although melanoma rates overall are highest among older adults, it is the third most common cancer in adolescents and young adults (aged 15–39 years).[12] Recent analyses have found increases in incidence across all tumor thicknesses and stages.[9] If current trends in cancer death rates continue, melanoma will be the only cancer objective included in Healthy People 2020 that will not meet the targets for reductions in cancer deaths (http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=5).[50,51]

Variation by Sex

In 2011, melanoma of the skin was the fifth most common cancer for men, with an incidence rate of 25.4 cases per 100,000 (31.0 for white men, the group with the highest rates) and the seventh most common cancer for women, with an incidence rate of 15.7 per 100,000 (20.1 for white women).[52] During 2002–2011, melanoma incidence increased at an average annual rate of 1.6% for men and 1.5% for women.[52] This increase is the largest increase of the 10 most common cancers among men, and it is surpassed only by increases in thyroid cancer among women (Figure 2).[51,52] Although incidence rates for melanoma are increasing among both males and females (Figure 3), melanoma death rates are only increasing among males (Figure 4).[9,14,51]

Table 1. Invasive Melanoma Incidence, by Sex and Race/Ethnicity, United States, 2007–2011[a,b]

Race/Ethnicity	Male and Female		Male		Female	
	Rate	Average Annual Count	Rate	Average Annual Count	Rate	Average Annual Count
All Races	19.7	63,429	25.1	36,679	15.9	26,750
White	22.2	59,882	27.9	34,842	18.2	25,041
White, Hispanic[c]	4.4	1,215	4.8	553	4.2	662
White, Non-Hispanic[c]	24.7	58,667	30.6	34,289	20.4	24,378
Black	1.0	336	1.1	145	1.0	191
American Indian/Alaska Native	4.7	131	5.8	69	3.9	62
Asian/Pacific Islander	1.3	177	1.4	84	1.2	93
Hispanic[c]	4.3	1,301	4.7	588	4.1	713

[a] Rates are per 100,000 people and are age-adjusted to the 2000 U.S. Standard Population (Source: Day JC. *Population Projections of the United States by Age, Sex, Race, and Hispanic Origin: 1995 to 2050*. U.S. Bureau of the Census, Current Population Reports, P25-1130. Washington, DC: U.S. Government Printing Office; 1996).

[b] Source: Data are from population areas that meet United States Cancer Statistics publication criteria (http://www.cdc.gov/cancer/npcr/uscs/technical_notes/criteria.htm) for 2007–2011 and were reported to the National Program of Cancer Registries (Centers for Disease Control and Prevention) and the Surveillance, Epidemiology, and End Results (SEER) Program (National Cancer Institute). They cover about 99.1% of the U.S. population.

[c] Race and ethnicity are not mutually exclusive. Counts may not always sum to the total due to rounding and because cases with "other" and "unknown" race are included in the totals.

Table 2. Melanoma Death Rates, by Sex and Race/Ethnicity, United States, 2006–2010[a,b]

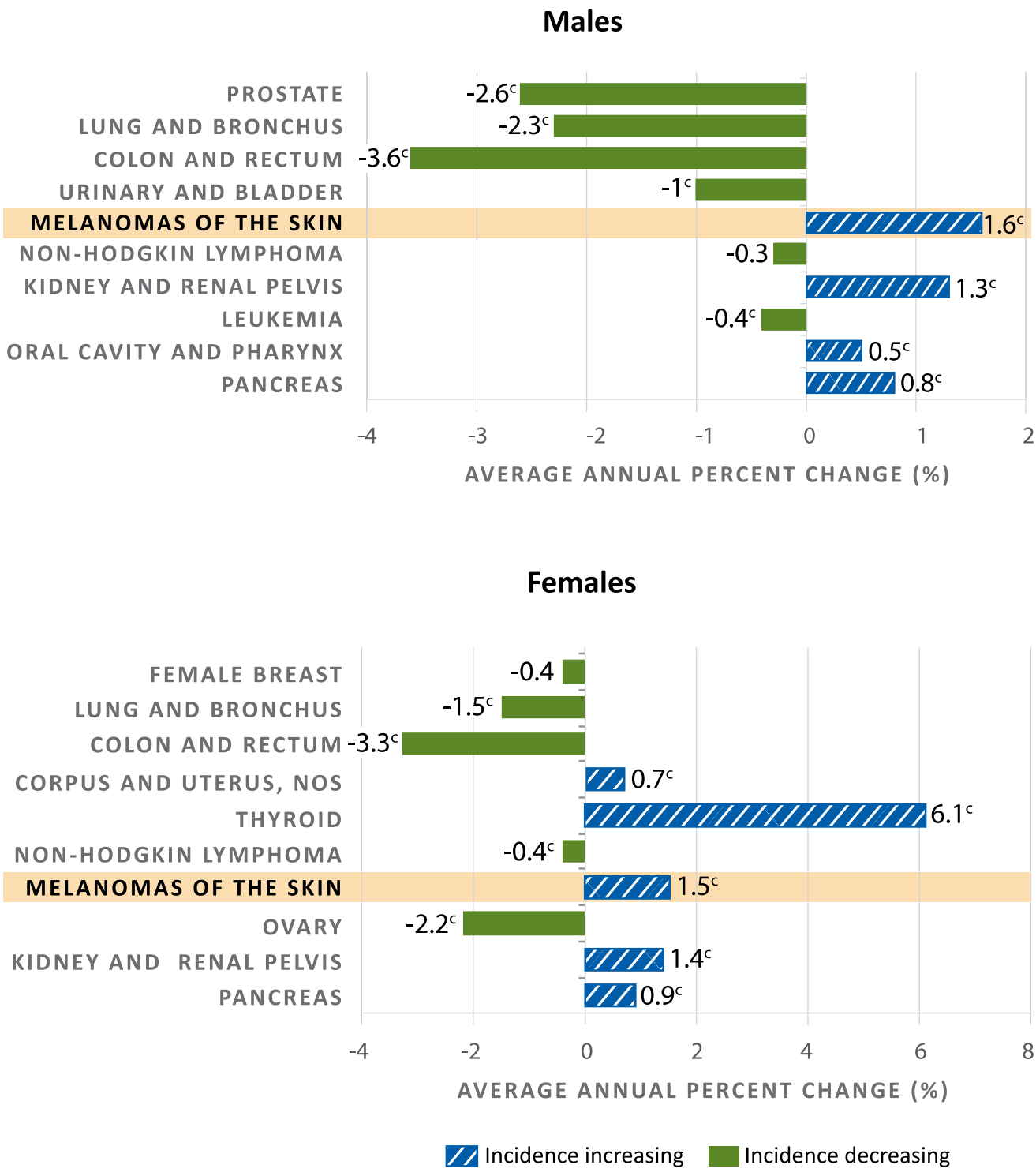
Race/Ethnicity	Male and Female		Male		Female	
	Rate	Average Annual Count	Rate	Average Annual Count	Rate	Average Annual Count
All Races	2.7	8,776	4.1	5,730	1.7	3,046
White	3.1	8,580	4.6	5,633	2.0	2,947
White, Hispanic[c]	0.8	198	1.1	115	0.6	83
White, Non-Hispanic[c]	3.4	8,375	5.0	5,513	2.1	2,862
Black	0.4	131	0.5	63	0.4	68
American Indian/Alaska Native	0.9	19	1.2	11	0.7	8
Asian/Pacific Islander	0.4	45	0.4	23	0.3	22
Hispanic[c]	0.8	201	1.1	117	0.6	85

[a] Rates are per 100,000 people and are age-adjusted to the 2000 U.S. Standard Population (Source: Day JC. *Population Projections of the United States by Age, Sex, Race, and Hispanic Origin: 1995 to 2050*. U.S. Bureau of the Census, Current Population Reports, P25-1130. Washington, DC: U.S. Government Printing Office; 1996).

[b] Source: Surveillance, Epidemiology, and End Results (SEER) Program, National Cancer Institute (http://www.seer.cancer.gov). SEER*Stat Database: Mortality. Source: Released April 2013. Underlying mortality data provided by the National Center for Health Statistics, Centers for Disease Control and Prevention (http://www.cdc.gov/nchs).

[c] Race and ethnicity are not mutually exclusive. Counts may not always sum to the total due to rounding and because Hispanic ethnicity for some cases was unknown.

Figure 2. Average Annual Percent Change[a] in the 10 Most Common Cancers, 2002–2011[b]



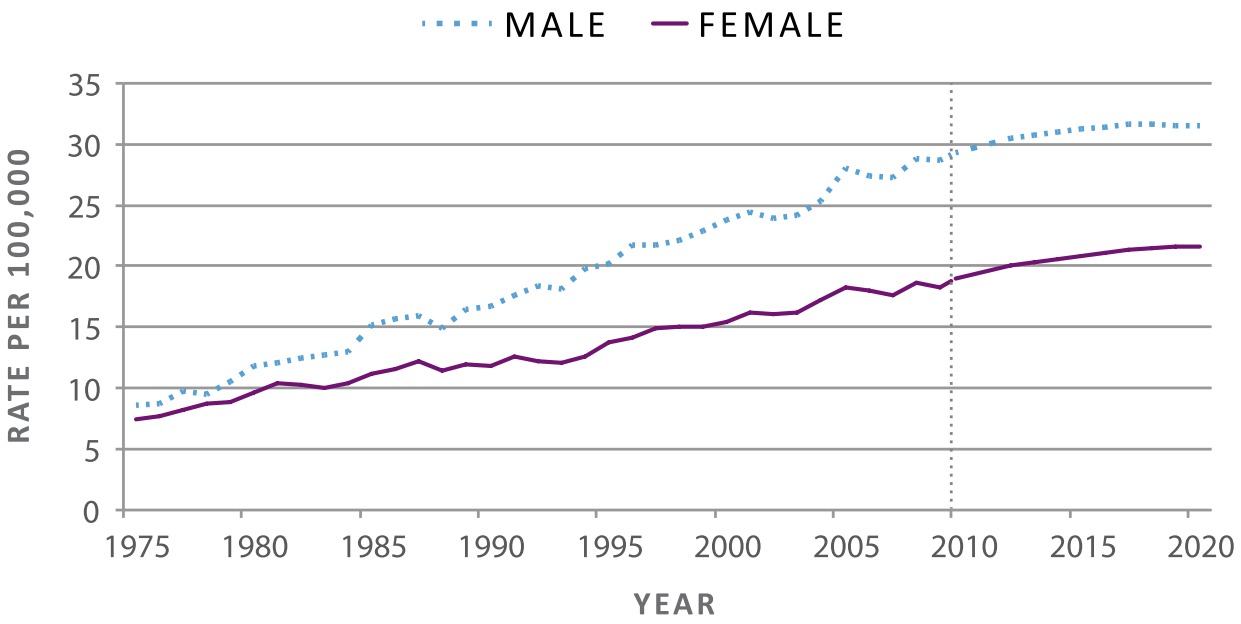
Abbreviation: NOS, Not Otherwise Specified.

[a] Calculated by using 1 year for each end point and the weighted least squares method.

[b] Source: Data are from population areas that meet United States Cancer Statistics publication criteria (http://www.cdc.gov/cancer/npcr/uscs/technical_notes/criteria.htm) for 2002–2011 and were reported to the National Program of Cancer Registries (Centers for Disease Control and Prevention) and the Surveillance, Epidemiology, and End Results (SEER) Program (National Cancer Institute). They cover about 92.4% of the U.S. population.

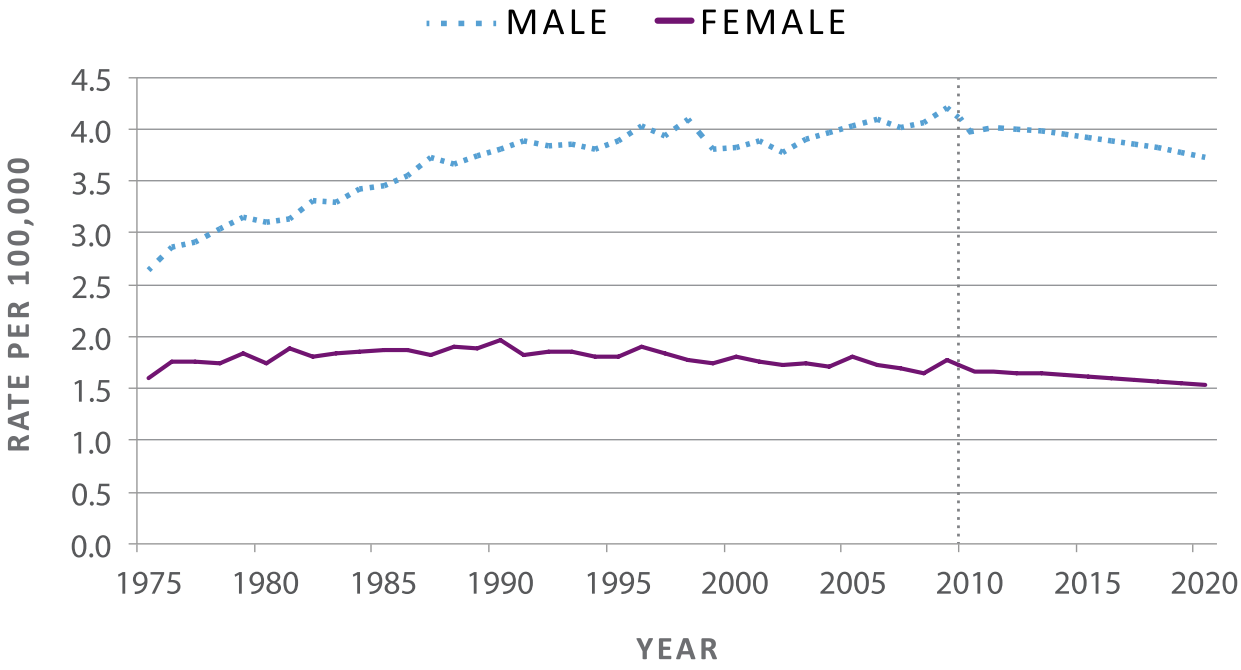
[c] The average annual percent change is significantly different from zero (2-sided Z test; $P < 0.05$).

Figure 3. Age-Adjusted Melanoma Incidence Rates, Actual and Projected, by Sex, 1975–2020



Note: Data after vertical dotted line are projected rates.
Source: Surveillance, Epidemiology, and End Results (SEER) Program, National Cancer Institute (http://www.seer.cancer.gov). SEER 9 Incidence Database (1973–2010). November 2011 submission. Nordpred software used to create age-period-cohort regression models to calculate projections.

Figure 4. Age-Adjusted Melanoma Death Rates, Actual and Projected, by Sex, 1975–2020



Note: Data after vertical dotted line are projected rates.
Source: Surveillance, Epidemiology, and End Results (SEER) Program, National Cancer Institute (http://www.seer.cancer.gov). SEER*Stat Database: Mortality. Released April 2013. Underlying mortality data provided by the National Center for Health Statistics, Centers for Disease Control and Prevention (http://www.cdc.gov/nchs). Nordpred software used to create age-period-cohort regression models to calculate projections.

Melanoma incidence and death rates are highest among males, especially non-Hispanic white males (Tables 1 and 2 and Figures 3, 4, and 5).[50] Increased risk of melanoma in white males may be related to a variety of factors, including skin type and historical differences in sun exposure and sun protection behaviors. White men aged 65 years or older have the highest incidence (130.1 cases per 100,000) and death rates (23.7 per 100,000) for melanoma.[9,12]

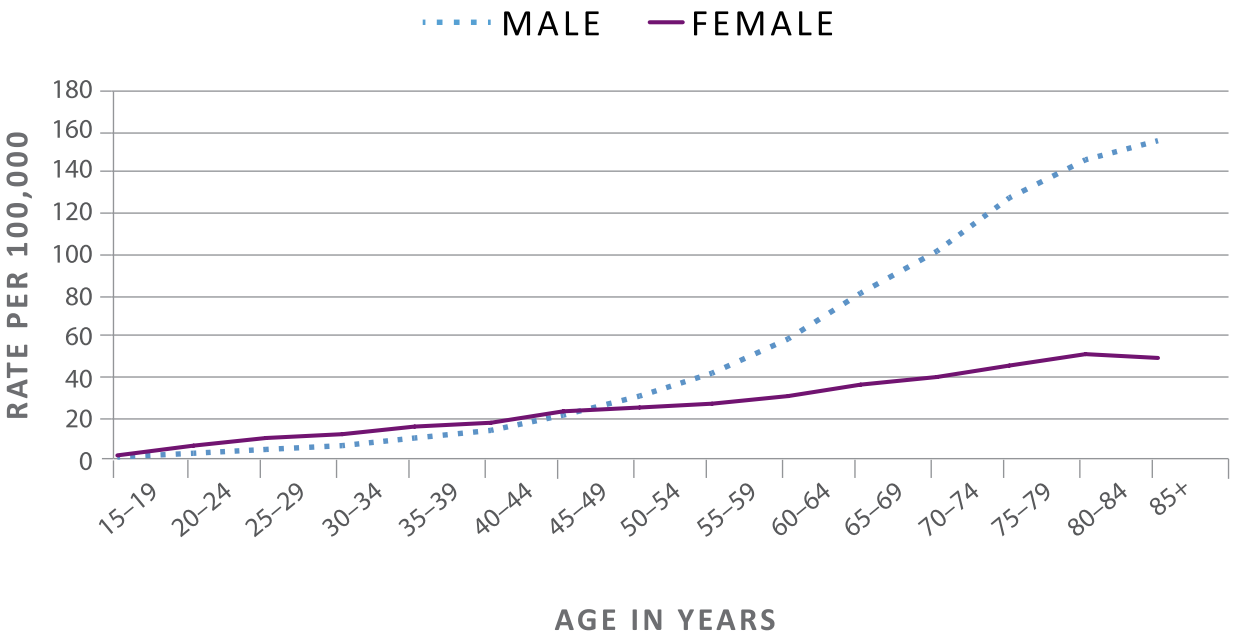
Variation by Anatomic Site

Melanoma is found more often on parts of the skin that get more intermittent, intense UV exposure, such as the torso and legs, although patterns vary by age.[32,53] In addition, the anatomic distribution of melanoma varies by sex, most often occurring on the legs for females and on the torso for males.[32] Recent research suggests that melanomas among young women may be particularly increasing on the torso.[54] However, these patterns are complex and vary among populations.[55] Because acral melanoma (which occurs on palms of hands and soles of feet) arises in typically unexposed areas of the body, the role of UV exposure in this cancer is thought to be limited, and acral melanoma may have different risk factors than other types of cutaneous melanoma.[56,57]

Variation by State

State incidence rates for melanoma among all races vary widely, from 11.9 per 100,000 in Alaska to 31.9 per 100,000 in Utah during 2007–2011.[49] Reasons for state variations include differences in populations by race, age, and genetic background; by socioeconomic status (SES) and health care access; and by patterns of UV radiation and exposure, as well as differences in collection of data on melanomas by state central cancer registries.[53] Much of the variation in state rates is because of differences in state populations. Among non-Hispanic whites, the population at highest risk, higher UV levels are associated with higher melanoma

Figure 5. Melanoma Incidence Rates, by Age and Sex, 2007–2011



Source: Data are from population areas that meet United States Cancer Statistics publication criteria for 2007–2011 (http://www.cdc.gov/cancer/npcr/uscs/technical_notes/criteria.htm) and were reported to the National Program of Cancer Registries (Centers for Disease Control and Prevention) and the Surveillance, Epidemiology, and End Results (SEER) Program (National Cancer Institute). They cover about 99.1% of the U.S. population.

incidence rates; for this population group, Alaska has the lowest melanoma rate of all states (14.8 per 100,000), and Hawaii has the highest melanoma rate of all states (66.7 per 100,000).[49,58] States in southern latitudes have the highest death rates for melanoma among non-Hispanic white populations.[52,59]

Survival

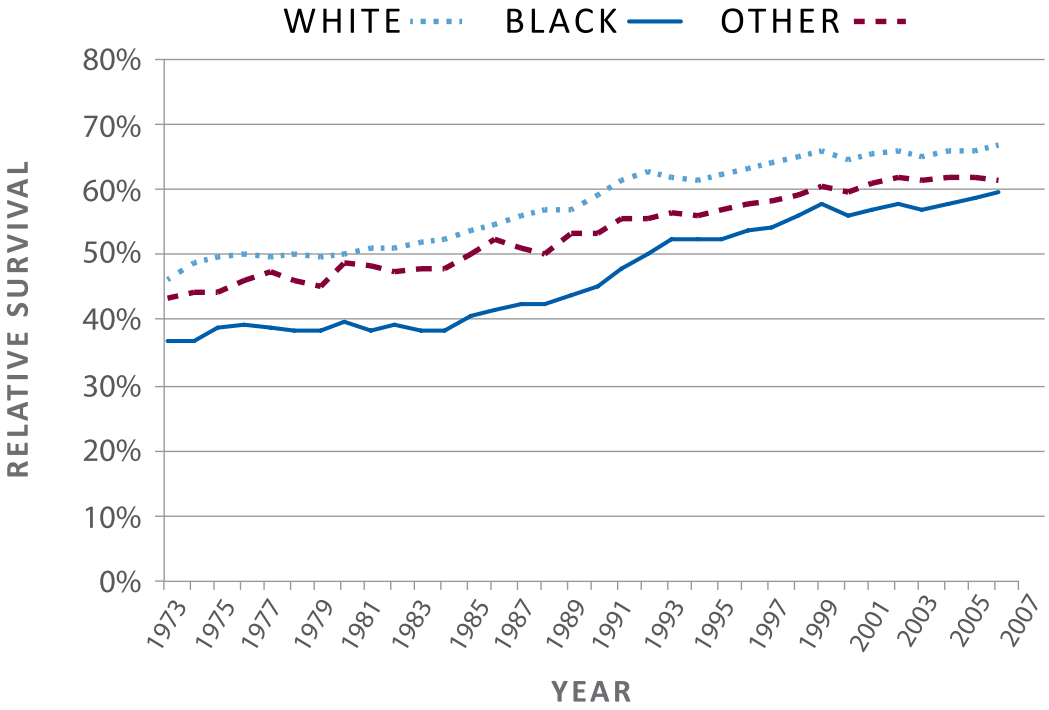
The prognosis for patients with metastatic melanoma remains poor, but has been improving because of recent advances in treatment.[60-62] Survival is poorest among black populations, possibly because of later diagnoses and lower perceived risk, and because these populations are disproportionately diagnosed with certain types of melanoma with poorer survival rates (acral lentiginous melanoma) (Figure 6).[6,63,64]

Economic Burden of Skin Cancer

In addition to causing illness and death, skin cancer is costly to the nation. Skin cancer treatment is estimated to cost about $8.1 billion in the United States each year, $4.8 billion of which is for NMSC and $3.3 billion of which is for melanoma.[10] Several new medications are available for skin cancer, which increases treatment options but could also lead to higher costs.[65-67]

Skin cancer also results in significant costs beyond those related to treatment. Annual costs associated with lost workdays and restricted-activity days are estimated at $76.8 million for NMSC and $29.4 million for melanoma.[68,69] An individual in the United States dying from melanoma loses an average of 20.4 years of potential life, compared with an average of 16.6 years for all malignant cancers.[70] Annual productivity losses associated with these lost years is estimated to cost an additional $4.5 billion ($3.5 billion attributed to melanoma deaths and $1.0 billion attributed to NMSC deaths).[69,70]

Figure 6. Trends in 5-Year Melanoma Survival, by Race, 1973–2006[a]



[a] Five-year relative survival calculated by actuarial method. Data could not be calculated for 2007–2010.
Source: Surveillance, Epidemiology, and End Results (SEER) Program, National Cancer Institute (http://www.seer.cancer.gov). SEER*Stat Database: Incidence – SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2012 Sub (1973–2010 varying).

Risk Factors for Skin Cancer

Genetic Factors

People with certain genetic risk factors are more likely than others to develop skin cancer. Genetic risk factors for skin cancer include having a lighter natural skin color; blue or green eyes; blond or red hair; dysplastic nevi (a type of unusual mole) or a large number of common moles; and skin that burns, freckles, or reddens easily or becomes painful after excessive time spent in the sun.[18,24] People with red hair may be at particularly increased risk of melanoma.[24] In addition, those with a family history or personal history of skin cancer, especially melanoma, are at increased risk.[18-23]

Skin Type

Skin cancer risk varies by skin type, which is classified by how likely a person is to tan or burn. The six skin types of the Fitzpatrick skin type classification system are shown in Table 3.[71] Sunburn often is used as a proxy outcome measure in skin cancer prevention studies because it takes into account the person's skin type, as well as the intensity and duration of UV exposure. Although anyone's skin can be damaged by UV exposure, people with skin types I and II are at the highest risk of burns, damage from UV radiation, and skin cancer.

Originally, the Fitzpatrick system was constructed for white populations and had only four categories (Skin Types I–IV). Types V and VI were added to the system later in recognition of the wide variety of races and skin types.[71] Because the Fitzpatrick system was developed to measure the skin types of whites, the terminology used may make it difficult for blacks or other races to classify their skin type.[72] Although the Fitzpatrick system is often considered the gold standard for categorizing skin type, it may not always accurately reflect an indvidual's risk of skin cancer, and other systems have been proposed.[73,74]

Table 3. Fitzpatrick Skin Type

Skin Type	Description
I	Always burns, never tans, sensitive to ultraviolet (UV) exposure.
II	Burns easily, tans minimally.
III	Burns moderately, tans gradually to light brown.
IV	Burns minimally, always tans well to moderately brown.
V	Rarely burns, tans profusely to dark.
VI	Never burns, deeply pigmented, least sensitive.

Race and Ethnicity

Race and ethnicity play an important role in skin cancer risk because characteristics associated with race and ethnicity (such as skin, hair, and eye color) are indicators of melanoma risk. Blacks and Asians/Pacific Islanders have the lowest melanoma incidence and death rates, followed by American Indians/Alaska Natives and Hispanics (Tables 1 and 2). People of European descent and non-Hispanic whites have the highest melanoma incidence and death rates because they generally have lighter natural skin color.[32,53]

However, race and skin type do not always align neatly, and wide genetic variation exists within races.[75,76] People who identify as being other than non-Hispanic white may still be at higher risk of skin cancer because of their skin type and may underestimate their risk.[63,64,77-79] Some black Americans report being sensitive to the sun.[80] Recent data showed low reported use of sun protection behaviors among Hispanics, and melanoma may be increasing among some Hispanic groups.[77,81]

Exposure to UV Radiation

Although genetic risk factors contribute to a person's skin cancer risk, most skin cancers are believed to be caused by a combination of genetic factors and exposure to UV radiation, from the sun and from artificial sources such as indoor tanning. By reducing intentional UV exposure and increasing sun protection, many skin cancer cases can be prevented.

Types of UV Radiation

Sunlight is made up of different types of electromagnetic radiation, mostly infrared, visible, and UV. Exposure to sunlight has both positive and negative effects. Although sun exposure can have positive effects on mood and stimulates production of vitamin D, exposure to UV radiation also damages DNA and cell functions, and that damage can lead to cancer. UV radiation is categorized into three types: UVA (UV radiation with a wavelength of 315 nm to 400 nm), UVB (280 nm to 315 nm), and UVC[b] (100 nm to 280 nm).[33,34]

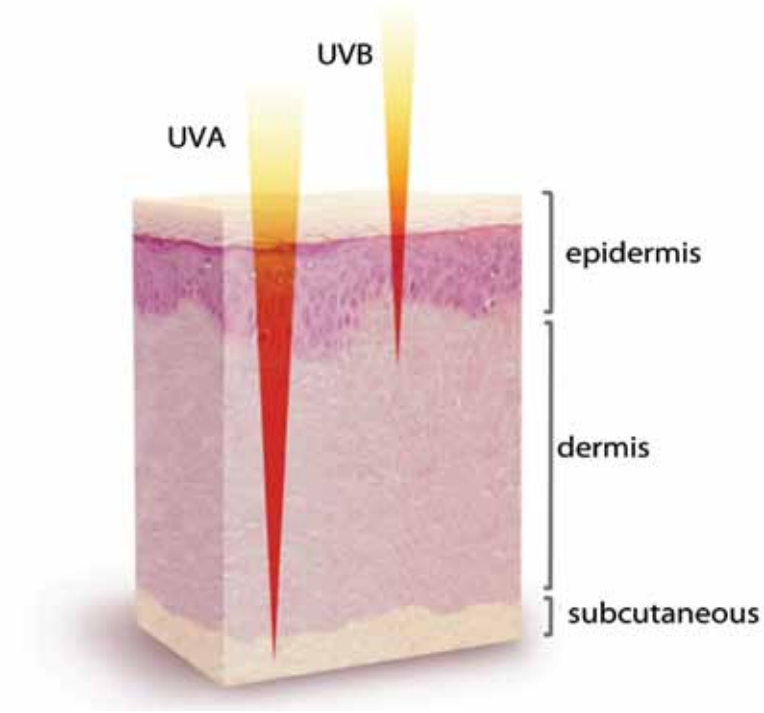
UVB radiation has intermediate levels of energy and can cause sunburn and direct DNA damage (Figure 7). Ozone and other components of the atmosphere absorb more than 90% of UVB from the sun, but the amount absorbed varies widely depending on time, location, season, and weather. Certain chemical and carbon emissions also have caused depletions in stratospheric ozone since the 1970s, and evidence suggests that this decrease has led to an increase in ground-level UVB levels.[82,83] Further study is needed to determine whether ozone depletion is contributing to the increasing incidence of skin cancers worldwide.[82-85] UVA radiation has less energy than UVB radiation, but it can also cause skin cancer and other skin damage. Unlike UVB radiation, nearly all UVA radiation passes through the atmosphere, and it penetrates to deeper layers of the skin than UVB radiation.

U.S. Environmental Protection Agency's UV Index

The UV Index developed by the U.S. Environmental Protection Agency (EPA) provides daily and hourly forecasts of the expected risk of overexposure to UV radiation from the sun. The UV Index scale describes how to use the UV Index to help avoid harmful exposure to UV radiation, with a lower UV Index indicating a lower risk on a scale of 0–11 (Table 4). In winter, the average UV Index is 2 or below, although it can be higher on some days. During November–January, the daily average for the UV Index is usually 2 or below nearly

[b] Although UVC radiation has the highest energy of the three, it is almost completely absorbed by the earth's atmosphere and is not responsible for cancer in the general population.

Figure 7. Types of Ultraviolet (UV) Radiation and Skin Penetration



Note: UVC radiation (not shown) is almost completely absorbed by the earth's atmosphere and does not generally affect human skin.

everywhere in the United States except Florida and Hawaii (http://www2.epa.gov/sunwise/monthly-average-uv-index). However, reflective surfaces, such as snow, water, and sand, and high altitudes can increase risk of overexposure to UV radiation and sunburn. EPA recommends that people use more sun protection strategies as UV levels get higher. For specific recommendations for sun protection at different UV levels, visit http://www2.epa.gov/sunwise/uv-index-scale.

UV Exposure and Skin Cancer

Many skin cancers can be avoided by reducing exposure to UV radiation.[3,25-30] As many as 90% of melanomas are estimated to be caused by UV exposure.[25,86] Some evidence suggests that certain rare skin cancers, such as Merkel cell carcinoma, a rare but frequently fatal cancer arising from neuroendocrine cells, may also be related to UV exposure.[41,42] The degree to which UV exposure increases a person's risk of skin cancer depends on many factors, such as individual skin type, the amount and types of sun protection used, whether exposure is chronic or intermittent, and the age at which the exposure occurs.[15,86-92]

Ecologic studies have shown that light-skinned people who live in areas with higher UV exposure, particularly when they are younger, have higher rates of skin cancer, especially SCC.[85,88,93] Similarly, melanoma is thought to be caused by sun exposure throughout life, possibly with stronger effects in early life, although adult exposures clearly increase risk as well.[87] Some studies suggest that UV exposures in childhood that do not result in a burn may be associated with lower rates of future melanomas.[94,95] Melanoma incidence is also associated with higher SES, which is a combination of education, income, and wealth. This association is likely

due to the relationship between SES and other risk factors, such as skin type and patterns of UV exposure.[32,78] When people with lower SES are diagnosed with melanoma, they tend to have poorer outcomes, probably because of later detection and poor access to treatment.[6,32,96,97] See Table 5 for a comparison of avoidable risk factors for skin cancer.

Chronic Versus Intermittent UV Exposure

The effects of some risk factors are different for different types of skin cancers. Chronic exposure is defined in different ways in the literature, but usually refers to frequent, extended outdoor exposures to UV radiation from the sun above a certain number of times a week or a certain number of days a year.[43,87,90,95,98-103] Studies of chronic exposure usually do not include short frequent exposures, such as those experienced by the average person in his or her commute to work or school. Extended or intense exposures experienced only a few times a year, such as the sun exposure received on a trip to the beach, are typically classified as intermittent exposures. Continuous, chronic UV exposure, such as that observed among outdoor workers, is more strongly associated with SCC, while intermittent or recreational exposure is more strongly associated with melanoma and BCC.[43,87,95,99-103]

Table 4. Ultraviolet (UV) Index Levels

COLOR	UV INDEX	RISK
GREEN	0–2	**Low** Low danger from the sun's UV rays for the average person.
YELLOW	3–5	**Moderate** Moderate risk of harm from unprotected sun exposure.
ORANGE	6–7	**High** High risk of harm from unprotected sun exposure. Protection against skin and eye damage is needed.
RED	8–10	**Very High** Very high risk of harm from unprotected sun exposure. Take extra precautions because unprotected skin and eyes will be damaged and can burn quickly.
PURPLE	11 or more	**Extreme** Extreme risk of harm from unprotected sun exposure. Take all precautions because unprotected skin and eyes can burn in minutes.

Adapted from the U.S. Environmental Protection Agency's UV Index scale, available at http://www2.epa.gov/sunwise/uv-index-scale.

Table 5. Excess Health Risks Associated with Ultraviolet (UV) Exposure, by Type of Skin Cancer and Type of UV Exposure

Exposure (No. of Studies)	Excess Risk (95% CI)	Comparison Groups
MELANOMA		
Sun exposure[a]		
Total sun exposure (N = 28)	34% (2, 77)	N/A
Intermittent sun exposure (N = 34)	61% (31, 99)	N/A
Chronic sun exposure (N = 40)	-5% (-13, 4)	N/A
Sunburn[b]		
Sunburn in childhood (N = 27)	91% (59, 130)	Ever vs never
Sunburn in adolescence (N = 13)	63% (42, 86)	Ever vs never
Sunburn in adulthood (N = 13)	44% (27, 63)	Ever vs never
Sunburn in past 5–10 years (N = 5)	62% (-1, 165)	Ever vs never
Ever sunburned in lifetime (N = 28)	59% (37, 83)	Ever vs never
Indoor tanning		
Ever indoor tanned (N = 27)[c]	20% (8, 34)	Ever vs never
Ever indoor tanned (N = 8; U.S. studies only)[d]	23% (3, 47)	Ever vs never
Ever indoor tanned (N = 10; studies from year 2000 onward)[d]	22% (3, 45)	Ever vs never
Indoor tanned before age 35 years (N = 13)[c]	59% (36, 85)	Ever before age 35 vs never before age 35
Frequent indoor tanning (N = 15)[c]	42% (15, 74)	Frequent vs infrequent/never
Relative risk for each indoor tanning per year (N = 4)[c]	2% (0, 4)	N/A
>10 lifetime tanning sessions (N = 10)[d]	34% (5, 71)	>10 lifetime tanning sessions vs never
Indoor tanned >1 year (N = 3)[d]	61% (-2, 167)	Indoor tanned >1 year vs never
BASAL CELL CARCINOMA[e]		
Ever indoor tanned (N = 10)	29% (8, 53)	Ever vs never
Frequent indoor tanning (N = 4)	50% (-19, 177)	Frequent vs infrequent/never
Indoor tanned before age 25 years (N = 3)	40% (29, 52)	Ever before age 25 vs never before age 25
SQUAMOUS CELL CARCINOMA[e]		
Ever indoor tanned (N = 10)	67% (29, 117)	Ever vs never
Indoor tanned before age 25 years (N = 2)	102% (-30, 486)	Ever before age 25 vs never before age 25

Abbreviation: CI, confidence interval. N/A: not applicable; measured as a continuous variable.

Note: We did not differentiate between measures of relative risk (e.g., odds ratio, rate ratio, risk ratio) for melanoma because it meets the rare disease assumption by which these measures can be interpreted to be the same. Measures of relative risk for basal cell carcinoma and squamous cell carcinoma are based on odds ratios.

[a] Source: Meta-analysis of risk factors for cutaneous melanoma: II.[89]

[b] Source: Sunburns and risk of cutaneous melanoma: does age matter? A comprehensive meta-analysis.[87]

[c] Source: Cutaneous melanoma attributable to sunbed use: systematic review and meta-analysis.[118,119]

[d] Source: The association of indoor tanning and melanoma in adults: systematic review and meta-analysis.[121]

[e] Source: Indoor tanning and non-melanoma skin cancer: systematic review and meta-analysis.[120]

Sunburn is a clear sign of overexposure to UV, and it typically occurs after intermittent exposure; sunburn at any age increases a person's risk of skin cancer.[9,43,87,99,100] Indoor workers may receive a substantial proportion of their total UV radiation from intermittent exposure.[104-106] Cumulative exposure to UVA through glass windows, which block most UVB, can also cause skin damage over time.[107,108]

Outdoor Workers

Although research clearly indicates that outdoor workers are at increased risk of BCC and SCC, some studies suggest that outdoor workers might not have an increased risk of melanoma, or that they may even have a lower risk than indoor workers.[43,109-111] When stratified by UV level, outdoor workers in UV-intense areas do appear to be at increased risk of melanoma.[55,103] Studies of melanoma risk and outdoor work may be limited by lack of information on other related factors, which then limit the ability to attribute effects to the relationship between outdoor work and melanoma.[15,91] Regardless of these potential study limitations, outdoor workers often experience excessive UV exposure on the job, and efforts are needed to ensure that outdoor workers are protected from the sun.

Indoor Tanning

Indoor tanning devices, such as tanning beds, tanning booths, and sun lamps, expose users to intense UV radiation as a way to tan the skin for cosmetic reasons. Although reducing UV overexposure from the sun can be challenging for some people, UV exposure from indoor tanning is completely avoidable. In 2009, the World Health Organization (WHO) classified indoor tanning devices as Class I human carcinogens on the basis of strong evidence linking indoor tanning to increased risk of skin cancer.[27,112] Meta-analyses have consistently shown that indoor tanning increases the risk of developing SCC, BCC, and melanoma (Table 5).[27,113-121] The risk increases the more an individual uses indoor tanning, with younger and more frequent users having more steeply increased risk.[113-121]

Findings consistently document a strong association between increased risk of melanoma and indoor tanning use, although the magnitude of the association varies from study to study, reflecting different populations and settings. A recent international meta-analysis that included 31 studies collectively reviewing 14,956 melanoma cases and 233,106 controls (individuals without melanoma) reported that individuals who reported ever indoor tanning had a 16% increased risk of melanoma over those who never indoor tanned.[121] The association between indoor tanning and melanoma increased when analysis was restricted to more recent studies conducted in 2000 or later (22%) or when restricted to individuals who had used indoor tanning devices 10 or more times in their lives (34%).[121] When analysis was restricted to the 11 studies from North America, including 4,395 melanoma cases and 79,358 controls, the increased risk of melanoma with ever using indoor tanning was 23%.[121] In one U.S. study included in the meta-analysis, researchers reported a 74% increased risk of melanoma among individuals who reported ever using indoor tanning compared with those who did not tan.[116] Findings from this study also reported a strong dose-response relationship, with greater risk for more sessions, hours, or years spent tanning.[116]

Indoor tanning also increases the risk of BCC and SCC.[122,123] For NMSCs, indoor tanning was found to increase risk of BCC by 29% and of SCC by 67%.[120] A 2014 meta-analysis estimated that more than 400,000 cases of skin cancer may be related to indoor tanning in the United States each year: 245,000 BCCs, 168,000 SCCs, and 6,000 melanomas.[124]

Initiating indoor tanning at younger ages appears to be more strongly related to lifetime skin cancer risk, possibly because of the accumulation of exposure over time from more years of tanning.[114,116,118,119] The magnitude of increased risk with younger age at initiation varies because of differences in collection and

reporting of data, but studies consistently show an increase in risk. A frequently cited meta-analysis estimated that tanning before age 35 increased risk by 59%.[118,119] This risk estimate is based on a compilation of data from U.S. and international studies from different settings.[118,119] One 2010 U.S. study found that ever using indoor tanning before age 18 increased risk of melanoma by 85% compared with never indoor tanning; risk for those aged 18–24 years increased by 91%.[116] Years of use of tanning devices appeared to be the strongest predictor of increased risk in this study, with increased risk of 47% with 1 year of indoor tanning, 64% with 2–5 years of indoor tanning, 85% with 6–9 years of indoor tanning, and 145% with 10 or more years of indoor tanning.[116] Harms of indoor tanning may be accelerated for adolescents and young adults, leading to early-onset skin cancers.[115,125,126]

Although earlier studies describing the association between indoor tanning and skin cancer had been criticized for not accounting for skin type and outdoor UV exposure or sunburns,[127] more recent studies have controlled for these factors, and these studies have also found that indoor tanning increases the risk of melanoma.[116,125,128-131] For example, a 2014 study showed that individuals who tanned indoors without burning had an increased risk of skin cancer, regardless of lifetime sunburns experienced.[128]

According to 2013 Youth Risk Behavior Survey (YRBS) data from the Centers for Disease Control and Prevention (CDC), about 13% of high school students, 20% of high school girls, and 27% of girls in the 12th grade had used an indoor tanning device, such as a sunlamp, sunbed, or tanning booth (not including a spray-on tan), one or more times during the previous 12 months.[132] Results from CDC's 2010 National Health Interview Survey (NHIS) show that some groups of young adults had high rates of indoor tanning, specifically non-Hispanic, white women aged 18–21 years (32%) and 22–25 years (30%). Among non-Hispanic, white indoor tanners, 58% of women and 40% of men did so 10 or more times during the 12 months before the survey.[133] A study that combined data from the YRBS and NHIS reported that about one-third of non-Hispanic white women aged 16–25 tanned indoors each year.[134]

No evidence exists to suggest that indoor tanning is safer than tanning outdoors or confers any substantial protection from future sun exposure. Studies have found that indoor tanning exposes users to excessive levels of UV radiation, especially UVA.[135-138] The average intensity of artificial UV radiation was found to correspond to a UV Index of 13 or 14 (extreme), with some devices measuring even higher.[135,136] Some studies have found that tanning devices may expose users to 4–13 times the amount of UVA as exposure from summer noontime sun in the District of Columbia, depending on the type of device used.[136,138] In studies examining the relationship between UV exposure and skin cancer risk, indoor tanning is typically classified as intermittent UV exposure (similar to outdoor recreational exposure) rather than chronic exposure because of the acute intensity of the exposure.[90,98] An estimated 3,200 people a year in the United States seek care in emergency rooms with injuries attributed to indoor tanning.[139] In addition to increasing skin cancer risk, indoor tanning can cause burns to the skin, acute and chronic eye diseases if eye protection is not used, and, if tanning devices are not properly sanitized, skin infections.[139-141]

Other Harms Caused by Excessive UV Exposure

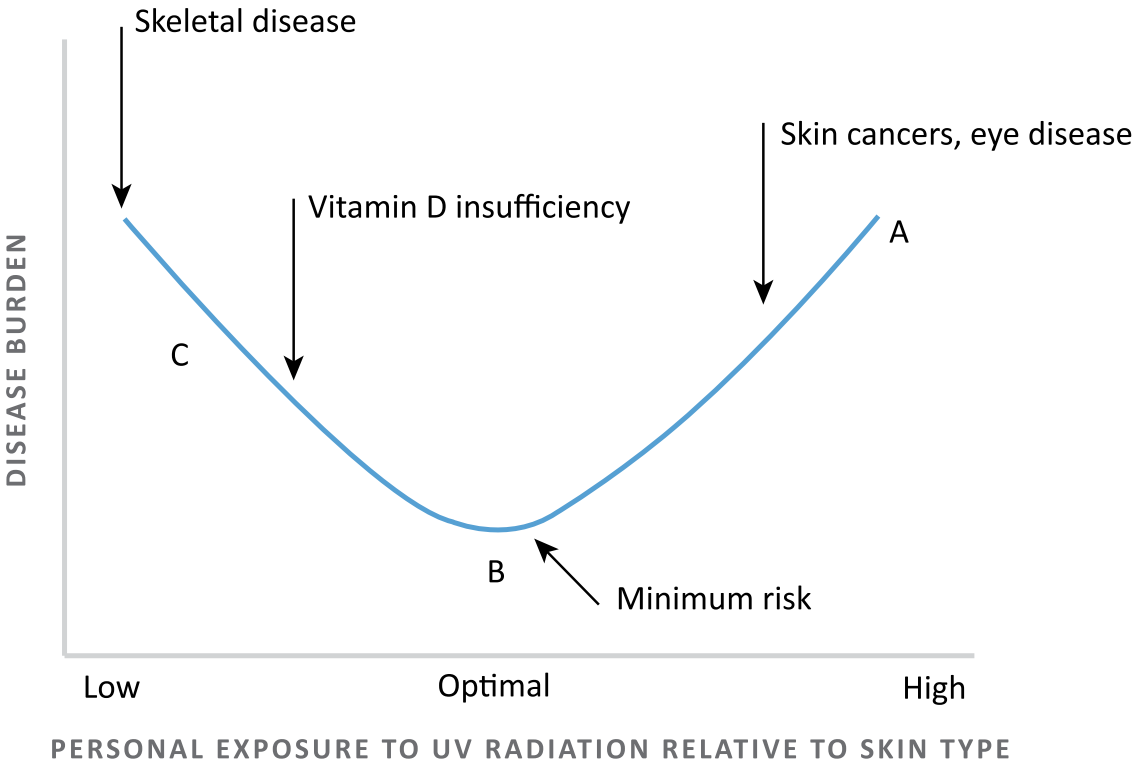
In addition to increasing the risk of skin cancer, UV exposure can have adverse effects on the skin, eyes, and immune system. Excessive UV exposure can damage the immune system; cause premature skin aging, including wrinkling, mottled pigmentation, and loss of elasticity; and increase the risk of actinic keratoses, which can progress to SCC.[86,113,142,143] Excessive UV exposure may reduce the effectiveness of folic acid supplements, which has potential health consequences for pregnant women and women of childbearing age.[144]

Excessive UV exposure can also damage the eye, affecting surface tissues and internal structures, such as the cornea and lens. Unprotected exposure to excessive UV radiation can cause photokeratitis (sunburn of the eye).[145] Chronic exposure to UV radiation can lead to skin cancer around the eyelids (BCC, SCC, and melanoma), as well as cataracts, conjunctival cancers, pterygium (abnormal, noncancerous growth in the corner of the eye that can extend to the cornea and partially block vision), age-related macular degeneration, and possibly ocular melanoma (melanoma of the eye).[145] Wearing sunglasses that fit properly and have 100% UVA and UVB protection is the best way to protect eyes from UV damage.[146,147]

Complex Relationship Between Outdoor UV Exposure, Vitamin D, and Human Health

As well as being a carcinogen, UV radiation can affect other aspects of human health.[148,149] UV exposure can stimulate production of vitamin D in the skin, a vitamin important for bone health and associated with other health outcomes.[150-152] Complete avoidance of sun exposure may put bone health at risk, although too much exposure increases risk of skin cancers and eye disease (Figure 8).[82,86,142] UV radiation is sometimes used as a medical treatment for certain skin or bone ailments.[153] Many people engage in regular physical activity outdoors, which can lead to UV radiation overexposure if appropriate sun protection is not used (see the "Reducing the Risk of Skin Cancer" section on page 23 for a discussion of sun protection methods). Some have also suggested that UV exposure may have benefits for heart health by reducing blood pressure, but the evidence is still evolving.[154,155] The following sections summarize the current evidence on UV exposure, vitamin D, and other health benefits.

Figure 8. Relationship Between Ultraviolet (UV) Radiation Exposure and Disease Burden



Source: Recreated from Lucas RM, Ponsonby AL. Ultraviolet radiation and health: friend and foe. *Med J Aust*. 2002;177(11):594-598.

Vitamin D

The health benefits of sun exposure are often framed within the context of vitamin D production. Vitamin D is essential for human health and is synthesized by the skin after exposure to sunlight.[150,151,156] Although the scientific literature has established vitamin D as an important component of bone health,[151,152,157] substantial research has also been devoted to the role of vitamin D in the prevention of numerous chronic diseases, including autoimmune conditions, obesity, diabetes, high blood pressure, heart disease, preterm birth, certain types of cancer, and all-cause mortality.[155,158-165] The results of this research are primarily based on ecologic studies and are conflicting.[151,160,166-170] Some have speculated that low vitamin D concentrations may be a result of ill health, rather than a cause.[166,171,172]

In 2010, the Institute of Medicine (IOM) published a report examining dietary reference intakes and optimal serum 25-hydroxyvitamin D (25OHD) concentrations.[c,151] During 2001–2006, roughly one-quarter of the U.S. population had serum 25OHD values that put them at risk of inadequacy, 8% were at risk of deficiency, and 1% had a high serum 25OHD value that may possibly be harmful.[172] Optimal concentrations of serum 25OHD may vary among individuals.[173] Blacks have the lowest 25OHD concentrations compared with other racial and ethnic groups.[156,172] Lower concentrations of vitamin D-binding proteins among blacks may provide more bioavailable vitamin D, potentially explaining the paradox of frequently diagnosed deficiency among U.S. black populations, who also tend to have better bone health than whites.[156,174,175]

Although maternal concentrations of vitamin D and incidental sunlight exposure are sufficient for most breastfed infants, some can be at risk of vitamin D deficiency if adequate vitamin D is not obtained from another source, such as a supplement. The American Academy of Pediatrics recommends a supplement of 400 IU/day for infants and children not consuming enough vitamin D-fortified formula or milk to provide the recommended daily amount of vitamin D.[176,177]

[c] The IOM report states that people with serum 25OHD levels of below 30 nmol/L (12 ng/mL) are at risk of deficiency relative to bone health and that serum 25OHD levels of 50 nmol/L (20ng/mL) or higher are sufficient. It expresses concern for values above 125 nmol/L (50 ng/mL).

The amount of outdoor sun exposure needed for meaningful vitamin D production depends on many factors, including time of day, time of year, latitude, altitude, weather conditions, a person's skin type, amount of skin exposed to the sun, other individual circumstances, and reflective surfaces, such as snow, water, and sand. According to WHO, 5 to 15 minutes of casual sun exposure on face, arms, and hands 2 to 3 days a week in the summer can sustain adequate concentrations of vitamin D in most people.[142] However, those with dark skin may require 3 to 6 times the amount of sun exposure as those with light or fair skin.[142,178,179] Because the skin of a person with fair complexion is less able to produce a tanning response,[180] the amount of sun exposure needed for a fair-skinned person to get a tan either indoors or outdoors, even before sunburn, exceeds levels of exposure needed to synthesize vitamin D.[135-137,181] In the winter months in northern latitudes, exposure to sunlight does not result in meaningful cutaneous vitamin D synthesis.[151]

Because the U.S. population contains wide variations in skin tone, and because our nation covers a wide array of latitudes and geographic conditions, populationwide recommendations for obtaining vitamin D from sunlight would likely result in too little vitamin D in some groups and too much sun exposure in other groups because no known threshold of UV exposure exists that does not also increase skin cancer risk.[182] Exceeding limited levels of exposure is not advisable because the skin can only produce a finite level of vitamin D, and increases in UV exposure are not proportional to increases in serum vitamin D concentrations.[183-185]

For individuals and populations who avoid all sun exposure, a dietary source of vitamin D is necessary to maintain vitamin D status.[186] Although complete sun avoidance can result in vitamin D deficiency, evidence to date does not suggest that sunscreen use causes vitamin D deficiencies. In 2001, the U.S. Food and Drug Administration (FDA) reviewed seven clinical studies that examined the effect of sunscreen use on vitamin D concentrations and determined that the studies failed to show that sunscreen use caused vitamin D deficiencies.[187] Adequate vitamin D can be obtained safely through food and dietary supplements without the risks associated with overexposure to UV radiation.[150,151] Research suggests that most people get the majority of the total vitamin D they need from food rather than from the sun.[188]

DIETARY SOURCES OF VITAMIN D

The best natural sources of vitamin D in the diet include fatty fish (such as salmon, tuna, mackerel, sardines, and catfish) and fish liver oils.[173] Small amounts of vitamin D are also found in egg yolks, beef liver, some mushrooms, ricotta cheese, and some cuts of pork. Vitamin D-fortified foods and beverages provide most of the vitamin D in the U.S. diet. Almost all of the milk in the United States is fortified with vitamin D, and many of the ready-to-eat breakfast cereals provide a small amount of added vitamin D. In addition, specific brands of soy beverages, orange juice, yogurt, margarine, and other foods are also fortified with vitamin D.[189]

Medical Uses of UV Exposure

Dermatologists and other doctors sometimes use UV light to treat health conditions, such as psoriasis, rickets, and eczema. These providers are advised to carefully weigh the risks and benefits of UV treatment for individual patients and carefully monitor doses.[153,190-196]

Benefits of Being Outdoors

Beyond the benefits directly attributable to UV exposure, spending time in outdoor environments may also have positive effects on physical and mental health, including higher levels of physical activity and positive effects on overall health and sense of well-being.[38-40] These benefits can be achieved while using adequate sun protection, including shade, protective clothing, and broad spectrum sunscreen with a sun protection factor (SPF) of 15 or higher to reduce skin cancer risk.[38-40,197-199] Features like shade trees can make spaces more attractive and provide protection from the sun and heat. In turn, perceived availability and "greenness"

of spaces are associated with increased physical activity and better mental and physical health.[200-202] The presence of shade in play spaces for children increases the use of the play space and children's activity levels.[203,204] Thus, changes to outdoor environments can increase both physical activity and sun protection, aligning important public health goals.

Risks of Indoor Tanning Outweigh Any Potential Benefits

The benefits to limited UV exposure when outdoors do not extend to indoor tanning.[205] UV exposure from indoor tanning is particularly intense, the type and intensity of UV emitted varies between devices, and exposures often exceed limits recommended by FDA or by states.[135-138] Some tanning lamps emit primarily UVA, which tans the skin but does not induce vitamin D production or provide even the minimal photoprotection that a UVB-induced tan provides.[150,206,207] Some tanning lamps do emit UVB, but studies suggest that vitamin D production is limited and plateaus after brief exposures, so that the amount of UV radiation needed to tan generally exceeds levels needed for adequate vitamin D production.[183,208] Indoor tanning does not appear to be protective against cancer or all-cause mortality. A recent study found that indoor tanning was not associated with reduced risks of internal cancer.[209] In addition, a large Swedish cohort study found that, although outdoor UV exposure was associated with reductions in all-cause mortality, exposure to artificial UV radiation from indoor tanning was associated with increased mortality.[210]

Some people associate tanned skin with attractiveness and health. Some also believe that a tan provides protection from future UV exposure and sunburn (often referred to as a "base tan").[211,212] Tanning is the skin's acute response to damage from UV rays.[213-215] A UVB-induced tan provides minimal sun protection, equivalent to an SPF of about 3, and thus does not provide adequate protection against future UV exposure.[216,217] Belief in the protection of a "base tan" may lead to a false sense of security and inadequate use of sun protection while outdoors in the sun.[212] Some studies have found that indoor tanning does not protect against sunburn.[212,218] People who engage in indoor tanning before going on vacation may be more likely to stay out longer in the sun, putting themselves at greater risk of sunburn.[212]

Low levels of sunlight in the winter months may contribute to seasonal affective disorder (SAD),[219] and as a result, some indoor tanners may attempt to self-treat SAD with UV exposure through indoor tanning.[220,221] Medical treatment of SAD frequently incorporates light treatment, but UV wavelengths are not generally recommended (although some lights used in treatment of SAD may contain small amounts of UVA and UVB).[153,219,222] In addition, light is thought to affect SAD through the retina, not the skin.[219]

Current Trends in Sun Protection, Sunburn, and Indoor Tanning

Data on behaviors related to skin cancer risk among the U.S. population are collected by CDC through the national YRBS and NHIS. The national YRBS is a cross-sectional, school-based, biennial survey that monitors the prevalence of health risk behaviors among high school students. It is a nationally representative survey of students in grades 9–12 attending public and private schools.[223] This survey includes questions about using sunscreen with an SPF of 15 or higher and indoor tanning. The NHIS is an annual, cross-sectional, nationally representative survey of the civilian, noninstitutionalized U.S. population.[224] Interviews are conducted, mainly in person, with adults aged 18 years or older in each household, with follow-up interviews by telephone when necessary.

A periodic cancer control supplement to the NHIS includes questions about outdoor sun-protective behaviors (staying in the shade, wearing a wide-brimmed hat, wearing a long-sleeved shirt, wearing long clothing to the ankles, and using sunscreen with an SPF of 15 or higher), indoor tanning, sunburn, and sun sensitivity. This supplement is sponsored by CDC's Division of Cancer Prevention and Control and the National Cancer Institute (NCI) in the National Institutes of Health (NIH).

According to YRBS data, sunscreen use is low among U.S. high school students, with only 10.1% using sunscreen with an SPF of 15 or higher *always or most of the time* when outside for more than 1 hour on a sunny day. Sunscreen use is higher among high school girls (13.2%) than boys (6.9%) and higher among non-Hispanic whites (11.5%) compared with non-Hispanic blacks (4.7%) and Hispanics (7.9%). During 1999–2011, a significant linear decrease occurred in the prevalence of routine sunscreen use (from 13.3% to 10.8%). However, prevalence of sunscreen use remained stable from 2011 (10.8%) to 2013 (10.1%).[132,225]

NHIS data from 2010 indicate that use of sun protection was also low among U.S. adults and that about 37% of adults had been sunburned in the past year.[226] Sunburn[d] rates were even higher among adults aged 18–29 years and sun-sensitive groups (defined as those who burn repeatedly and freckle). Half of all Americans in this age group (about 65% of non-Hispanic whites, 10% of non-Hispanic blacks, and 35% of Hispanics) reported having had a sunburn in the past year.[227] Although NHIS data indicate that some sun protection behaviors have increased among young adults over the past decade (including use of shade, use of sunscreen with an SPF of 15 or higher, and wearing of long clothing to the ankles), a corresponding decrease in sunburn has not been reported.[227]

[d] The NHIS defines sunburn as even a small part of the skin turning red or hurting for 12 hours or longer. This definition is only given to respondents who request more information about what is meant by sunburn.

Indoor Tanning

According to 2013 YRBS data, 13% of high school students had used an indoor tanning device, such as a sunlamp, sunbed, or tanning booth (not including a spray-on tan) one or more times during the previous 12 months.[132] The prevalence of indoor tanning was higher among female, older, and non-Hispanic white students, with the highest prevalence among 12th-grade females (27.2%), and among non-Hispanic white females (30.7%). During 2009–2013, a significant linear decrease occurred overall in the prevalence of indoor tanning device use (from 15.6% to 12.8%). The prevalence of indoor tanning device use did not change significantly from 2011 (13.3%) to 2013 (12.8%). Data from the 2013 YRBS indicate that among students who engaged in indoor tanning, frequent sessions were common, with more than half reporting frequent use (10 or more times during the previous 12 months).[132]

Results from the 2010 NHIS show that 6% of adults aged 18 years or older had engaged in indoor tanning in the past year.[133] The prevalence of indoor tanning was higher among females (9%) than males (2%) and among younger adults than older adults, with the highest use among adults aged 18–21 years (12%), 22–25 years (12%), and 26–29 years (9%). Similar to the data for U.S. high school students, rates were higher among non-Hispanic whites (8%) than among non-Hispanic blacks (<1%) and Hispanics (2%). Certain demographic groups had high rates of indoor tanning, including non-Hispanic white women aged 18–21 years (32%) and 22–25 years (30%). Among non-Hispanic white indoor tanners, 58% of women and 40% of men did so 10 or more times during the 12 months before the survey.[133]

Reducing the Risk of Skin Cancer

Most skin cancers are at least partially caused by UV exposure, so reducing exposure reduces skin cancer risk. However, one out of every three U.S. adults has been sunburned in the past year, and most do not take recommended actions to protect themselves from the sun.[227,228] In addition, indoor tanning rates are high among some groups, such as young, non-Hispanic white females, and skin cancer incidence rates are increasing. These facts show a need to take action to improve sun protection behaviors and address the harms of indoor tanning.

For Individuals

Sun protection helps prevent the harmful effects of sun exposure, including sunburn, skin cancer, premature skin aging, and eye damage. When used as part of a comprehensive approach, well-tailored, individual-focused strategies may be effective for reaching specific subpopulations.[229,230] According to WHO's International Agency for Research on Cancer (IARC), ideal sun protection involves several behaviors, including

- Wearing tightly woven protective clothing that adequately covers the arms, torso, and legs.
- Wearing a hat that provides adequate shade to the whole of the head.
- Seeking shade whenever possible.
- Avoiding outdoor activities during periods of peak sunlight (such as midday).
- Using sunscreen (in conjunction with other sun protection behaviors).[231]

Federal agencies and other health organizations in the United States all provide recommendations for sun protection (see Table A in Appendix 5). These recommendations vary across agencies and organizations, often reflecting the specific area of focus for each institution (such as cancer or dermatologic conditions). Strategies for protection are often listed in varying order and do not always follow guidance from the IARC that sunscreen should be used in combination with other methods.[231,232]

Recommendations also do not often describe how to use sunscreen appropriately in terms of the amount to apply, the need to pre-apply some sunscreens before going out into the sun, and the need to reapply. These differences in sun protection messaging indicate missed opportunities for coordination across health organizations and highlight the need for more messaging about sun safety that is consistent and clear.[232]

Sun Protection Strategies

Wear Protective Clothing

When possible, wear long-sleeved shirts and long pants and skirts, which can provide protection from UV rays. Clothes made from tightly woven fabric offer the best protection. A wet T-shirt offers much less UV protection than a dry one, and darker colors may offer more protection than lighter colors. Some clothing certified under international standards comes with information on its UV protection factor.

Wear a Hat and Sunglasses

Wide-brimmed hats that shade the face, ears, and back of the neck provide the most protection. Tightly woven fabrics, such as canvas, provide the best protection; straw hats with holes that let sunlight through do not provide adequate protection. A darker hat may offer more UV protection. In addition to a hat, sunglasses

that block as close to 100% of both UVA and UVB rays as possible can provide extra eye protection. Most sunglasses sold in the United States, regardless of cost, meet this standard. Wrap-around sunglasses work best because they also block UV rays from the side.

Seek Shade

An umbrella, tree, or other shelter can provide protection from the sun and relief during hot weather. Shade does not block all UV radiation if it does not block all of the sky, nor does it protect against scattered UV rays. For this reason, shade should be combined with other methods, such as protective clothing, especially in areas with highly reflective surfaces, such as snow, water, and sand.

Avoid Times of Peak Sunlight

UV radiation from the sun is most intense during the midday hours of 10 AM to 4 PM (daylight savings) or 9 AM to 3 PM (standard time), so scheduling outdoor activities earlier or later in the day can reduce UV exposure. UV radiation is also more intense during the late spring and early summer, at higher altitudes, closer to the equator, and when reflected off surfaces such as snow, water, and sand.[233] Different surfaces have different reflectivity and can increase exposure. Snow reflects 80%–90% of UV radiation, sand 20%–30%, and water 5%–7%.[233] Man-made surfaces can also have increased reflectivity. Concrete has been measured to reflect 14%–15% of UV rays, whereas grass only reflects about 1%–2% of UV rays.[234] When near highly reflective surfaces, extra care should be taken to protect from UV exposure.

Use Sunscreen

Sunscreen should be used with other sun protection behaviors and applied to any exposed skin before going outside. For adequate protection, sunscreen should have an SPF of 15 or higher. SPF is a measure of how much UV radiation is required to produce a sunburn with sunscreen applied to the skin in relation to the amount required to produce a sunburn on unprotected skin. As the SPF increases, the amount of protection increases.[235] Sunscreen should also have broad spectrum protection, which means that it protects against both UVA and UVB radiation.

Sunscreen is one of the most common methods of sun protection used by Americans.[227] When used as directed with other sun protection measures, broad spectrum sunscreen with an SPF of 15 or higher helps prevent sunburn and reduces the risk of early skin aging and skin cancer (melanoma and SCCs) associated with UV radiation.[99,231,236-238] Sunscreens with lower SPFs, or without broad spectrum protection, also help prevent sunburn but do not offer sufficient protection against early skin aging and skin cancer.

Sunscreen is most effective when used with other methods of sun protection. Current recommendations also state that sunscreen should be reapplied every 2 hours and after swimming, sweating, and toweling off.[239] Some have suggested that a one-time reapplication 15–30 minutes after the original application may increase sunscreen's protectiveness against total UV exposure.[240] When used incorrectly, sunscreen may provide a false sense of protection, which can ultimately lead to increased duration of sun exposure.[231]

Although concerns have been raised about real-world efficacy (because many people do not follow label instructions, use enough sunscreen, or reapply it often enough), broad spectrum sunscreens with an SPF of 15 or higher are effective at reducing the risk of skin cancer.[241] Future scientific assessments are expected to provide more information about the long-term safety of frequent sunscreen use in people of all ages.

Avoid Indoor Tanning and Sunbathing

In addition to using sun protection when outdoors, avoiding intentionally tanning can help prevent skin cancer. Similar to excessive sun exposure, indoor tanning is associated with an increased risk of melanoma, SCC, and BCC.[118-120] Indoor tanning also causes premature skin aging, such as wrinkles and age spots.[143,242] Intentionally tanning the skin in the sun is an additional source of unnecessary and easily avoidable UV exposure.

Barriers to Using Sun Protection

Many Americans lack a general knowledge or awareness about the risks associated with sun exposure, or they think they are at low risk of developing skin cancer or sunburn.[63,243,244] Some groups of Americans, especially blacks, the elderly, and people with less education, may perceive themselves to be at low risk of skin cancer.[63] Because of the perception of low risk and a lack of awareness, these groups tend to be diagnosed with skin cancer at later stages.[78,96,245]

A substantial segment of U.S. adults also do not perceive cancer as preventable and thus may be less likely to engage in skin cancer prevention practices, such as using broad spectrum sunscreen with an SPF of 15 or higher or covering up.[246] Lack of understanding of the UV Index is also a barrier to making informed decisions about adequate sun protection while outdoors.[247,248]

Many Americans either do not use sun protection when outdoors or do not use adequate protection, and as a result, they experience sunburn.[227,228] The costs of protective clothing (e.g., wide-brimmed hats and sunglasses) and sunscreen may pose financial problems for some.[243,249] Personal clothing style preferences can also create barriers to people using certain protective clothing items if they are seen as unfashionable, uncomfortable, or interfering with sports or other outdoor activities.[243] For some people, protective clothing may interfere with the body's ability to cool itself, increasing the risk of heat illness.[250,251]

Reported barriers to sunscreen use include a perception that it is too messy, inconvenient, or feminine.[243,252] Some sunscreen users may view sunscreen use as a way to stay out in the sun longer without getting burned.[231,243] Others may use sunscreen for protection, but use it improperly by not applying enough or forgetting to reapply.[243,253] Sunscreens may be somewhat less effective than physical barriers, and some people may have skin sensitivities or concerns about certain chemicals in sunscreens.[241,254]

High melanoma incidence and death rates among older non-Hispanic white men demonstrate the need to increase sun protection among males, especially adults.[9] Higher rates observed among older men may be due to less use of sun protection and more time spent outdoors throughout life compared with women.[117,227,231] Men are less likely to use personal care products that contain sunscreen, and they may be less influenced by

social pressures to avoid premature skin aging.[231] For this reason, clothing and wide-brimmed hats may be particularly important strategies for males. Baseball caps do not provide adequate sun protection on their own, because they leave the ears and the back of the neck exposed.[228,255]

If not addressed in a coordinated way, physical activity and sun protection messages can conflict. Staying out of the sun at peak hours may not be feasible, depending on recreational and occupational activities and schedules. Reapplication of sunscreen can be difficult during activities such as sports events or practice.[250,256] Engaging in physical activity outdoors is associated with overexposure to UV radiation and sunburn.[257] However, findings from one study suggest that the promotion of sun safety is not likely to reduce physical activity among children.[258]

Barriers to Reducing Intentional Tanning

Intentional tanning, which includes both indoor tanning and seeking a tan outdoors, is strongly associated with a preference for tanned skin and other appearance-focused behaviors.[259-262] Studies indicate that messages that focus on the effects of indoor tanning that are related to appearance, such as premature skin aging, may be more effective for tanners than health-focused messages and may even promote long-term behavior change.[263-266]

Patterns of indoor tanning vary, with some people tanning only before special events, such as proms, and others tanning sporadically or regularly. Strategies that tailor prevention messages to specific types of tanners are likely to enhance the effectiveness of interventions.[230,267] Additional strategies may be needed to prevent the initiation of intentional tanning. Indoor tanners may incorrectly believe that tanning indoors has health benefits or that it is safer than tanning outdoors because it is regulated.[211,268,269]

Researchers are currently examining the psychological effects of indoor tanning and possible links between indoor tanning behavior and dependence and addiction.[270] Indoor tanning appears to have reinforcing properties similar to those ascribed to addictive substances, such as the release of endorphins when the skin is exposed to UV radiation.[270-272] Endorphins are a type of natural opioid involved in the brain's reward pathway. Their production during indoor tanning could create a future incentive to tan.[271]

Social Norms Regarding Tanned Skin

Social norms regarding tanned skin as attractive and healthy create barriers to reducing intentional exposure to UV radiation, whether indoors or outdoors. In many communities and social groups, tanned skin is considered attractive,[273] and social pressures to conform to this beauty standard can be powerful motivators.[274] Women in particular may experience greater social pressure to tan and have tanned skin, which likely explains the higher rates of indoor tanning observed among women than men.[133,134,259,273-275]

Social norms regarding tanned skin have changed over time. Before the 1920s, pale skin was considered beautiful and an indication of upper class lifestyles, while tanned skin was a sign of working class people who labored outdoors.[276] As the industrial revolution moved the working class indoors and into crowded inner cities, pale skin was no longer viewed as a sign of wealth, but rather an indicator of poverty and poor health.[276] Tanned skin began to signify a life of leisure and disposable income that allowed time for outdoor sports and beach vacations.[211,276]

Although messages about the risks associated with excessive sun exposure and indoor tanning have become more common in recent years, many still consider tanned skin to be a sign of health, fitness, youth, and

attractiveness,[211,276] and this viewpoint is often perpetuated in popular media.[260] To be successful, future efforts to improve sun protection behaviors, reduce indoor tanning, and prevent skin cancer will likely need to address the underlying motives that drive behaviors associated with skin cancer risk, such as the desire to look attractive and healthy and to conform to societal beauty standards. For example, future messages could focus on the appearance-related harms of excessive UV exposure and how most people do not use indoor tanning devices.[265,277-279]

To reduce harms from indoor tanning, some organizations have promoted the use of topical sunless tanning products as a way to get a tanned appearance without UV exposure.[260] One concern about this method of tanning is that dihydroxyacetone (DHA), a commonly used ingredient in sunless tanning products, is approved by FDA for use in cosmetics and drugs for external application only (21 CFR Part 73).[280] When this product is used in spray tanning booths (spray-on tans), inhalation is usually unavoidable.[260] In addition, the promotion of sunless tanning products does not address the underlying social norms that drive tanning behaviors. Sunless tanning products are often used in conjunction with, rather than in place of, UV tanning.[281-285] Furthermore, their use does not appear to lead to safer outdoor sun exposure and could potentially increase the likelihood of sunburn.[282,286,287] Other methods used to achieve tanned skin, such as pills and injections, have additional health risks.[288] However, over-the-counter sunless tanning creams and lotions may be an option for those who want to have tanned skin while avoiding the health risks of UV exposure and inhaled and absorbed DHA.

For Clinicians

Evidence demonstrates that clinicians can play a role in reducing UV exposure through individually directed counseling, particularly among adolescent and young adult patients with fair skin.[265,289] Federal agencies and the independent U.S. Preventive Services Task Force (USPSTF) recently conducted a systematic review of the evidence on the effectiveness of behavioral counseling to prevent skin cancer. Findings from the review indicated that counseling in primary care settings can increase sun-protective behaviors and decrease intentional tanning, including indoor tanning.[277,278] On the basis of these findings, the USPSTF now recommends that clinicians counsel patients with fair skin aged 10–24 years to minimize their UV exposure to reduce their risk of skin cancer.[265,277,278]

Effective interventions are generally of low intensity, are completed almost entirely during the primary care interaction or visit, and use cancer prevention or appearance-focused messages to reach specific audiences.[265,277,278] Appearance-focused messages are successful at reducing intent to pursue indoor tanning among late-adolescent women (the population most likely to engage in indoor tanning).[265,277,278] Efforts are needed to identify ways to disseminate this type of information to clinicians and provide them with effective, user-friendly tools to use with patients. Evidence of the benefits of counseling for patients older than age 24 is sparse and insufficient to serve as a basis for a recommendation.

Some groups recommend periodic skin cancer screening[e] either by a health care provider or by self-examination.[290,291] Consistent and regular screening identifies melanomas that are, on average, thinner than those found during usual care. Whether detection of these lesions leads to fewer cases of disease or death is unknown.[292] For this reason, the USPSTF has stated that current evidence is insufficient[f] to recommend skin cancer screening by primary care providers among the general U.S. adult population. On May 15, 2014, the USPSTF released a draft research plan, which will be used to guide a systematic review of the evidence by researchers.[293] Although screening is not currently recommended, providers should remain alert to suspicious lesions. For more information on skin cancer screening, see Appendix 3.

For Communities and Schools

Community-level intervention strategies vary greatly by audience, setting, duration, and the number and types of included components. For some strategies, sufficient evidence is available to recommend dissemination. For other strategies, more research is needed to determine basic effectiveness before the intervention can be disseminated to other communities. For specific examples of community-level interventions, see Appendix 4.

Current Evidence on Effective Community-Level Interventions

Federal agencies and the independent Community Preventive Services Task Force have worked together to conduct systematic reviews of the evidence on the effectiveness of community-based interventions to prevent skin cancer. Findings from an initial review were published in 2003 and 2004 and used as the basis for recommendations for interventions designed to prevent skin cancer made by The Guide to Community Preventive Services (The Community Guide[g]).[28,294,295]

The Community Guide states that sufficient evidence exists to recommend multicomponent, communitywide interventions,[h] as well as interventions designed for certain settings (specifically, child care centers, primary and middle schools, outdoor recreational and tourism settings, and outdoor occupational settings).[296] The Community Guide states that insufficient evidence exists to recommend mass media campaigns alone or to recommend skin cancer prevention interventions in other settings (high schools, colleges, and health care settings[i]).[296] Although some skin cancer prevention interventions have been shown to be effective in these settings, more research is needed before these findings can be translated into evidence-based recommendations for skin cancer prevention interventions.[296] Efforts to update these recommendations to reflect the latest evidence are ongoing. The current recommendations for skin cancer prevention, which are based on updated reviews, are available online at http://www.thecommunityguide.org/cancer and are summarized in Table B in Appendix 5. The recommendations provided in this *Call to Action* are consistent with The Community Guide.

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[e] Skin cancer screening is defined as an evaluation of the skin by a medical provider, in the absence of changes to the skin.

[f] The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of this service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.

[g] The Community Guide is a website that houses the official collection of all Community Preventive Services Task Force findings and the systematic reviews on which they are based.

[h] Multicomponent, communitywide interventions are defined as interventions that include at least two distinct components that are implemented in at least two different types of settings (e.g., schools, recreation areas) or that reach the entire community (e.g., mass media campaigns).

[i] Community-based interventions in health care settings were last reviewed and recommendations were updated in 2002. These interventions are different from the provider counseling for fair-skinned youth aged 10–24 years, which the USPSTF has found to be effective.

SKIN CANCER PREVENTION IN ACTION: RECREATIONAL SETTINGS

Pool Cool: Sun Safety for Outdoor Swimming Pools

Pool Cool is a sun-safety education program for children aged 5–10 years and their parents, as well as for pool staff and other pool users. It is being used at public pools across the United States. The program is centered on eight brief sun-safety lessons that are taught at the beginning of regular swim classes. The program also promotes the creation of sun-safe pool environments that include shaded areas, signs to promote sun safety, and sunscreen dispensers.

First piloted in Hawaii and Massachusetts, Pool Cool has been used and evaluated at more than 400 pools across the country. These evaluations found that pools that use the program have more protected pool environments, better sun protection habits among children and parents, and fewer sunburns among children and lifeguards. For more information about the Pool Cool program, visit http://www.med.upenn.edu/poolcool/.

Prevention Policies in Schools

Sun protection programs for children can have important benefits.[297] Sunburns in childhood are a clear risk factor for skin cancers later in life, and building healthy habits early when children are more receptive can lead to increased sun protection into adulthood.[297,298] Given the amount of time children spend in school settings, much of the skin cancer prevention efforts for children have focused on sun-safety education in schools and changes to the school environment to promote sun-safe behaviors. This section provides examples of the resources available to schools and an overview of policies used in some schools to promote sun safety.

Sun protection policies can be implemented at the school, community, school district, or state level. CDC's School Health Policies and Practices Study (SHPPS) collects data from a nationally representative sample of public school districts to assess school health policies and practices in the United States. According to 2012 SHPPS data,[299] some U.S. school districts have policies to promote sun safety among their students. Although very few districts had policies that required specific sun-safety strategies, many districts had policies that recommended the following:

- Allowing students to apply sunscreen while at school (44.4%).
- Encouraging students to wear hats or visors (36.1%), protective clothing such as long-sleeved shirts or long pants (39.6%), and sunglasses (25.0%) when in the sun during the school day.
- Scheduling outdoor activities to avoid times when the sun is at peak intensity during the school day (38.3%).[299]

A baseline assessment of school policies collected during 2005–2007 from 112 public school districts in Colorado and California found that 52% of school districts in California and 8% in Colorado had at least one policy on sun protection before a randomized intervention was implemented.[300] After the randomized

intervention, districts appeared to adopt stronger policies than districts that did not participate in the intervention.[301] Some states require public schools to provide information on sun safety and skin cancer prevention.[302,303] For example, since 2004, Arizona has mandated that all public schools teach EPA's SunWise program (http://www.epa.gov/sunwise; SunWise box, page 32) from kindergarten through eighth grade.[303,304] Across the United States, teachers taught sun safety or skin cancer prevention in at least one class as part of required health instruction in 68% of elementary schools, 76% of middle schools, and 78% of high schools in 2006.[305]

Barriers to Interventions in Schools and Communities

Effective strategies can improve sun protection behavior in children and adults, particularly in child care, school, and outdoor recreational and tourism settings (Table B, Appendix 5).[306] But without widespread, comprehensive implementation, these strategies may have little effect on sun protection behaviors and sunburn prevention at the community level. Single-component interventions may only have a small effect on behavior change, which may not be sufficient to reduce skin cancer risk.[307] In addition, school policies can either support or pose barriers to sun protection. Currently, some schools and school districts do not allow certain kinds of protection to be easily used, because of rules such as bans on hats and sunglasses or provision of sunscreen only by prescription or by a school nurse.[300] Policies allowing the use of sun protection in schools can help support broader efforts.

Social and contextual factors within communities can also create barriers to reducing UV exposure. For example, outdoor environments, such as community parks and school playgrounds, often lack adequate shaded areas. Providing shade, either in the form of man-made shade structures or natural shade from trees and shrubs, can help people enjoy the outdoors at any time of day without the risk of excessive sun exposure.[308]

For Outdoor Work Settings

Similar to schools, outdoor work settings are an important setting for efforts to prevent overexposure to the sun and reduce skin cancer risk. Research has shown that skin cancer prevention interventions designed to reach outdoor workers can be highly effective at increasing sun protection behaviors and decreasing sunburns.[309]

According to The Community Guide,[309] effective interventions include one or more of the following:

- Educational approaches, such as messages about sun protection delivered to workers through instruction, small media (e.g., posters, brochures), or both.
- Activities designed to influence the knowledge, attitudes, or behavior of workers, such as modeling or demonstrating behaviors.
- Environmental approaches to encourage sun protection.
- Workplace policies that support sun protection practices.

A study in Australia found that workers who were more aware of sun safety or who worked in smaller workplaces were more likely to use protection when they received instructions on its use.[310] Other studies have found that being employed in a workplace that is perceived to be supportive of sun protection is associated with better sun protection behaviors among workers.[311] In addition to employers, local governments and labor organizations have played a role in increasing programs for sun protection among outdoor workers.[312,313]

State and Local Policies, Legislation, and Regulation

Intervention strategies that address social and contextual factors have the potential for broad public health impact by making the healthy choice the easy or default choice.[314] Policies, legislation, and regulation are examples of such interventions, reaching wide segments of communities while requiring minimal individual effort compared with interventions directed at individuals.[314]

Sun Protection Policies and Legislation

Sun Protection

Many schools have policies that limit students' ability to use sun protection, such as dress codes that prohibit the use of hats or sunglasses or policies about over-the-counter drugs that prohibit the use of sunscreen.[300] Only a few states, such as California and New York, have passed legislation requiring that schools allow students to use sun-protective clothing (California) or sunscreen (California and New York) on campus.[315,316] The California School Boards Association recommends that individual school districts adopt specific sun protection policies for students.[317,318] In addition, lifeguards in California who get skin cancer are eligible for workers' compensation benefits under certain conditions.[319] California law also urges employers to identify and correct workplace hazards connected to UV radiation.[320]

Local policies that address skin cancer prevention vary across the country, and their effects on the incidence of skin cancer or on intermediate outcomes, such as sun protection behaviors and sunburn, have not been formally evaluated or documented. However, such policies could be considered as one component of a larger, more comprehensive skin cancer prevention initiative within a community.

Education and Awareness

A few states have passed legislation to support sun-safety education programs and skin cancer prevention awareness. Laws in Arizona and New York mandate instruction on skin cancer prevention as part of the health education curriculum in public schools.[303,321] In 2004, Arizona adopted a law requiring implementation of the state's SunWise school program (adapted from EPA's SunWise program; see box, page 32) in grades K–8 in all public schools.[303,304] In 2006, Kentucky passed a law encouraging skin cancer education in schools.[322]

Photo courtesy of Queensland Department of Health

Some states have policies that reach beyond children as the audience for education and awareness. New York mandates sun-safety education for all state employees who spend more than 5 hours a week outdoors.[323] In 2009, Arkansas began providing grants to organizations that provide skin cancer education to state citizens.[324] Florida has included skin cancer prevention in its health awareness campaign program since 2004, reaching a wide range of the state's population.[325]

SUNWISE: SUN SAFETY FOR KIDS AND EDUCATORS

SunWise is the most widely used health and environmental education program for sun safety in the United States. It is designed to teach children aged 5–15 years and their caregivers how to protect themselves from overexposure to the sun. It uses classroom, school, and community components to teach sun-safe behaviors. Program participants receive free materials that promote cross-curricular learning about sun safety, UV radiation, and ozone science.

SunWise was launched in 2000 by the U.S. Environmental Protection Agency (EPA). Today, more than 32,000 schools and 6,000 other educational organizations (e.g., camps, science and children's museums, scout troops) in all 50 states, the District of Columbia, and several U.S. territories have received educational materials. Cities, counties, and states across the country have worked to promote the program's safety message throughout their communities. To reinforce its sun-safety message, SunWise partners with community organizations and nonprofit skin cancer prevention foundations.

The SunWise program has shown success in raising awareness and changing behaviors related to sun safety.[326] It has also been shown to be cost-effective, with the potential to prevent as many as 11,000 skin cancer cases among participants and save up to $4 for every $1 invested.[327]

For more information about SunWise, visit the EPA website at http://www.epa.gov/sunwise.

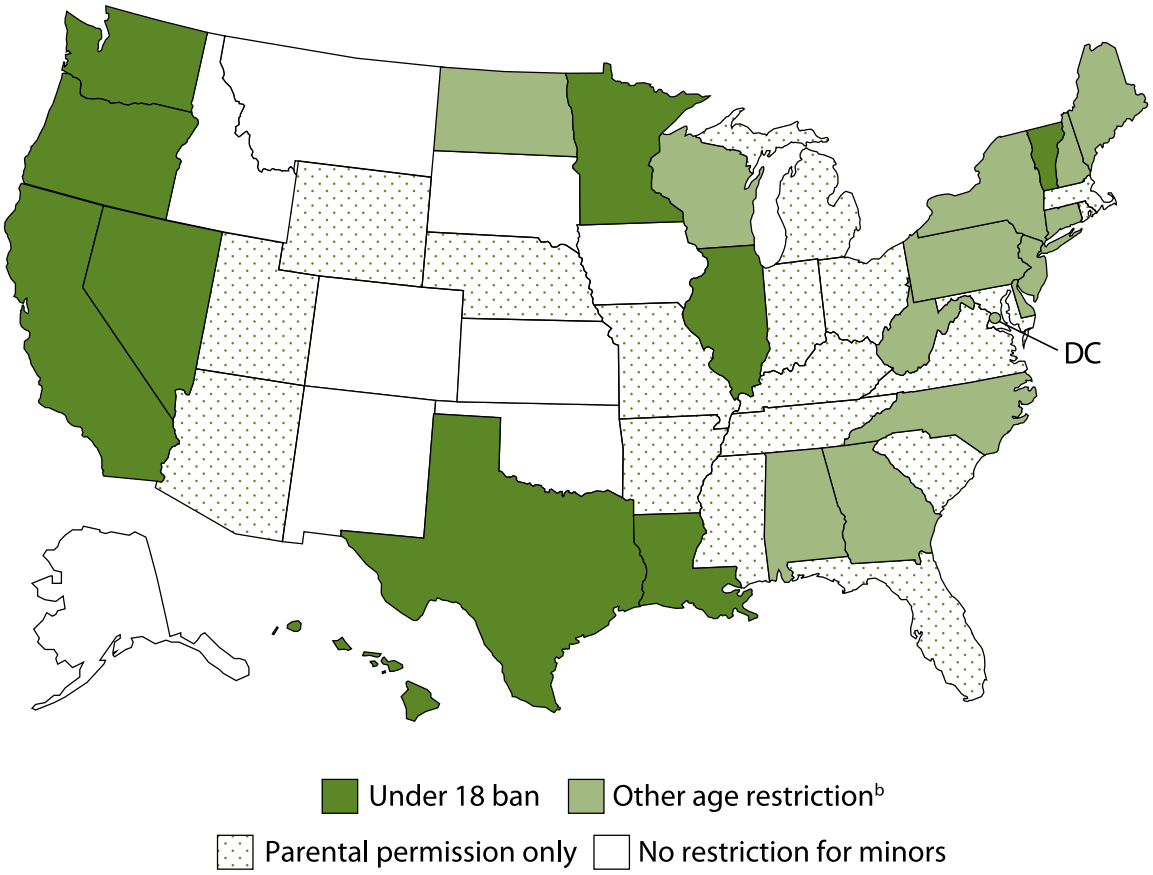
Indoor Tanning Policies and Legislation

Some states and municipalities in the United States have regulations relating to the use of indoor tanning devices. As with many public health issues, regulation of indoor tanning is likely to be most effective if combined with a multifaceted approach. For example, monitoring use of indoor tanning devices and changes in use over time, restricting use of tanning devices to protect certain populations (e.g., minors, people with fair skin, people at increased risk because of a family or personal history of skin cancer), offering safe alternatives to indoor tanning, warning users about the health risks associated with indoor tanning, and enforcing existing regulations could help reduce harms.[328]

Considerable variation exists throughout the country in the strength and enforcement of indoor tanning restrictions, as well as compliance with these restrictions. In October 2011, California passed the most stringent youth access law in the country, which took effect on January 1, 2012, and prohibits indoor tanning for anybody younger than age 18 years (Figure 9).[329] Since then, Vermont, Nevada, Oregon,[j] Texas, Illinois, Washington,[j] Minnesota, Louisiana, and Hawaii have also adopted prohibitions on indoor tanning for minors younger than age 18 years.[329-331] Several additional states proposed legislation to enact bans on indoor tanning for this age group during the 2013–2014 legislative session.[329,330]

[j] State laws in Oregon and Washington allow minors younger than age 18 years to use indoor tanning facilities with a doctor's prescription.

Figure 9. Legislative Restrictions on Access to Indoor Tanning by Minors in the United States[a]



Note: State laws in Oregon and Washington allow minors younger than age 18 years to use indoor tanning facilities with a doctor's prescription.
[a] Map represents legislation passed before July 10, 2014.
[b] Defined as a restriction for any other age group, including for minors younger than age 17, 16, 15, or 14 years.
Source: National Conference of State Legislatures, Indoor Tanning Restrictions for Minors: A State-by-State Comparison website (http://www.ncsl.org/research/health/indoor-tanning-restrictions.aspx) and AIM at Melanoma, 2014 Indoor Tanning Legislation website (http://www.aimatmelanoma.org/en/aim-for-a-cure/legislative-accomplishments-in-melanoma/2014-indoor-tanning.html).

Currently, at least 44 states and the District of Columbia have some kind of law or regulation related to indoor tanning,[329-334] including the following:

- Bans on indoor tanning for minors under a certain age, ranging from 14 to 18 years.
- Laws for minors requiring parental accompaniment or parental permission.
- Harm-reduction regulations (for all ages) that require use of eye protection or limit exposure time.

Indoor tanning laws, particularly those that include age restrictions, appear to be effective in reducing indoor tanning among female high school students, who have the highest rates.[335]

Many states require that tanning salons be licensed or registered and that they provide information on the risks of tanning to customers; some require that tanners sign a warning statement before tanning.[336] Other legislative approaches include time limits, UV irradiance or exposure limits, requirements that warning

statements be signed or posted, mandatory eyewear, mandatory reporting of incidents, penalties for violations of existing regulations, and training requirements.[336] The strength of state laws varies, and some states have no laws relating to indoor tanning.[336] Restrictions on indoor tanning also exist at local levels. For example, indoor tanning is prohibited among minors younger than age 18 in Chicago and Springfield, Illinois, and in Howard County, Maryland.[329]

Evidence suggests that bans on underage tanning are effective in reducing access to and use of indoor tanning among minors.[335,337] According to a 2003 telephone survey of randomly selected indoor tanning salons in three states—Texas, Illinois, and Wisconsin—that banned indoor tanning by youth younger than age 13, 14, or 16 years, respectively, 62% of facilities contacted stated that they would not allow a 12-year-old to tan, whereas only 18% of facilities in a state without age restrictions (Colorado) would prohibit such use.[337] A study of the recently enacted under-18 ban in California found that 77% of salons would not allow a 17-year-old to tan.[338] Another recent study found that indoor tanning laws, particularly those with age restrictions, are associated with lower rates of indoor tanning among female adolescents.[335]

Laws that require parental consent for tanning by youth under a particular age have the potential to be effective at reducing youth indoor tanning, but more evaluation is needed. In 2009, researchers published results of a study of more than 3,600 indoor tanning facilities nationwide.[339] Data collectors called the facilities, posing as prospective fair-skinned, 15-year-old customers who had never tanned before. Of the 20 states with parental consent laws at the time of the study, facilities sampled in only four states (Louisiana, Maine, New Hampshire, and South Carolina) uniformly stated that they would require 15-year-old customers to obtain parental consent to tan.[339] Facilities in Georgia had the lowest level of compliance (72.5%).[339]

Other smaller studies confirmed low compliance. In a 2005 study, 15-year-old girls visited 200 indoor tanning facilities in Minnesota and Massachusetts, posing as potential customers. In 2005, both states had laws requiring parental permission for indoor tanning by youth (younger than age 16 years in Minnesota or 18 years in Massachusetts). However, 81% of the facilities sold the girls tanning sessions without parental consent.[340] A 2001 study of 54 salons conducted in San Diego, California, found that 43% of facilities visited would have enforced the existing parental accompaniment consent law.[341] These data indicate the need for, and importance of, enforcement of regulations or laws that may be effective at reducing youth indoor tanning.

Training requirements for tanning facility employees also vary by state. Some require that a salon must have at least one trained operator on site while tanning beds are in operation.[342] Others require training for all tanning salon employees.[334,343-345] Likewise, the extent and rigor of training required varies by state. For example, in Iowa, tanning bed operators are required to read a document on the risks of tanning provided by the state health department and complete an assessment.[346] Florida requires that all tanning salon employees and tanning bed operators complete a training course provided by a preapproved outside vendor. Many of the vendors are industry groups.[345]

Federal Policies, Legislation, and Regulation

Many federal departments and agencies work on efforts related to skin cancer prevention and control, individually and together. Federal agencies also disseminate information about what works to prevent skin cancer. The U.S. Department of Health and Human Services (HHS) and its agencies play important roles in skin cancer prevention at the federal level. These agencies include the National Cancer Institute (NCI) in the National Institutes of Health (NIH), CDC, FDA, and the Agency for Healthcare Research and Quality. CDC supports Comprehensive Cancer Control Programs in states, tribes, and territories, many of which conduct

activities related to skin cancer prevention. Federal entities outside HHS also address skin cancer prevention, including the Federal Trade Commission (FTC), EPA, the National Park Service, and the Occupational Safety and Health Administration (OSHA).

Federal legislation can help support skin cancer prevention and control efforts. For example, the Affordable Care Act includes a 10% excise tax on indoor tanning services and a requirement that nearly all health insurance plans cover USPSTF-recommended preventive services. Recommended services include behavioral counseling for children, adolescents, and young adults aged 10–24 years with fair skin on how to minimize their exposure to UV radiation to reduce the risk of skin cancer.

For more information on federal activities related to skin cancer prevention, see Appendix 5.

Sun Protection Policies and Legislation

Sunscreens sold in the United States are governed by FDA as over-the-counter drugs. Regulations identify acceptable active ingredients and dosage strengths, provide language and format for product labels, and establish standardized test methods for determining a product's SPF, among other requirements. Products that satisfy regulatory conditions are considered to be safe, effective, and truthfully labeled and may be marketed without premarket review and approval by FDA. Products that vary from regulatory conditions may be sold only after FDA review and approval.[187]

Under FDA regulations, all sunscreen products are labeled for use to help prevent sunburn, and they must state the product's SPF. Sunscreens that pass a separate test for broad spectrum (UVA and UVB) protection may also be labeled as "broad spectrum." In addition, broad spectrum sunscreens with SPF levels of 15 or higher may be labeled as reducing the risk of skin cancer and premature skin aging when used together with other sun protection measures, including limiting time in the sun and wearing long-sleeved shirts, pants, hats, and sunglasses.

Broad spectrum sunscreens with SPF levels above 2 but below 15 must be labeled with a "Skin Cancer/Skin Aging" alert in the warning section of the label. This alert states the following: "Spending time in the sun increases your risk of skin cancer and early aging. This product has been shown only to help prevent sunburn, not skin cancer or early skin aging."[187,347]

FDA regulations do not allow for the terms "waterproof" or "sweat proof" because no product has been shown to completely retain its effectiveness regardless of the time a person is immersed in water. Only the term "water resistant," followed by the length of time of demonstrated water resistance (40 or 80 minutes), is allowed to appear on sunscreen labeling.[187,347]

Indoor Tanning Regulations

At the federal level, FDA regulates indoor UV tanning devices under separate authorities, both as medical devices and as radiation-emitting electronic products. Manufacturers of indoor tanning devices (also known as sunlamp products) are required to certify that their products comply with the FDA Performance Standard for Sunlamp Products (21 CFR 1040.20).[348] FDA originally classified indoor tanning devices as Class I (low risk) medical devices, suggesting that they posed minimal dangers to consumers. FDA is working to reflect current science on the risks of indoor tanning, improve the visibility and readability of the warning label, update and promote compliance with the performance standard, and help reduce harms from these devices through

regulatory mechanisms. On May 29, 2014, FDA reclassified indoor tanning devices as Class II medical devices (moderate to high risk) (see Appendix 5 for more information).[349-352]

Once the reclassification order is effective,[350] manufacturers will have to do the following:

- Include a visible black box warning on the tanning device that people younger than age 18 years should not use these devices.
- Receive premarket notification 510(k) clearance from FDA for newly marketed devices (which were previously exempt from any premarket review).
- Show that their products have met certain performance testing requirements.
- Address certain product design characteristics.
- Provide comprehensive labeling that presents consumers with clear information on the risks of use.

Although the effect of strengthening FDA regulation is currently unknown, estimates from Australia suggest that strengthening and enforcing regulations restricting indoor tanning among minors and people with Fitzpatrick Skin Type 1 could result in 18–31 fewer diagnoses of melanomas per 100,000 and 200–251 fewer diagnoses of SCC per 100,000 each year in that country.[353]

Barriers to Addressing Indoor Tanning Through Policies, Legislation, and Regulation

Ubiquity of Indoor Tanning Devices

The ubiquity of indoor tanning salons and the low cost of indoor tanning may be important barriers to reducing harms from indoor tanning. A study found an average of 42 indoor tanning salons in major U.S. cities in 2006.[354] The study also found that cities with higher percentages of whites had significantly higher facility densities than those with lower percentages of whites and that living within 2 miles of an indoor tanning facility was a significant predictor of indoor tanning among adolescents.[354,355] In addition, indoor tanning devices are available for use in unsupervised settings, such as fitness centers and apartment complexes, which can promote frequent use and raises questions about the ability to enforce current and future regulations.[356]

Enforcement

Lack of enforcement creates a potential barrier to successful implementation of controls and can limit the effect these efforts could have on reducing indoor tanning. Studies examining state enforcement of indoor tanning laws and regulations raise concerns about the sufficiency of enforcement efforts. For example, a 2008 study in 28 cities found that routine annual inspections of indoor tanning facilities were conducted in only 36% of cities. Thirty-two percent conducted inspections less than annually, and about 32% did not inspect indoor tanning facilities for compliance with state laws. Officials in only 50% of cities stated that they would give citations to tanning facilities that violated laws.[357]

Compliance

FDA recommends limits on maximum exposure times, and FDA regulations require that the recommended exposure schedule appear on the label and in the instructions for sunlamp products.[358] However, compliance with existing regulations and recommendations varies.[136,341,359,360] A study of tanning salons

in North Carolina found that 95% of patrons exceeded FDA exposure recommendations, and 33% of patrons began tanning at maximum doses recommended for maintenance tanning.[136] Indoor tanning salons often use promotional pricing packages that promote frequent indoor tanning.[260,359] A study of 54 tanning salons in San Diego found that 75% of advertisements and 100% of facilities offered "unlimited" tanning packages,[341] which may encourage users to indoor tan in ways that are inconsistent with the intent of FDA exposure recommendations.

State regulation of indoor tanning devices, including restrictions on youth access, also varies considerably across the country, and studies examining state indoor tanning laws and regulations in the United States demonstrate that compliance with these laws is low and not adequately enforced.[262,360] The study of tanning salons in San Diego found low compliance with some state and federal regulations, including posting of warning signs.[341]

Marketing

Marketing tactics used by the indoor tanning industry can also be a concern. In 2010, FTC sued the Indoor Tanning Association (ITA), a trade association representing the tanning industry, alleging false and misleading advertising about the health risks of indoor tanning (see Appendix 5).[361] The settlement reached in this case prohibits the ITA from making the misrepresentations challenged in the complaint, misrepresenting any tests or studies, or providing deceptive advertisements to members. These prohibitions are applicable only to the ITA and related individuals and entities.

Evidence suggests that tanning industry members, including salon chains and individual salons, continue to make statements about indoor tanning that may be inconsistent with the available scientific evidence.[260,360] For example, according to a 2013 report of the results of a telephone survey of 338 indoor tanning salons in California, 61% denied harms of UV exposure, and many made claims of health benefits from indoor tanning exposure.[338] A 2012 report of the U.S. House of Representatives Committee on Energy and Commerce, Minority Committee, described the response of randomly selected tanning salons to calls from individuals posing as teenaged girls. According to the report, many of the salons stated that indoor tanning does not increase cancer risk, despite substantial evidence to the contrary.[362]

Lack of a Comprehensive Approach

Lack of a comprehensive, coordinated approach may also be a barrier to successful policy and legislative efforts. Without enforcement, certain restrictions may be easily circumvented. Stronger laws to regulate tanning salons and restrict youth access to them will not be as effective in the absence of increased controls on unsupervised tanning beds and direct sales to the public. Instead, they may drive people to indoor tan in unsupervised locations, such as gyms, beauty salons, or common areas of apartment complexes, or to buy tanning beds for home use. Unsupervised use of a tanning bed or use without a trained operator may lead to longer, more intense exposure to UV radiation. A qualitative study found that ownership of a tanning bed could lead to very high exposures. One participant shared that he would often fall asleep in his tanning bed, tanning for as long as 40 minutes at a time.[k,211]

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[k] Although indoor tanning devices sold in the United States are required to have timers that would automatically shut off the device after a certain period of time, these timers may be inoperative or possibly overridden by users. Data from the National Electronic Injury Surveillance System on visits to emergency rooms related to indoor tanning contain anecdotal reports of users falling asleep and being burned.

A survey of British youth in 2010, before the United Kingdom enacted restrictions banning indoor tanning for all minors, found that 23% of youth aged 11–17 years had used an indoor tanning device at home, and 21% had used unsupervised devices in other settings.[363] To prevent minors from accessing unsupervised tanning facilities where access is not controlled, WHO has recommended banning unsupervised tanning facilities as a complement to restricting the use of tanning beds by minors.[356]

International Efforts to Prevent Skin Cancer

Other countries have taken a variety of approaches to prevent skin cancer, including community-based, multicomponent interventions, which are recommended by The Community Guide.[295] If these types of interventions include some level of continued support, they have demonstrated an ability to influence sun-protective behaviors.[364] A study of an Australian skin cancer prevention program called SunSmart estimated that a national, ongoing program funded at historic levels ($0.12–$0.41 Australian dollars per year per capita) would save $2.30 in Australian dollars for every $1 invested. The program was also estimated to save 22,000 life-years in the state of Victoria, Australia, during 1988–2003.[365] Data from the evaluation of the SunSmart program provide evidence that sustained funding for a community-level skin cancer prevention initiative can improve health outcomes and result in long-term savings in health care costs.

Some countries have also used mass media campaigns with varied success, but most of these efforts have not been formally evaluated. One particularly successful sun-safety campaign called Reduce Your Sun was implemented in Denmark.[366] Since the campaign started in 2007, surveys have shown decreases in the percentage of Danes who sunbathe and who indoor tan.[367] The Danish campaign made extensive use of social marketing and social media, including provocative videos designed to appeal to adolescents and young adults.[366,368]

Many countries have laws specifically addressing indoor tanning. In November 2009, based on WHO's designation of indoor tanning devices as Class 1 human carcinogens (the highest risk level), Brazil became the first country to ban indoor tanning for cosmetic purposes.[369] In February 2012, New South Wales, Australia—home to more than 5 million people—passed a complete ban on indoor tanning, which will become effective on December 31, 2014.[328] In addition, as of January 2014, France, Spain, Portugal, Germany, Austria, Belgium, the United Kingdom, Australia, Iceland, Italy, Finland, and Norway prohibit indoor tanning for youth younger than age 18 years; most of these laws have been in place since 2003.[328,369]

According to WHO,[356] other approaches can include the following:

- Banning unsupervised indoor tanning devices (e.g., devices located in gyms or apartment common areas, coin-operated devices).
- Requiring eye protection.
- Restricting the use of indoor tanning by people at higher risk of skin cancer (e.g., those with Fitzpatrick Skin Type 1).
- Limiting the UV intensity emitted from devices.
- Requiring informational and warning notices.
- Conducting health education.
- Requiring informed consent to ensure that all users are aware of risks.
- Requiring training of tanning salon staff.

SKIN CANCER PREVENTION IN ACTION: MULTICOMPONENT EXAMPLE FROM AN INTERNATIONAL SETTING

SunSmart Australia: Lessons from International Success

Australia has the highest incidence of skin cancer of any country, and the disease costs the country's health care system more than $294 million in Australian dollars annually. In 1988, the state of Victoria launched the SunSmart program to encourage sun-protective behaviors and minimize the human cost of skin cancer.

This multicomponent, communitywide intervention is designed to raise awareness, change personal behaviors, and influence institutional policy and practices. Activities include mass media campaigns, programs in schools and work sites, a sports program, health care provider education, resource development and dissemination, and capacity building at the community level.

Since SunSmart began, rates of BCC and SCC skin cancers among people younger than age 45 years have begun to taper off, and increases in melanoma rates have stabilized.[365,370] SunSmart is estimated to save $2.30 in health care costs for every $1 spent.[365] For more information about the SunSmart Program, visit http://www.sunsmart.com.au.

Photo courtesy of Queensland Department of Health

Gaps in Research and Surveillance

Internationally, research has provided strong evidence about what works to reduce the risk of skin cancer, and there is a growing body of evidence in the United States. However, additional research and surveillance are needed to maximize the success of future skin cancer prevention efforts. Important strides have been made in skin cancer prevention in the United States, but they have not been sufficient to curb the rising rates of skin cancer incidence. Social and behavioral research can help us better understand some issues, such as ongoing high rates of sunburn despite improvements in sun protection and ongoing high rates of indoor tanning despite evidence that it is a human carcinogen. More information is needed regarding effective message framing and effective policies to promote behavior change.

Finally, reliable data are needed to measure the effect of prevention efforts. Many skin cancer cases are not being captured by current surveillance systems, and current behavioral surveillance systems may not be adequate to track the effect of state and local initiatives, such as indoor tanning restrictions for minors. Identifying areas where information is lacking is important in order to improve efforts to prevent skin cancer. This section details the gaps in what is currently known. The "Calls to Action" section (page 46) will propose strategies for filling these gaps.

Individuals

Although surveillance data indicate that some sun protection practices have increased, these behaviors have not been associated with a reduction in the incidence of sunburn.[226] These data indicate inadequate use of sun protection among Americans and are cause for concern. Research is needed to increase understanding of the factors that underlie inadequate sun protection behaviors and to identify strategies to increase adoption of sun protection practices beyond sunscreen use. Current recommended intervals for reapplication may not maximize the protectiveness of modern sunscreens, and more research that accounts for how sunscreens are actually applied in real-world situations would help guide future recommendations.[240]

Specific information is needed about effective messaging to influence positive behavior change related to skin cancer prevention for specific groups, such as frequent tanners, event tanners (those who tan before a special occasion like a prom or wedding), athletes, people concerned about vitamin D deficiency, males versus females, and different racial and ethnic groups. More research on effective communication would allow for specific messaging in education and communication interventions. Similarly, testing prevention messages would ensure that only the most effective interventions are disseminated and that they are suitably tailored for specific groups.

New technologies, such as personalized mobile applications (or "apps") that measure UV exposure, may provide opportunities to address messages to people concerned about sun protection.[371,372] Behavioral counseling has been shown to be effective, but these studies were only conducted among female undergraduate tanners. More research is needed to determine effectiveness among broader populations, especially frequent tanners.[306]

Better understanding is needed of the potentially reinforcing properties of indoor tanning, such as the release of endorphins when the skin is exposed to UV radiation.[270-272] By adapting questionnaires used for substance-related addiction disorders, researchers found that study participants who report regular, more frequent indoor tanning tended to report reactions to tanning such as relaxation, pain relief, stress relief, and a sense

of well-being or euphoria.[373] More research is needed to understand whether these reactions to indoor tanning can cause users to feel physically or psychologically dependent on indoor tanning. In turn, alternative approaches may be needed to intervene for these indoor tanners, who may differ from the broader population.[374]

Parents

For children, adequate sun protection depends largely on their parents' attitudes and behaviors.[375,376] Research has also shown that parental acceptance of tanning has a strong influence on adolescent tanning behavior.[275] More information is needed to assess parents' attitudes and behaviors regarding sun protection and indoor tanning (for themselves and for their children), as well as parents' awareness of their children's use of sun protection and tanning behaviors. Although parental modeling of tanning behavior is a strong predictor of their children's tanning behavior, the prevalence of parents' indoor tanning with their children is unknown.[275] Strategies for involving parents in prevention efforts for children should be formulated and evaluated.

Clinicians

Currently, little information exists on whether clinicians follow USPSTF recommendations for behavioral counseling for skin cancer prevention. Surveys or other systems are needed to monitor clinicians' counseling practices. Given the large time demands on clinicians, resources and tools are needed to provide guidance on best practices that clinicians can fit into their short time with patients. These resources should include information on how to identify patients at high risk and give them appropriate behavioral counseling on how to prevent skin cancer. Providing computer prompts through electronic health record (EHR) systems may increase clinicians' delivery of preventive care, including behavioral counseling on skin cancer prevention.[377]

Skin cancers detected at earlier stages are easier to treat than those diagnosed later.[6,31] More research is needed to determine who is most likely to benefit from screening (see Appendix 3), as well as effective ways to increase awareness and early detection.

Schools

Skin cancer prevention interventions that use education and policy approaches in elementary and middle schools and child care centers have been found to be effective.[306] More information is needed on the long-term effect of these interventions on sun-protective behaviors and sunburn. More evidence is needed to determine the effectiveness of similar interventions in high school, college, and university settings. Furthermore, evidence is needed to identify similar school-based strategies that could effectively address indoor tanning and complement other efforts to reduce indoor tanning, such as legislation and mass media campaigns.

Photo courtesy of Queensland Department of Health

Outdoor Workers

Better understanding of how to reduce the risk of skin cancer among outdoor workers is needed. Although employers are legally responsible for ensuring the protection of their workers, they are not specifically required to provide sun protection, such as sunscreen, hats, or long-sleeved shirts. Understanding the costs and benefits of employer-provided protection would help determine its effectiveness and cost-effectiveness. More information on the types and prevalence of sun protection methods among outdoor workers is needed, as well as information on potential differences in language and culture.[378]

Communities and Social Networks

Additional research can provide information to communities on how to maximize the protective effects of environmental changes in the community, such as how adding shade structures will affect sun protection, which improvements are most cost-effective, and where and how shade structures could be best used. Best practices on community shade structures, similar to guidelines for schools, may be needed. Surveys that ask about common sources of sun exposure would help identify sites where shade would be most effective.

Researchers need to conduct further studies to identify ways to shift social norms around tanned skin and sun protection and increase sun protection methods beyond sunscreen use. Social network research in general and social media research in particular could help capture real-time responses to media stories and campaigns. This research could help monitor attitudes on tanned (or untanned) appearance. In turn, social marketing may provide opportunities for wide dissemination of individualized messages about skin cancer prevention. Interventions that use text messages have also shown promise in improving prevention behaviors and may provide opportunities for skin cancer prevention.[379] New wearable UV sensor technology may provide additional opportunities for research on the effectiveness of prevention strategies, but their effect on sun protection practices is unknown.[104,380-382]

Indoor Tanning Legislation and Multilevel Influence

Evidence on the effectiveness of indoor tanning legislation suggests that different laws may have different effects on tanning behaviors.[335] The effects of specific laws, such as prohibitions on tanning for youth younger than age 18 years or enhanced warning labels, are unclear. Recent studies have found that age restrictions appear to be associated with decreased tanning among youth.[335,337] Evidence regarding the effects of other policies and legislation on indoor tanning is limited, and some studies that have attempted to examine the relationship between the presence of local laws and indoor tanning have failed to find an association.[355] The lack of evidence may be due, in part, to challenges in surveillance and monitoring of indoor tanning at the state level; wide variation in the stringency, compliance, and enforcement of laws and regulations; and the relatively recent adoption of restrictive laws and regulations.[335,355]

Monitoring changes in tanning behaviors over time (both indoor tanning and sunbathing) as new indoor tanning legislation is adopted can help document the effects of such legislation. It can also guide future policies and identify unintended consequences, such as replacement of tanning in salons with indoor tanning at home or sunbathing. Adequate compliance, monitoring, and enforcement will be needed to have the greatest effect on behavior and policies.

The lack of a comprehensive and multilevel approach to reducing indoor tanning may also be a barrier to successful policy efforts. Without reinforcement by other legislative or regulatory organizations, certain restrictions on indoor tanning may be difficult to enforce. For example, without adequate controls to ensure that minors do not tan indoors on their own, age bans on tanning are easily circumvented.[356] WHO recommends banning the sale of unsupervised indoor tanning devices as a complement to restricting minors' use of tanning beds.[356] The prevalence of unsupervised tanning and home use of tanning beds is also not well-documented, and surveys or other systems are needed to monitor these types of tanning behaviors.

Social norms regarding tanning, the desire to have tanned skin, and misconceptions about the health effects of indoor tanning are more likely to be influenced if policy approaches are coordinated with comprehensive approaches at local, state, and national levels.[260,262] Research is needed to identify the effective combination of intervention components at different levels of influence that can be tailored to specific groups and widely disseminated.[260,262]

Surveillance

Cancer Surveillance

Counts and prevalence of people treated for NMSCs have been estimated from individual-level data from the Medical Expenditure Panel Survey,[7,10] but surveillance data on these cancers are not generally available. Melanoma data are collected by population-based cancer registries, and these data are needed for long-term evaluation of prevention efforts. Doctors diagnosing or treating in situ and invasive melanomas are required by law to report cases to central cancer registries.[383] Hospitals generally have systems set up to report inpatient cases. However, melanomas diagnosed and treated in outpatient settings are frequently underreported, highlighting the need for improved awareness of proper reporting requirements among doctors, especially dermatologists.[384,385]

In 2009, the Centers for Medicare & Medicaid Services (CMS) established incentive programs to encourage health care providers to adopt, implement, and upgrade the use of certified EHRs in different stages. (For more information about EHRs, visit http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Stage_2.html.) Reporting cancer cases to a central cancer registry is included in Stage 2 of the incentive program, so providers have an additional incentive to report melanoma cases beyond compliance with state law.[386,387] The most recent estimates of melanoma and NMSC incidence were conducted in 2011.[7,9,53,388] New analyses are needed to show melanoma trends from more recent years, and new methods are needed to better estimate NMSCs (which are not included in cancer registry collection).

Behavioral Surveillance

Some information on sun-safety behaviors and indoor tanning is included in surveillance system surveys, but more could be done to use these systems to advance surveillance of behaviors related to skin cancer risk. For example, the Behavioral Risk Factor Surveillance System (BRFSS) is a state-based, random-digit–dialed telephone survey of the noninstitutionalized, U.S. civilian adult population aged 18 years or older. It is administered annually to households with landline and cellular telephones by state health departments in collaboration with CDC.[389] This nationally representative survey is designed to enable prevalence estimates at the state level and, in some instances, at the local or metropolitan level.

Inclusion of questions about sun protection and indoor tanning on the BRFSS would allow better state-specific analysis of indoor tanning prevalence and sun protection behavior, which would provide more information on the effect of interventions. Likewise, the national YRBS is designed to be a nationally representative sample of high school students. It measures indoor tanning frequency and sunscreen use, but does not currently measure other sun protection behaviors, such as use of protective clothing, hats, and shade. Furthermore, the survey's sample design does not yield state-specific measures.

Inclusion of indoor tanning questions on state YRBS questionnaires would allow for evaluation of state policies. However, only a few states have added such questions to their surveys, making it difficult to measure prevalence of indoor tanning and monitor the effect of indoor tanning restrictions for minors at state levels. This lack of data at the state level also poses barriers for state-level planning and evaluation.

In addition, little information is available on intentional outdoor UV exposure behaviors (sunbathing or seeking a tan). Measuring this behavior would help researchers quantify any unintended consequences of changes to indoor tanning legislation or attitudes. Surveillance systems that monitor indoor tanning attitudes and beliefs among the U.S. population and among indoor tanners are also needed. Questions designed to collect this information could be added to existing surveys, such as the Health Information National Trends Survey (HINTS), the National Survey of Family Growth, or national panel surveys such as HealthStyles.

Surveillance of Environmental Exposure

Little information is available on general outdoor exposure to UV radiation that is experienced in the course of routine activities, such as playing sports, engaging in physical activity, gardening, or walking a dog. Research on personalized UV sensor technology and Global Positioning System devices could be used to better capture UV exposure among individuals and allow for more accurate measurement of individual UV exposure in the near future.[104,371,372,381] Research is needed to determine the best way to use existing technology or expand the way current systems work together. Doing so may improve surveillance estimates of UV exposure, guide intervention efforts, and possibly enhance prevention behavior.

Vitamin D and Sun Protection

More research on the relationship between vitamin D and sun protection behaviors is needed. Although guidelines exist to identify levels of insufficiency and deficiency, optimal serum concentrations of vitamin D are a matter of scientific debate and most likely vary among individuals.[173] As previously discussed, FDA concluded in 2011 that clinical studies on the effect of sunscreen use on vitamin D concentrations were inconclusive.[187] Although not enough evidence exists currently to determine whether sunscreen use alone can lead to vitamin D deficiency,[187] improving sun protection across the population could potentially lead to reduced vitamin D concentrations for some individuals if not compensated for by vitamin D intake from diet or supplements.[82,86,142,187] If populationwide skin cancer prevention programs were implemented in the future, surveillance data from the National Health and Nutrition Examination Survey (NHANES) could be used to monitor vitamin D serum concentrations in the population and document any unintended consequences of skin cancer prevention interventions, such as increases in vitamin D deficiency.

Economic Analysis

Estimates of the health and economic benefits of reducing risk factors for skin cancer and the subsequent reductions in skin cancer incidence and mortality are needed to justify and guide current and future prevention efforts. For example, economic modeling could be performed to examine the number of skin cancer cases averted and the costs saved by implementing various indoor tanning policies and other communitywide efforts.

In addition, the effect of economic interventions, such as the 10% excise tax levied on indoor tanning services through the Affordable Care Act, is largely unknown.[390,391] The only evidence of its effect was limited to tanning salons in one state.[391] A national study is needed to examine the effect of the excise tax and how increases in the price of indoor tanning could affect its use, similar to studies conducted on tobacco taxes.[392]

Potential Unintended Consequences of Interventions

As with any intervention, increasing sun protection in the population could have unintended consequences. Some people may become sensitized to the chemicals in sunscreens, and increased sunscreen use could lead to increased sensitization, resulting in urticaria (hives) or allergic contact dermatitis.[231] Restrictions on indoor tanning without changes to social norms about the desirability of tanned skin might encourage tanners to seek the sun outdoors, to tan in less-regulated settings (such as in homes), or to use sunless tanning.[260] Ongoing efforts are needed to monitor the effects of skin cancer prevention efforts, including unintentional and potentially harmful effects, such as reductions in vitamin D concentrations in the population or reductions in physical activity.

Calls to Action

This section presents five strategic goals to support skin cancer prevention in the United States. Federal, state, tribal, local, and territorial governments; members of the business, health care, and education sectors; community, nonprofit, and faith-based organizations; and individuals and families are all essential partners in this effort. Strategies that change the context or environment to support healthy choices generally have greater reach and are more effective at the population level than strategies focused on individual behavior.[314]

This section also provides education and communication strategies, which will likely be most effective if used in conjunction with changes to the social context and environment. Aligning and coordinating efforts for skin cancer prevention across a wide range of partners is central to achieving success. Involving partners across disciplines, sectors, and institutions will be essential to addressing the rising incidence of skin cancers in the United States.

PARTNERS IN PREVENTION

- Federal, state, tribal, local, and territorial governments.
- Businesses, employers, and labor representatives.
- Health care systems, insurers, and clinicians.
- Early learning centers, schools, colleges, and universities.
- Community, nonprofit, and faith-based organizations.
- Individuals and families.

Goal 1. Increase Opportunities for Sun Protection in Outdoor Settings

Increasing opportunities for sun protection in outdoor settings can make healthy sun-safe behaviors the default choice and help Americans enjoy their time outdoors safely with minimal effort. Changing the context for sun protection may also contribute to changing social norms regarding the necessity of sun protection while outdoors.

Strategy 1A. Increase shade in outdoor recreational settings.

When spending time outdoors, Americans can be exposed to high levels of UV radiation. Communities can increase the availability of shade in recreational settings, such as parks and sports fields, to provide passive protection and increase comfort levels. Strategically planting trees or building structures to shade frequently used areas can protect people from heat as well as UV radiation and increase their comfort while outdoors. A shade audit is a systematic process to determine how much shade is currently available on a site, where more is needed, and where to place trees and shade structures to be most effective.[308,393,394] Existing shade audit, planning, and policy tools, such as CDC's *Shade Planning for America's Schools*, could potentially be adapted for broader community use.[308,394] New technologies might offer the possibility of strategic shade

planning with minimal resources and investment.[393] Changing the environment by increasing shade can help parents and caregivers adequately protect their children from excessive sun exposure. Even one bad sunburn in childhood increases risk of melanoma later in life.[87] Protecting children can be difficult, as they may be resistant to wearing additional clothing, hats, and sunglasses. Sunscreen can be difficult to apply and reapply, especially for younger children.

Key partners in prevention include federal, state, tribal, local, and territorial governments; businesses and employers, especially urban planners and architects; early learning centers, schools, colleges, and universities; community, nonprofit, and faith-based organizations; and individuals and families. These partners can support efforts to do the following:

- Provide shade from trees, nearby buildings, or structures specifically designed to block the sun, such as canopies and umbrellas.
- Use a shade audit process or tool[308,393,394] to help ensure effective shade planning.
- Adapt existing shade planning tools[308,393,394] for broader community use and disseminate these tools widely.
- Ensure ample availability of shade in recreational and play areas to help protect children from overexposure to UV radiation.

Strategy 1B. Support sun-protective behaviors in outdoor settings.

Encouraging Americans to enjoy physical activity in outdoor areas, such as parks, fields, pools, and beaches, is important for physical fitness and health. Just as many recreational areas take steps to reduce the risk of immediate injury from accidents, other outdoor areas can take steps to reduce the short-term risks of sunburn and long-term risks of skin cancer by promoting sun-protective behaviors. Coaches and other organizers of outdoor sports and recreational activities can change the social context by scheduling routine breaks to reapply sunscreen and drink water, which also reduces risk of heat illness.[239,250,251,256] Simple modifications to the outdoor environment can help to make sun safety the easy or default choice.

Key partners in prevention, such as federal, state, tribal, local, and territorial governments; businesses and employers; early learning centers, schools, colleges, and universities; and community, nonprofit, and faith-based organizations, can support the following efforts:

- Establish agreements with vendors in outdoor recreation areas to sell sun protection equipment, such as protective hats, clothing, and umbrellas, which will support healthy behaviors and provide additional revenue for communities, businesses, and sports teams.

- Provide broad spectrum sunscreen with an SPF of 15 or higher in dispensers with prompts and signs that tell people how to apply sunscreen in high-UV areas, such as beaches and pools. Sunscreen should not be the only protection method offered.
- Provide prompts and signs about sunscreen to remind people to reapply and to encourage users to pair sunscreen with other methods of protection, such as protective clothing and shade.
- Provide routine breaks during outdoor recreational or occupational activities to reapply sunscreen.

Strategy 1C. Increase availability of sun protection in educational settings.

Because many children spend substantial amounts of time in schools and child care and early learning centers, addressing overexposure to UV radiation in these settings is important. Increasing shade in appropriate locations would provide passive protection from overexposure to UV and help protect children from heat illness. Shade audits can help identify where to place trees and shade structures to be most effective. These audits can also be used to identify areas that may already be shaded at key times of the day, so that activities can be located in less UV-intense areas.[308,393] CDC's *Shade Planning for America's Schools* provides guidance and tools for using a shade audit to increase availability and use of shade on school grounds.[308]

Schools, colleges, and universities can also support sun protection in outdoor recreational settings on campus, such as those used for athletics. Support for sun protection at athletic events has the potential to benefit coaches, athletes, and students, as well as fans and spectators of all ages. Athletes face many of the same risks as outdoor workers.[250]

Key partners in prevention, such as federal, state, tribal, local, and territorial governments; businesses; early learning centers, schools and school districts, colleges, and universities; community, nonprofit, and faith-based organizations; and individuals and families, can support sun protection in educational settings in the following ways:

- Conduct shade audits to find solutions that fit a school or child care system's budget, maximize investment, and identify locations where trees and shade structures will be most effective.[308]
- Locate activities in shaded areas or schedule activities during low-UV times of day, when feasible.
- Provide shade trees or structures in key locations identified through audits. Consider public-private partnerships or grants to leverage resources.
- Include shade planning in the planning of new school facilities.
- Support sun protection in outdoor athletic settings, especially in high schools, colleges, and universities.

Strategy 1D. Increase availability of sun protection for outdoor workers.

Sun protection is of particular importance for outdoor workers, who are at increased risk of skin cancer. Appropriate protection strategies will depend on the occupation and the work site. For example, shade for lifeguards can be relatively inexpensive and practical because they are frequently stationary. For farmworkers, hats and protective clothing are more appropriate. Sunscreen can make a person's hands slippery and may interfere with the work and safety of certain outdoor workers. A readily available hand-washing station to wash hands after reapplying sunscreen can be considered, as well as other methods of protection. Heavy, long-sleeved clothing may also increase risk of heat illness by trapping in heat. Sun protection that takes into account the needs and preferences of workers will likely be most successful.

Corporate risk managers are accustomed to reducing risk for workers, and they may be especially attuned to risks of UV exposure. Providing shade for stationary workers or providing shaded areas for breaks can also reduce the risk of heat illness, but shade alone may not be sufficient, especially in high-UV areas with reflective surfaces, like snow, water, and sand. Employers should consider multiple methods of sun protection for workers.

Key partners in prevention, such as businesses and employers, can protect outdoor workers in the following ways:

- Provide readily accessible sun protection to all employees, clients, contractors, and other visitors to outdoor work sites, including uniforms or other protective clothing, wide-brimmed hats to protect ears and backs of necks, and sunscreen.
- Encourage workers to reapply sunscreen throughout their shifts.
- Modify work environments, when feasible, by increasing the availability of shade and modifying or covering reflective surfaces to reduce workers' UV exposure.
- Adapt schedules to protect workers from overexposure to UV radiation, when feasible. Employers may be able to schedule outdoor work during times of the day and year when the UV Index is lowest. They may be able to rotate employees through jobs that require significant sun exposure to avoid excessive exposure to individual workers.

Goal 2: Provide Individuals with the Information They Need to Make Informed, Healthy Choices About UV Exposure

Individuals need clear information that is based on the best and most current evidence to make healthy choices about UV exposure and sun protection. Current skin cancer prevention messages are broad-based and may not resonate with some groups. Most Americans equate sun protection with sunscreen alone, so the importance of other strategies, such as shade and protective clothing, should be emphasized. Messages should also clarify that sunscreen should be used in combination with other protection, and they can emphasize the importance of applying and reapplying ample amounts of sunscreen. Current messages also do not address the need for vitamin D, potentially missing opportunities to highlight the importance of skin cancer prevention in media coverage of vitamin D issues.[395]

Many Americans lack a general knowledge or awareness about the risks associated with sun exposure.[63,243,244] Some groups, especially blacks, the elderly, and people with less education, may perceive themselves to be at low risk of skin cancer.[63] However, these groups are at increased risk of being diagnosed with skin cancer at later stages.[78,96,245] More comprehensive collection and dissemination of information about skin cancer in the United States would help underscore how frequently these cancers occur.

People need clear information about how to minimize their risk of skin cancer while leading healthy, active lives and enjoying the outdoors. A substantial segment of U.S. adults do not perceive cancer as preventable, and as a result, they may be less likely to engage in skin cancer prevention practices, such as using sunscreen or covering up.[246] Lack of understanding of the UV Index is also a barrier to making informed decisions about adequate sun protection while outdoors.[247,248] New technologies, such as evidence-based mobile apps that provide information about sun protection directly to individuals, may provide opportunities for direct messaging that is based on an individual's behavior and skin type.[371,372] Evidence-based information that is accurate and consistent and provided in various settings is an important part of reducing excessive UV exposure in the U.S. population.

Strategy 2A. Develop effective messages and interventions for specific audiences.

Mass media campaigns can be very effective at increasing skin cancer prevention behaviors when they are part of multicomponent, communitywide interventions.[396] Before conducting any large messaging campaigns, enhanced understanding of which messages will resonate with specific groups is needed. Because mass media public health campaigns can be expensive, evidence of the cost-effectiveness of different approaches will be valuable. Ensuring that messages and the channels used to disseminate them have been proven to be effective at changing attitudes and behaviors regarding skin cancer prevention in a specific audience is important before making large investments.[365,397,398] Effective messaging strategies designed to increase sun protection in various populations, including outdoor workers, specific racial and ethnic groups, younger women, and men across all age groups, are needed.

Some research has shown that messages that focus on appearance (such as increased risk of wrinkles and skin aging) can be effective in reducing indoor tanning among college-aged women.[278] However, more research is needed to determine the most effective messaging strategies for other demographic groups. Messages should provide specific information on the most effective methods for sun protection applicable for a specific audience, as well as information about the limitations of some types of sun protection. Consistent, clear, and tailored messages with prompts to make specific decisions can encourage people to take the necessary steps to avoid excessive sun exposure when outdoors.[230]

The UV Index was developed to provide such information, but it is not widely disseminated or understood by the general public.[247] Resources like the UV Index need to be promoted more widely through simple messages that include action steps for sun protection, so people understand when and how to take precautions.[247,248] Information about the UV Index and the corresponding need for sun protection could be disseminated in the same way as weather forecasts or air quality reports.[247] Then, people could routinely consider the UV level just as they consider the weather when they are getting dressed and preparing to go outdoors. Accurate, up-to-date information about UV levels and appropriate protection measures could be provided through a variety of media, such as weather reports, websites, personalized apps for smart phones, and possibly social media.[248,372]

Key partners in prevention, such as federal, state, tribal, local, and territorial governments; businesses and employers; health care systems, insurers, and clinicians; early learning centers, schools, colleges, and universities; and community, nonprofit, and faith-based organizations, can work together to develop and disseminate messages that accomplish the following:

- Address the misperception that sunscreen alone is the most effective way to protect skin from the sun.
- Improve sun protection, especially among adult men. Communications designed to reach men can emphasize the importance of wide-brimmed hats, protective clothing, and broad spectrum sunscreen with an SPF of 15 or higher on exposed areas when outdoors for extended periods.

- Improve communication in recreational settings. Prompts in outdoor recreational areas and in areas such as locker rooms may improve and normalize the use of sun protection.
- Improve communication about when and how to use sun protection. Simple messages that include action steps for sun protection could be widely disseminated across a variety of outlets, including weather reports and online tools.
- Increase understanding about effective use of sunscreens, including what type of sunscreen to use, how much to use, and how often to reapply.
- Address appearance-related motives and the desire to be tan, especially among young women.
- Help parents teach their children healthy sun protection behaviors from an early age.

Strategy 2B. Support skin cancer prevention education in schools.

Education about skin cancer prevention can be incorporated into school curricula and linked with outdoor activities from an early age, when children are more receptive to such messages. The education sector can be a key partner in supporting healthy choices for sun protection through adolescence and young adulthood. It can also influence the community through connections to families, alumni, and fans.

Educational and behavioral interventions to promote sun protection in child care centers and in elementary and middle schools have been shown to be effective.[295] These interventions vary greatly in intensity, duration, and the number of components included. In addition to influencing children's behaviors, these interventions may also influence the practices of adults and caregivers both inside and outside the school.

Key partners in prevention, such as federal, state, tribal, local, and territorial governments and early learning centers and schools, can support sun protection education in the following ways:

- Implement skin cancer prevention interventions that are designed for and proven to be effective in schools.
- Adopt lessons from interventions in daily routines, including during recess, physical education, and outdoor extracurricular activities.
- Adapt proven skin cancer prevention interventions, such as the SunWise program, and disseminate them in child care settings.

Strategy 2C. Integrate sun safety into workplace health education and promotion programs.

Skin cancers cause a significant loss of productivity in the U.S. workforce.[69,70] Incorporating sun-safety messages into comprehensive workplace health promotion and protection programs can increase health, safety, and productivity and save money. For outdoor workers, interventions designed to increase knowledge about sun protection; activities designed to influence attitudes, behavior, and knowledge of workers; environmental approaches designed to encourage sun protection (such as provision of shade); and policies designed to support sun protection practices have been shown to be effective.[306]

As an additional benefit, outdoor workers, such as lifeguards, coaches, and ski instructors, may be able to teach and model skin cancer prevention to customers and clients in their workplace.[399] Many of these workers have extended interaction with children and are exposed to high levels of UV radiation.

Employers of outdoor workers are required by OSHA to train employees on heat illness prevention. Given the overlap between risk factors for heat illness and risk factors for sunburn and skin cancer, current policies designed to prevent heat illness in the workplace could be adapted to incorporate sun safety. Employees who work in direct sunlight through windows or who drive regularly as part of their job are at risk of overexposure to UVA rays through glass. Sun-safety messages and training are also appropriate for indoor workers. Although indoor workers are not usually exposed to UV radiation during the work day, they may be more likely to have intense, intermittent sun exposure during recreational time on weekends or during vacations, putting them at increased risk of melanoma.

Key partners in prevention from the business sector, including employers, labor representatives, risk managers, and employee wellness program managers, can support sun protection education for workers in the following ways:

- Incorporate sun-safety information into existing workplace wellness programs. Heat illness prevention programs could be adapted to incorporate sun safety.
- Provide training to outdoor workers about risks of exposure to UV radiation and the signs and symptoms of overexposure.
- Encourage outdoor workers, such as lifeguards, coaches, and ski instructors, to be role models and discuss the importance of using appropriate sun protection measures with others.

Strategy 2D. Partner with health care systems and providers to implement and monitor use of recommended preventive services for provider counseling on skin cancer prevention.

Currently, the USPSTF recommends provider counseling on skin cancer prevention for fair-skinned youth aged 10–24 years, and these services are generally covered by health insurance.[265,277,278] However, skin cancer prevention is one of many competing priorities that health care providers may need to discuss during a medical visit. Providers could be supported to follow USPSTF guidelines in several ways. For example, tools developed and disseminated to providers for behavioral counseling on skin cancer prevention should include appearance-focused messages that have been shown to be effective in reducing the intent to indoor tan. Some of the materials suggested by the USPSTF have already been developed and tested.[265]

Provider prompts that are part of checklists or EHR systems have been shown to increase provider adherence to guidelines for other topics and may be applicable to skin cancer prevention counseling recommended by the USPSTF.[400-402]

Key partners in prevention from the health care sector, including health care systems, insurers, and clinicians (such as dermatologists, primary care physicians, physicians' assistants, and nurses), can do the following:

- Disseminate counseling messages in accordance with USPSTF guidelines.
- Include specific messages about avoiding indoor tanning when counseling young fair-skinned adolescents and young women, among whom this behavior is common.

Key partners in prevention, such as federal, state, tribal, local, and territorial governments; colleges and universities; health care systems, insurers, and clinicians; and community, nonprofit, and faith-based organizations, can work together on the following:

- Include provider prompts for counseling to minimize UV exposure for fair-skinned youth aged 10–24 in checklists or EHR systems.
- Develop and disseminate tools for providers to support behavioral counseling on skin cancer prevention.
- Collect information on providers' skin cancer prevention counseling practices to help identify further opportunities for intervention and conduct behavioral research to guide and refine tools available for counseling.

Strategy 2E. Establish partnerships between public and private sectors to disseminate effective messages about skin cancer prevention.

When paired with other interventions at the community level, communication campaigns can be effective at increasing skin cancer prevention behaviors.[295] Partners in prevention can work together across all sectors to provide consistent messages to a wide audience. Dermatologists and dermatologic societies have helped raise public awareness of the issue of skin cancer, and they and the health care sector will continue to be important contributors to these efforts. Media and entertainment industries can also be vital strategic partners in efforts to change social norms related to tanning behaviors. Community, nonprofit, and faith-based organizations can help tailor communications to select populations or geographic areas, directly or through innovative partnerships, such as working with various organizations in the private sector.

To have a broad influence, communication campaigns need to be implemented and sustained over an extended period. A comprehensive approach is needed to ensure that opportunities for sun protection are increased along with communications. Leveraging public-private partnerships may be a cost-effective strategy for such a campaign. Tailored messages about sun protection may be more effective than broad-based messages to the general population.[230] Thus, tools that allow for focused messages, such as social and electronic media, can be important for strategic dissemination, especially to some audiences, such as adolescents and young adults.[372,379]

Evaluations in Australia have shown that efforts to implement a multicomponent, communitywide intervention (SunSmart Australia) were successful in reducing skin cancer rates and were cost-effective.[365,397,398] Similar work to implement and evaluate a large-scale, multicomponent, communitywide intervention is needed in the United States.

Key partners in prevention, such as federal, state, tribal, local, and territorial governments; businesses and employers; health care systems, insurers, and clinicians; colleges and universities; community, nonprofit, and faith-based organizations; and individuals and families, can work together in the following ways:

- Build coalitions to coordinate the efforts of partners across sectors to maximize communication efforts and use consistent messages.
- Work with media and entertainment industries and the public at large to promote an understanding that tanned skin is not healthy.
- Leverage public-private partnerships to support and sustain communications campaigns.
- Explore new technologies for sharing sun protection messages to specific audiences.

Strategy 2F. Enhance ongoing engagement of federal partners to advance our nation's skin cancer prevention efforts.

This *Call to Action* on skin cancer prevention is the result of a collaborative effort across HHS in partnership with other federal departments representing diverse sectors, such as the environment, recreation, occupational health and safety, and trade (see Appendix 5). Using this collective leadership and taking specific actions that align with this *Call to Action* and with international consensus guidelines will help to advance our nation's skin cancer prevention efforts. Consistent skin cancer prevention messages across federal agencies will also help build consensus behind messaging and streamline the implementation efforts of partners in the skin cancer community.

Many public health and community initiatives overlap with skin cancer prevention, providing opportunities for collaboration. For example, public health messages about physical activity can incorporate sun protection, and sun protection messages can emphasize the importance of regular physical activity and healthy ways to obtain vitamin D. Heat illness campaigns can incorporate sun protection messages as well. Continued interagency coordination is needed to ensure that skin cancer prevention is aligned with other important public health priorities, such as nutrition, physical activity, and obesity prevention.

Partners in prevention in the federal government, such as HHS and its agencies (e.g., CDC, FDA, NIH/NCI), EPA, and OSHA, can work together on the following:

- Reexamine and update current sun protection messages, ensuring consistency across and within agencies.
- Identify opportunities to promote and enhance cross-agency and departmental collaborations to plan, implement, and disseminate skin prevention messages and activities.

Goal 3: Promote Policies that Advance the National Goal of Preventing Skin Cancer

Efforts to change social norms and increase knowledge about UV exposure are effective if they are supported by policies that promote healthy behaviors. Policies can establish support for sun protection from officials, managers, and employees, and they can be used to set priorities for resource allocation and to promote institutional changes that lead to increased sun protection. For this reason, policies and procedures in schools, health care facilities, communities, and workplaces and at state and national levels can have a significant effect on the success or failure of other skin cancer prevention efforts. Policies should also be routinely evaluated to assess their effectiveness, compliance, enforcement, and feasibility, especially if resources change. Skin cancer prevention is one of many other important concerns, and it should be considered in tandem with policies designed to address other health priorities, such as nutrition, physical activity, and obesity prevention.

Strategy 3A. Support inclusion of sun protection in school policies, construction of school facilities, and school curricula.

Rather than relying on individual schools to incorporate sun protection policies and education, states and school districts can support incorporation of sun-safety education in the required curriculum, as in Arizona and Florida.[303,325] Such policies will be most effective if they are accompanied by input from, and professional development for, teachers or other school staff who are delivering the sun-safety curriculum.[403] Some school

policies can create barriers to sun protection by prohibiting or limiting the use of sunscreen or hats and sunglasses.[300] These barriers can be addressed through policies that specifically allow or encourage students to wear hats, protective clothing, and sunscreen during outdoor activities. School, school district, and state policies can also encourage the use and planning of shade structures and could include requirements that school activities be scheduled in areas with more shade and at less UV-intense times of day. In addition, schools and school districts can take UV exposure into consideration when new play structures, school buildings, or child care and early learning centers are being planned as a way to ensure that shaded areas are provided for outdoor activities.

Parents are influential members of school communities, and they can work with local schools, school boards, and school administrations to make sure that appropriate, well-designed shade is considered when new schools are planned and that older schools are retrofitted. Parents and parent organizations may also be able to influence school policies on children's personal use of sunscreen, hats, and clothing while at school; on use of the UV Index to make decisions about outdoor activities; and on the inclusion of skin cancer prevention in health or science curricula.

Key partners in prevention, such as federal, state, tribal, local, and territorial governments; early learning centers, schools and school districts, colleges, and universities; community, nonprofit, and faith-based organizations; and individuals and families, can do the following:

- Incorporate sun-safety education into required school curriculum at the district or state level.
- Address barriers to sun protection in schools.
- Encourage the use of shade through shade-planning policies.
- Involve parents and parent groups in the development and promotion of skin cancer prevention policies in schools.

Strategy 3B. Promote electronic reporting of reportable skin cancers and encourage health care systems and providers to use such systems.

Health care providers who diagnose or treat melanomas (both in situ and invasive) are required to report cases to a central cancer registry in all 50 states and the District of Columbia. Although hospitals generally have reporting systems established, many providers in private practice who diagnose skin cancers, including dermatologists and primary care doctors, are unaware of requirements to report melanomas or are unsure of how to report to their state or local registry.[384,385] Additional steps to increase awareness among providers and to make it easier for providers to report this information are likely to increase reporting. Implementation of EHR systems for data collection can help increase reporting through incentives provided by CMS. In addition, electronic reporting directly from pathology laboratories to a central cancer registry has been increasing, and this practice significantly improves capture of melanoma cases.[404] Automation of reporting and other improvements in health information systems may increase ease and convenience of reporting.

Large national organizations, such as the American Academy of Dermatology, can help to educate health care providers about mandatory reporting requirements in their states. First steps can include compiling state-level reporting procedures in an easy-to-reference format and then disseminating these to providers through affiliated state health care provider organizations and continuing medical education programs.

Key partners in prevention, such as federal, state, tribal, and territorial governments and health care systems, provider organizations, insurers, and clinicians, can do the following:

- Increase awareness of reporting requirements, especially among primary care doctors and dermatologists in private practice.
- Provide clear guidance and specific action steps for reporting melanomas.
- Adhere to policies that require reporting of melanomas (both in situ and invasive).

Strategy 3C. Incorporate sun safety into workplace policies and safety trainings.

Employer policies can substantially reduce harms from overexposure to UV in the workplace for employees, contractors, clients, and other visitors to the work site by ensuring that strategies for reducing UV exposure among workers are consistently and fairly applied. Workers or their representatives should be involved in any decisions about policies that incorporate sun protection to ensure that these policies are functional and effective. Sun protection policies that take into account the job tasks and other safety and health risks will be the most useful. Employers who encourage behavioral changes and communicate well with their workers will increase the success and adoption of new policies.

Employers should also consider policies to reduce UV exposure from other environmental factors, such as reflective surfaces or the use or presence of substances that increase sensitivity to UV radiation, such as certain tars, dyes, or pesticides.[405] Policies that call for work to be scheduled at times of day or year that are less UV-intense can reduce exposure. In addition, outdoor workers are not the only ones at risk of excessive UV exposure on the job. Workers in certain occupations, such as drivers, may encounter substantial UV exposure through windows and may also be at increased risk. Sun protection policies for these workers can include provision of equipment or modifications to glass in windows.[406]

Key partners in prevention in federal, state, tribal, local, and territorial governments and in the business sector, such as employers, labor representatives, and risk managers, can enact policies that accomplish the following:

- Support provision of sun protection clothing and equipment for workers, such as long-sleeved shirts and long pants; hats that shade the face, ears, and back of the neck; and broad spectrum sunscreen with an SPF of 15 or higher.
- Modify the work environment where feasible to minimize UV exposure.
- Take into account UV levels when scheduling work hours when feasible.
- Encourage the rotation of workers in UV-intense positions to reduce UV exposure to individual employees.

Strategy 3D. Support shade planning in land use development.

Strategic shade planning can maximize the amount of shade provided to key areas of activity during the times of the day and months of the year with the highest UV levels. If placement and materials of shade structures are not carefully considered, shade may not provide sufficient protection, or the structures may not provide shade to the intended space during times when UV radiation is most intense because the angle

of the sun varies throughout the day and year. In addition, shade needs to complement the way an outdoor space is used. For example, a shade structure with a low roof built on an area used to play volleyball or a tree planted in the middle of a space used to play soccer or kickball is clearly incompatible with the intended use of the space.

State or federal decision makers could support efforts to plan and build effective shade structures in communities, taking into account local needs for shade and recreational areas. One model is the Safe Routes to Schools program (http://www.saferoutesinfo.org/), which provides grants to schools and school districts from federal transportation funding. Any program used should be evaluated to ensure that the funding is effective in reducing key adverse outcomes.

Key partners in prevention, such as federal, state, tribal, local, and territorial governments; businesses and employers; early learning centers, schools, colleges, and universities; community, nonprofit, and faith-based organizations; and individuals and families, can do the following:

- Support shade planning in the overall process of designing and building new outdoor public spaces, such as parks, playgrounds, and schools.
- Implement policies to support increased provision of shade structures in local communities.

Goal 4: Reduce Harms from Indoor Tanning

Indoor tanning devices, classified by WHO in 2009 as a known human carcinogen, expose the skin to intense levels of UV radiation. As discussed in the "Reducing the Risks of Skin Cancer" section, indoor tanning is of strong concern because it has been estimated to be related to more than 400,000 cases of skin cancer in the United States each year: 245,000 BCCs, 168,000 SCCs, and 6,000 melanomas.[124] In addition to increasing skin cancer risk, indoor tanning can cause burns to the skin, acute and chronic eye diseases if eye protection is not used, and, if tanning devices are not properly sanitized, skin infections.[139-141] About one out of every three non-Hispanic white women aged 16–25 years stated that they had tanned in the past 12 months, and many said they do so frequently.[134]

Unlike sun exposure, indoor tanning provides concentrated UV exposure regardless of geographical location, time of year, or time of day. Indoor tanning also exposes areas of the body not normally exposed to intense UV radiation, further increasing risk.[115] However, indoor tanning can be completely avoided, which allows for points of intervention beyond those used to reduce sun exposure.

Strategy 4A. Monitor indoor tanning attitudes, beliefs, and behaviors in the U.S. population, especially among indoor tanners, youth, and parents.

Increased data on attitudes and beliefs about indoor tanning would help guide the development of policies, tailored messages, and programs for indoor tanning prevention and cessation. Improved understanding of indoor tanners' motivations, especially subgroups that have been studied less frequently, such as males or nonwhite tanners, can help guide the development of messages and policies to address tanning. Monitoring the attitudes and beliefs of parents and their children is particularly important as part of efforts to reduce indoor tanning among minors, given parental influence on youth tanning behaviors. Monitoring attitudes and beliefs can also provide information on the effect of indoor tanning policies on attitudes and social norms.

Key partners in prevention, such as federal, state, tribal, local, and territorial governments; health care systems, insurers, and clinicians; colleges and universities; and nonprofit organizations that conduct science, can support efforts to do the following:

- Examine motivations for indoor tanning among frequent and event tanners, and examine motivations for not tanning among never-tanners.
- Examine children's and parents' attitudes and beliefs about indoor tanning.
- Conduct research to better quantify the effect of indoor tanning legislation on attitudes, behavior, and social norms.

Strategy 4B. Continue to develop, disseminate, and evaluate tailored messages to reduce indoor tanning among populations at high risk.

Conflicting messages to the public from industry and health agencies cause confusion about the risks of indoor tanning. Research shows that appearance-based messaging and behavioral counseling appear to be effective in reducing tanning behaviors among college-aged women.[263-266] This strategy has not been tested in other populations of indoor tanners. Messages that focus on the prevalence of an unhealthy behavior may unintentionally normalize or reinforce the behavior.[407] For this reason, messages to reduce indoor tanning may be most effective if they emphasize that most young women do not indoor tan but instead choose to embrace their natural skin color.[279] This strategy also needs to be tested. Although teens and young adult women are most likely to engage in indoor tanning, other populations also indoor tan. Having a mother who tans is a strong predictor of adolescent girls' initiation of tanning, so understanding how to present messages to mothers is also important.[408]

Outcomes of effective messaging interventions to reduce indoor tanning should be evaluated in order to provide information on unintended consequences, such as increased tanning outdoors. Messaging strategies may vary for different populations of indoor tanners. People who have accumulated UV exposure from indoor tanning or sunbathing are at increased risk of skin cancer, and messages focusing on the importance of awareness and early detection of potentially malignant lesions may be appropriate.

Key partners in prevention, such as federal, state, tribal, local, and territorial governments; health care systems, insurers, and clinicians; colleges and universities; and nonprofit organizations that conduct science, can do the following:

- Develop and test messages for populations at high risk, including current tanners and those most likely to initiate indoor tanning.
- Develop and test messages for parents.
- Evaluate the long-term effects that messages have on intentional tanning behaviors, both indoor and outdoor.

Strategy 4C. Support organizational policies that discourage indoor tanning by adolescents and young adults.

Colleges and universities sometimes have agreements with tanning salons that allow students to use university-sponsored debit cards to pay for tanning services.[409] Many colleges and universities have adopted campus polices that discourage alcohol and tobacco use, and similar types of policies could address indoor tanning. Colleges and universities could examine and address the financial incentives, campus policies, systems, and social norms that directly or indirectly encourage indoor tanning in order to create an educational environment that is supportive of student health and well-being. Reducing availability of tanning services on campus could lead to reduced use of indoor tanning by students and to changes in social norms related to tanning.

Key partners in prevention in the education sector, especially high schools, colleges, and universities, can address indoor tanning on campus in the following ways:

- Adopt campus policies that discourage indoor tanning by their students on campus.
- Reconsider campus practices that may encourage indoor tanning, such as the use of school-sponsored debit cards; financial arrangements between student organizations and members of the indoor tanning industry; and on-campus advertising, incentives, and promotional materials for indoor tanning.
- Develop an action plan to promote campuswide UV protection strategies.

Strategy 4D. Enforce existing indoor tanning laws and consider adopting additional restrictions.

The younger the age of indoor tanning initiation, the more the risk increases.[114,116,118,119] WHO classifies tanning beds as Class I human carcinogens and recommends that they never be used by anyone younger than age 18 years.[27] Australia and most western European countries currently prohibit indoor tanning among minors.[328,369] Currently, at least 44 states and the District of Columbia have some kind of law or regulation related to indoor tanning,[329-334] including bans on indoor tanning for minors under a certain age, ranging from 14 to 18; laws requiring parental accompaniment or parental permission; or regulations that otherwise reduce harms (such as requiring eye protection). FDA now requires that indoor tanning devices carry a visible black box warning on the device that explicitly states that the sunlamp product should not be used on people younger than age 18 years.[349]

In many locations, such as gyms and apartment complexes, indoor tanning devices are available for use without the supervision of a trained operator. Although FDA regulations do not distinguish between tanning devices used in supervised and unsupervised settings, unsupervised tanning devices are often not held to the same industry standards as indoor tanning salons, which may be licensed by the state or which may commit to certain standards as members of indoor tanning associations.

The inherent risks of indoor tanning are high, but unsupervised tanning locations provide none of the consumer protection mechanisms created by states and the indoor tanning industry to reduce risks of acute harm to consumers. The availability of unsupervised use may also limit the effect of efforts to reduce indoor tanning among minors because of difficulty enforcing current or future regulations.

Key partners in prevention in the government sector, such as federal, state, tribal, local, and territorial governments, can do the following:

- Ensure that facilities operate indoor tanning devices in compliance with established health and safety regulations.
- Adopt evidence-based policies such as age restrictions for minors.
- Investigate and address specific allegations of deceptive advertising by indoor tanning salons.
- Support efforts to implement and disseminate effective training programs for operators of indoor tanning devices.
- Educate consumers on FDA warnings and contraindications for indoor tanning device use.

Industry groups could also help to reduce the harms of indoor tanning in the following ways:

- Ensure compliance with laws that discourage deceptive and misleading advertisement.
- Increase communication to consumers on the risks of indoor tanning.
- Ensure compliance with federal and state regulations (such as UV exposure guidelines, training documentation, and warning labels).

Strategy 4E. Address the risks of indoor tanning with improved warning labels and updated performance standards.

Current warning labels are often not easily visible to customers, or they may be disregarded.[341,410] Public health messages should directly address competing health claims from advertising and should be clear that risks of indoor tanning are substantially higher than limited sun exposure. Strengthening efforts to communicate the risks of indoor tanning to consumers at the point of use may be an effective strategy. Stronger warning labels, visible to consumers and with information describing the risks of indoor tanning, combined with other outlets of communication about the risks of indoor tanning, could help make consumers aware of the danger and change perceptions about intense exposure to UV radiation.[352,411]

Manufacturers of indoor tanning devices (also known as sunlamp products) currently are required to certify that their products comply with the FDA Performance Standard for Sunlamp Products (21 CFR 1040.20).[348] FDA is working to reflect current science on the risks of indoor tanning, improve the visibility and readability of the warning label, and update and promote compliance with the performance standard.

As part of FDA's recent reclassification of indoor tanning devices to Class II medical devices (moderate to high risk), manufacturers will be required to do the following:

- Include a visible black box warning on the device that people younger than age 18 years should not use these devices.
- Receive premarket notification 510(k) clearance from FDA for newly marketed devices (which were previously exempt from any premarket review).
- Show that their products have met certain performance testing requirements.
- Address certain product design characteristics.
- Provide comprehensive labeling that presents consumers with clear information on the risks of use.[349,350]

Key partners in prevention in the government sector, such as federal, state, tribal, local, and territorial governments, can do the following:

- Require indoor tanning locations to prominently display the health warnings about indoor tanning in their facilities and provide verbal and written explanations of health risks to customers.
- Test different messages for warnings and signs to determine how to most accurately convey risk to consumers.
- Update performance standards for indoor tanning devices to reflect current science.

Goal 5: Strengthen Research, Surveillance, Monitoring, and Evaluation Related to Skin Cancer Prevention

This *Call to Action* proposes both the expansion of existing strategies and the creation of new strategies for skin cancer prevention in the United States. As with all public health initiatives, continuing to build on existing research and surveillance activities is critical to future success in reducing the incidence of skin cancer. As these strategies are implemented, skin cancer incidence and death rates, as well as trends in risk behaviors related to skin cancer, will need to be monitored.

Monitoring and evaluation of interventions will allow researchers to learn from the process of implementation, address weaknesses quickly, track progress over time, and ultimately determine the success of interventions in changing behavior and preventing disease, as well as their cost-effectiveness. Federal, state, and local public health agencies, nonprofit organizations, and academic researchers can work together to conduct this important research and guide future interventions.

Strategy 5A. Enhance understanding of the burden of skin cancer and its relationship with UV radiation.

More information is needed on the epidemiology and risk factors for skin cancer and the risks of different levels of UV exposure. Epidemiologic studies of skin cancers are limited by underreporting of early-stage melanomas. Increased reporting of melanomas will improve surveillance of melanoma incidence rates. Overdiagnosis of early-stage lesions has also been raised as an issue affecting epidemiologic studies, and this problem is suspected because incidence rates have increased disproportionately to death rates. Better understanding of the natural history of melanoma would help improve accuracy of diagnoses and therefore surveillance. More information on patient history of UV exposure and behavior can help identify those at risk and provide data on risk factors and prevention.

Lack of national surveillance of BCC and SCC presents another barrier to measuring the burden of skin cancer, which also inhibits the ability to measure outcomes of interventions. Data on these cancers can potentially be collected through EHRs as part of sentinel systems in limited areas. Also, more information is needed to determine the effectiveness of screening among the general population, as well as the relative benefits and cost benefits of various screening strategies, particularly in a diverse population like that of the United States, where wide variations exist in environmental UV exposure and the geographic latitude (and thus the UV intensity) of where people live.

Although national surveillance of these cancers is not feasible, large health care systems or other entities could use EHRs to establish systems for collecting their own data. Modeling studies could be used to better estimate trends in the incidence of BCC and SCC. Economic analyses could be used to quantify the costs of melanoma, BCC, and SCC. These types of analyses can incorporate both direct and indirect economic costs, as well as human costs.

Key partners in prevention, such as federal, state, tribal, local, and territorial governments; health care systems, insurers, and clinicians; colleges and universities; and nonprofit organizations that conduct scientific research, can do the following:

- Enhance understanding of the burden of skin cancer, including incidence and death rates from melanoma, BCC, and SCC.
- Continue to monitor the effects of UV exposure on human health.
- Conduct economic analyses to quantify the effects on disease and death rates, productivity, and health care costs.
- Increase research efforts to determine population groups most likely to benefit from skin cancer screening and early detection and potential effects on mortality, especially for populations at high risk.

Strategy 5B. Evaluate the effect of interventions and policies on behavioral and health outcomes.

Although sufficient evidence exists to take action to prevent skin cancer, evaluating the immediate, intermediate, and long-term effects of skin cancer prevention policies and interventions remains critical to their success. Evaluations should examine changes in sun protection behavior and whether they are sustained over time, as well as the effect of interventions on incidence of sunburn over time and on more distant outcomes, such as skin cancer incidence. Ongoing monitoring and periodic evaluation provide the opportunity to learn from and improve on existing interventions and policies and adjust if necessary.

Future interventions and policies should strive to include an impact evaluation component, whenever feasible. Evaluations can help employers set priorities and allocate resources toward sun protection strategies that work. Employee education interventions can be evaluated for efficacy across cultures and languages to address the diversity of the workforce.

Key partners in prevention, such as public health agencies, colleges and universities, and nonprofit organizations that conduct scientific research, can evaluate interventions in the following ways:

- Examine the duration of the effects of interventions in child care and early learning centers and elementary and middle schools on sun protection behaviors and sunburn later in life.
- Continue to evaluate the effectiveness of sun protection interventions in high school, college, and university settings as evidence evolves.
- Evaluate whether clinicians follow current USPSTF recommendations on counseling for sun protection among fair-skinned youth aged 10–24 years.
- Determine the health effects and cost-effectiveness of efforts to promote sun protection among outdoor workers.
- Evaluate the effects of communitywide shade policies.
- Measure the effect of communication interventions on attitudes and behaviors.

Strategy 5C. Build on behavioral research and surveillance related to UV exposure.

Ongoing surveillance of sun protection behaviors and general outdoor UV exposure in national surveys would help to measure progress over time and provide direction for future interventions. To fully understand how best to support the prevention of excessive outdoor sun exposure, more information is needed on how much (or how little) outdoor UV exposure the U.S. population in general and subpopulations specifically are receiving.

More in-depth behavioral research is needed in addition to surveillance. Many interventions to date have used a multicomponent approach that combines strategies directed at individuals, mass media campaigns, and environmental and policy changes. Research is needed to determine the contribution of individual components to the observed behavior change. Determining which components within multicomponent interventions are critical to eliciting behavior change would help prioritize and maximize use of limited resources. Current evidence suggests that age restrictions may be more effective than parental permission and accompaniment laws at reducing indoor tanning among minors,[335] but more evidence is needed.

States could consider including a question on indoor tanning frequency on their YRBS questionnaire, which would allow for state-level estimates of the prevalence of indoor tanning among high school students. Similarly, a question on indoor tanning frequency could be added to surveys such as the BRFSS to monitor indoor tanning in adults. If states begin collecting data on indoor tanning, they can track changes in indoor tanning behaviors over time as new policies are implemented. Survey findings can provide evidence on the effectiveness of indoor tanning policies and can guide future policy decisions at state and national levels.

Key partners in prevention, such as public health agencies, colleges and universities, and nonprofit organizations that conduct scientific research, can expand upon current research in the following ways:

- Increase understanding of indoor tanning behaviors, including when, where, and how people tan.
- Increase understanding of motivations to tan or not to tan.
- Strengthen collection of information on indoor tanning on national surveys, such as the state YRBS and the national and state BRFSS.
- Monitor changes in indoor tanning behaviors and social norms over time to evaluate the effectiveness of legislation or regulations to reduce intentional tanning, as well as to guide future efforts.
- Collect and examine information on outdoor tanning to monitor unintended consequences of indoor tanning restrictions.
- Collect and examine information on average outdoor UV exposure in the U.S. population.

Strategy 5D. Quantify the prevalence of tanning in unsupervised locations.

Currently, little is known about the prevalence of, access to, and attitudes toward unsupervised tanning devices. The availability of these devices creates a barrier to successful implementation of indoor tanning controls and limits the effect of efforts designed to protect minors from the harms of indoor tanning. Efforts are needed to quantify how many tanning devices are available for use outside of tanning salons (such as in gyms, apartment complexes, or beauty salons), where they are located, who has access to them, and whether they are being used in accordance with FDA performance standards. Similarly, more information is needed about the prevalence of home ownership of an indoor tanning device and the standards of devices found in homes.

Key partners in prevention, such as public health agencies, colleges and universities, and nonprofit organizations that conduct scientific research, can do the following:

- Quantify the prevalence of indoor tanning device use in unsupervised locations.
- Describe patterns of use of unsupervised tanning devices.
- Provide information about indoor tanning device use in private settings, such as homes.
- Quantify the health effects of unsupervised indoor tanning device use.

Conclusion

With this *Call to Action*, the U.S. Surgeon General emphasizes the need to act now to solve the major public health problem of skin cancer. Despite efforts to address skin cancer risk factors, skin cancer rates, including rates of melanoma, have continued to increase in the United States.[1,13-17] More than one-third of Americans report being sunburned in the past year,[226] and indoor tanning is common among some groups.[132,133] We need to work together to address skin cancer as a public health problem. We know that comprehensive, communitywide efforts to prevent skin cancer can work, with adequate support and a unified approach.

To reduce skin cancers in the population, people must get the information they need to make informed choices about sun protection, policies must support these efforts, youth must be protected from harms of indoor tanning, and adequate investments need to be made in skin cancer research and surveillance. Achieving these goals will not be a small task. It will require dedication, ingenuity, skill, and the concerted efforts of many partners in prevention across many different sectors. Many of these partners are already enthusiastically involved, but greater coordination and support are needed to increase the reach of their efforts. The strategies outlined in this document are the next steps. We must act with urgency to stop the ever-increasing incidence of skin cancers in the United States.

Appendix 1: Scope and Definitions

This document focuses on the three most common types of skin cancers: basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and melanoma, which together account for more than 99% of skin cancers.[41,42] This document also focuses only on cutaneous skin cancers and not other types, such as SCCs that occur on the genitals (and which generally have different risk factors, notably human papillomavirus) or noncutaneous types of melanoma, such as ocular.

Types of Skin Cancer

Skin cancer arises from the uncontrolled growth of different types of cells found normally in skin. The most common types are BCC and SCC. Although these cancers are rarely deadly, they are very common and potentially disfiguring, and they often recur. People diagnosed with SCCs and BCCs, especially at younger ages, are at increased risk of subsequent primary cancers, possibly for genetic reasons.[412,413]

Basal Cell Carcinomas

BCCs arise from the cells in the bottom, or basal, layer of the epidermis. BCCs tend to occur on skin that is chronically exposed to the sun, such as the face, head, and neck, but they also frequently occur on the trunk of the body.[43] Because it frequently occurs on the face and head, BCC and its treatment can result in noticeable disfigurement. This disease can be classified into five subtypes: nodular, ulcerating, pigmented, sclerosing, and superficial.[414]

Squamous Cell Carcinomas

SCCs arise from squamous cells in the outer layers of the epidermis. Similar to BCCs, SCCs usually occur in prominent, sun-exposed areas, like the face, head, and neck.[43] SCCs often arise from actinic keratoses, which are rough, scaly patches that occur on sun-exposed areas.[414]

Melanomas

Melanomas develop from melanocytes, the melanin-producing cells that give skin and eyes their color.[32] These cancers can arise in the skin (cutaneous melanoma) and less frequently in the eye (ocular melanoma) or mucous membranes. Melanoma can be classified into several subtypes: nodular and superficial spreading melanomas, which can occur in any location on the body; lentigo maligna melanoma, which is usually found on the head, neck, and face; and acral lentiginous melanoma, which arises on the palms of the hands and soles of the feet, and under nails.[32,57]

Types of Ultraviolet Exposure

Overexposure

Overexposure or *excessive exposure*, as used in this document, means any ultraviolet (UV) exposure that is likely to increase a person's risk of skin cancer, without conferring benefits beyond those that can be achieved through more limited outdoor exposures. Overexposure frequently results in tanned or sunburned skin. Seeking a tan (whether indoor tanning or outdoor sunbathing) is considered overexposure for the purpose of this document. Sunbathing and indoor tanning are common methods of skin tanning.

Unnecessary or avoidable exposures, as used in this document, are those UV exposures that can be easily avoided. Seeking a tan for cosmetic purposes, whether indoors or outdoors, is considered an unnecessary exposure. Some outdoor exposures are necessary as part of daily routines, such as walking for transportation, being outdoors for physical activity, or working outdoors. Sun protection can be used to reduce risks of unavoidable exposure.

Erythema, or sunburn, is defined as an acute cutaneous inflammatory reaction to UV exposure, with classic signs of inflammation, such as redness, warmth, tenderness, and edema.[415] Sunburn is a clear indication of overexposure. However, a person can have suffered overexposure even in the absence of signs of sunburn.[128,183,184]

Limited Exposure

Limited exposure to UV radiation, as used in this document, refers to very brief (5–15 minute) outdoor exposures received during the course of daily activities or exposures at very low UV Index levels (2 or less). For most people, the risk of skin cancer from such limited, incidental UV exposure is likely low. However, damage from UV radiation is cumulative, so even limited exposures can result in harm over time.

The risks and benefits of UV exposure vary by individual, as well as by environmental conditions, such as weather, altitude, latitude, and the presence of reflective surfaces, such as snow, sand, or water. For a very fair-skinned person in the summer sun at low latitudes or high altitudes, even a very short time outdoors could lead to overexposure, especially in highly reflective environments, such as areas that are snowy, sandy, or near bodies of water.[135-137,181]

Conversely, for a very dark-skinned person, short exposures may not be enough to achieve sufficient vitamin D levels, especially in the winter in northern climates.[178] Skin pigmentation can also vary within individuals. For example, some people have vitiligo, a condition in which the melanocytes in some areas of the skin do not function, resulting in patches of depigmented skin that are sensitive to UV radiation.[416] Current evidence indicates that UV exposures below the amount needed to induce sunburn, including exposures that result in a tan, can also increase skin cancer risk.[128,183,184,292,417]

Appendix 2: Signs and Symptoms of Skin Cancer

Melanomas diagnosed at earlier stages are much more treatable than those diagnosed at later stages.[6,31] Anyone can get skin cancer, and everyone should know the symptoms of this disease. Changes in the skin, such as a new growth, a sore that does not heal, or a change in an existing mole, are the most common signs of skin cancer.

The characteristics of malignant melanoma are often described as the A-B-C-D-Es of melanoma:

A = **asymmetrical.** Does the mole or spot have an irregular shape with two halves that look very different?

B = **border.** Is the border irregular or jagged?

C = **color.** Is the color uneven?

D = **diameter.** Is the mole or spot larger than the size of a pea?

E = **evolving.** Has the mole or spot changed during the past few weeks or months?

Not all skin cancers look the same. If a person notices a change in the skin, such as a new growth, a sore that does not heal, a change in an old growth, or any of the A-B-C-D-Es of melanoma, he or she should consult a doctor.

Appendix 3: Skin Cancer Screening

Some groups recommend periodic skin cancer screening,[a] either by a health care provider or by self-examination.[290,291] Consistent and regular screening identifies melanomas that are, on average, thinner than those found during usual care. Whether detection of these lesions leads to fewer cases of disease or death is unknown.[292] For this reason, the independent U.S. Preventive Services Task Force (USPSTF) has stated that current evidence is insufficient[b] to recommend skin cancer screening by primary care providers among the general U.S. adult population. On May 15, 2014, the USPSTF released a draft research plan that will be used to guide a systematic review of the evidence by researchers.[293] Despite the insufficient evidence supporting screening in the general population, an estimated 87% of Americans believe that skin cancer screening is recommended.[244]

Although screening is not currently recommended, providers should remain alert to suspicious lesions. The USPSTF states the following: "Clinicians should remain alert for skin lesions with malignant features noted in the context of physical examinations performed for other purposes. Asymmetry, border irregularity, color variability, diameter greater than 6 mm (ABCD criteria), or rapidly changing lesions are features associated with an increased risk for cancer. Biopsy of suspicious lesions is warranted."

A recent study conducted in one state in Germany found that population-based screening was associated with reduced melanoma death rates.[418] Although the results are promising, some of these reductions occurred before implementation of the screening portion of the study, which suggests that some of the reduction could be due to increased awareness among the population as a result of the communications campaign related to the screening program. Screening did not reduce melanoma deaths in a recent study in Switzerland, a country with a particularly high incidence of cutaneous melanoma, implying that other primary and secondary strategies may be more effective.[419]

Further studies are needed to determine the effectiveness of screening among the general population. Research is also needed to determine the relative benefits and cost benefits of various screening strategies, particularly in a diverse population like that of the United States, where wide variations exist in environmental UV exposure and the geographic latitude (and thus the UV intensity) of where people live.

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[a] Skin cancer screening is defined as an evaluation of the skin by a medical provider, in the absence of changes to the skin.

[b] The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of this service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.

Appendix 4: Success Stories in Skin Cancer Prevention

Federal Resources for Skin Cancer Prevention in Schools

A 2002 CDC report, *Guidelines for School Programs to Prevent Skin Cancer*,[420] reviewed both the scientific evidence on skin cancer prevention and current school practices. It suggested guidelines for a comprehensive approach to skin cancer prevention in schools through policies, environmental change, education, family involvement, professional development, health services, and evaluation.

To support schools' implementation of these guidelines and to help schools create and maintain a physical environment that would support sun safety by ensuring that school grounds have adequate shade, CDC subsequently created a manual for schools called *Shade Planning for America's Schools*.[308] The manual outlines steps that school communities can take to develop a comprehensive approach to reducing the risk of skin cancer, including strategies for providing shade at schools, an overview of how to plan a shade project, success stories from schools and school districts that have completed shade planning projects, and information on how to conduct a shade audit. CDC also created the *Sun Safety for America's Youth Toolkit*, a resource for local comprehensive cancer control programs.[421] It outlines a step-by-step process for program planning, suggests strategies for implementing sun protection education in schools, and provides sample evaluation questions.[421]

RAYS Skin Cancer Prevention Program Shines Bright for New Mexico Schoolchildren

The RAYS (Raising Awareness in Youth About Sun Safety) Project provides funding and technical support to elementary schools and community organizations across New Mexico to implement sun-safety education. It is supported by the New Mexico Department of Health Comprehensive Cancer Program. The RAYS Project uses various evidence-based and preapproved curricula, including Sunny Days, Healthy Ways, the SunSmart Project, and the U.S. Environmental Protection Agency's (EPA's) SunWise Program.

Many RAYS Project schools have changed policies on their campuses to support sun protection, including changing recess times to avoid peak UV exposure, allowing students to wear hats and sunglasses, and providing shade on playgrounds. English- and Spanish-language materials have been developed for parents and have been distributed to various audiences statewide. RAYS Project contractors also include sun-safety education from evidence-based programs in other health-related school and community events.[422]

For more information about the RAYS Project and other CDC-supported Comprehensive Cancer Control Programs working on skin cancer prevention, visit http://www.cdc.gov/cancer/ncccp/pdf/success/SuccessStories.pdf.

City of Toronto Shade Policy

The City of Toronto in Ontario, Canada, enacted a citywide shade policy in 2007. The shade policy states that providing shade can be an effective way to reduce exposure to UV radiation and its associated health risks, such as skin cancer. Furthermore, the presence of shade can encourage physical activity, reduce greenhouse

gas and air pollutant emissions, lessen the urban heat island effect, and reduce energy costs. Under the policy, providing shade, either natural or constructed, should be an essential element when planning for and developing new city facilities, such as parks or public spaces, and in refurbishing existing city-owned and city-operated facilities and sites. Increasing shade in Toronto contributes to a healthier and more sustainable city.

In 2010, the City of Toronto developed shade guidelines to help implement the shade policy. For more information, visit http://www1.toronto.ca/health/shadeguidelines. The shade policy and guidelines were created by the Ultraviolet Radiation and Shade Working Group of the Toronto Cancer Prevention Coalition with the support of Toronto Public Health, the Toronto Board of Health, and the Toronto City Council.

Appendix 5: Federal Departments, Agencies, and Policies

Appendix 5 presents information about current federal efforts on skin cancer prevention. Recommendations from federal agencies and from national organizations that are leaders in skin cancer prevention are summarized in Table A on page 79.

U.S. Department of Health and Human Services: Healthy People

The U.S. Department of Health and Human Services (HHS) and federal agencies within HHS—including the Centers for Disease Control and Prevention (CDC), National Cancer Institute (NCI) within the National Institutes of Health (NIH), U.S. Food and Drug Administration (FDA), and others—work together to develop Healthy People goals and objectives, which provide science-based, 10-year national objectives for improving the health of all Americans. Measureable objectives related to skin cancer include reducing melanoma mortality, reducing the proportion of adults who report sunburn, reducing the proportion of adults and high school students in grades 9–12 who report using artificial sources of UV light for tanning, and increasing the proportion of adults and high school students in grades 9–12 who follow protective measures that may lessen the risk of skin cancer.

CDC and NCI work together in ongoing efforts to monitor skin cancer and behaviors related to known risks and to track progress toward meeting the Healthy People objectives for skin cancer. For example, in November 2011, several articles from CDC were published in a supplemental issue of the *Journal of the American Academy of Dermatology* (http://www.jaad.org/issues?issue_key=S0190-9622%2811%29X0013-0). Some articles described patterns of melanoma, and others focused on melanoma prevention. Contributors included partners from the state-based central cancer registries, the American Cancer Society, NCI, and academic centers.

In addition, CDC and NCI routinely publish analyses of data from the National Health Interview Survey and its Cancer Control Supplement (NHIS CCS),[133,227] which they cosponsor. CDC also publishes analyses of Youth Risk Behavior Survey (YRBS) data related to both sun protection and indoor tanning.[134,423]

National Cancer Institute

NCI produces the Cancer Trends Progress Report Updates (http://progressreport.cancer.gov), which summarize the nation's progress against skin cancer and other cancers in relation to Healthy People objectives and other targets set by HHS. The first report was published in 2001, and the data have been updated about every 2 years since then, with annual updates beginning in 2014. The updates include key measures of progress along the cancer control continuum, including risk factor monitoring for skin cancer, especially related to sun protection behavior, indoor tanning, and sunburn. They use national trend data to illustrate where advances have been made and gaps still remain.

NCI also fields the Health Information National Trends Survey (HINTS), which collects nationally representative data about the American public's use of cancer-related information.[246] For example, HINTS publications show that, despite the large control over behavioral factors that people may exert—such as avoiding UV exposure, wearing protective clothing, and applying broad spectrum sunscreen with a sun protection factor (SPF) of 15 or higher—many adults do not perceive cancer as preventable and are less likely to engage in skin cancer prevention practices.[244]

NCI's Cancer Control P.L.A.N.E.T. (Plan, Link, Act, Network with Evidence-based Tools) (http://cancercontrolplanet.cancer.gov) is a web-based portal that provides access to data and resources for cancer control planning efforts. It is a joint effort between NCI, CDC, the Substance Abuse and Mental Health Services Administration (SAMHSA), and the Agency for Healthcare Research and Quality (AHRQ). The portal can help planners, program staff, and researchers to design, implement, and evaluate evidence-based cancer control programs. State-level melanoma incidence and mortality data and data on skin cancer risk perceptions are also available on the site through State Cancer Profiles (http://statecancerprofiles.cancer.gov).

NCI and SAMHSA cosponsor the Research-tested Intervention Programs (RTIPs) website (http://rtips.cancer.gov/rtips), which is a searchable database of cancer control interventions and related program materials. Interventions included in the RTIPs database must meet specific inclusion criteria to ensure research integrity, intervention impact, and amenability to dissemination in the United States. When possible, the RTIPs page for a given intervention links directly to corresponding recommendations from The Guide to Community Preventive Services (The Community Guide) (see Table B on page 81 and http://www.thecommunityguide.org/cancer/index.html). The website is designed to provide program planners and public health practitioners easy and immediate access to research-tested materials for use in a community or clinical setting.

NCI scientists also have developed an online Melanoma Risk Assessment Tool, which is designed to help clinicians to evaluate an individual's risk of melanoma (http://www.cancer.gov/melanomarisktool/). The tool is limited to estimating risk for non-Hispanic whites, and it is not appropriate for people with a family history of melanoma.

NCI's Physician Data Query (PDQ) is a comprehensive cancer database that contains summaries on a wide range of cancer topics. The PDQ cancer information summary on skin cancer provides health professionals with comprehensive, peer-reviewed, evidence-based information about skin cancer prevention. It is intended as a resource to inform and assist clinicians; it does not provide practice guidelines. See http://www.cancer.gov/cancertopics/pdq/prevention/skin/HealthProfessional.

In addition, the NCI website has health education information on skin cancer causes, prevention, and treatment (http://www.cancer.gov/cancertopics/types/skin). It includes a unique resource for people with darker skin, called Anyone Can Get Skin Cancer (http://www.cancer.gov/cancertopics/prevention/skin/anyone-can-get-skin-cancer). NCI also sponsors extramural research related to health behaviors, including skin cancer prevention.[424]

Centers for Disease Control and Prevention

CDC provides administrative, research, and technical support for the Community Preventive Services Task Force, an independent, nonfederal panel of public health and prevention experts. The panel provides evidence-based findings and recommendations about community preventive services, programs, and policies to improve health. Its members represent a broad range of research, practice, and policy expertise in community preventive services, public health, health promotion, and disease prevention.

CDC programs contribute subject matter experts to participate, and sometimes take the lead, in conducting systematic reviews for The Community Guide (http://www.thecommunityguide.org/index.html). The Community Guide is a resource that provides evidence-based recommendations and findings developed by the panel about what programs and policies work to improve public health and prevent disease in the community.[306] The Community Guide includes recommendations on effective community-based skin cancer prevention interventions (see Table B on page 81 and http://www.thecommunityguide.org/cancer/index.html). Recommendations are periodically updated to reflect the latest scientific evidence.

CDC has also led communications campaigns designed to reduce UV exposure among individuals and in communities. HHS and CDC sponsored the *Choose Your Cover Campaign*, a 5-year skin cancer prevention and education campaign that ended in May 2003 (some campaign materials are available at http://www.cdc.gov/cancer/dcpc/publications/skin.htm).[425] In 2014, CDC sponsored The Burning Truth communication initiative, which encourages individuals to keep their skin healthy and beautiful for life by protecting themselves from too much exposure to UV rays from the sun and tanning beds. For more information, see http://www.cdc.gov/cancer/skin/burningtruth.

In addition, CDC provides technical assistance to grantees that receive funding under the National Comprehensive Cancer Control Program (NCCCP). CDC suggests that funded programs address skin cancer prevention through the use of evidence-based interventions and promising environmental strategies to reduce UV exposure.

Comprehensive Cancer Control Programs and Coalitions

CDC funds 65 programs in states, territories, Pacific Island jurisdictions, and tribes/tribal organizations through the NCCCP to establish broad-based comprehensive cancer control (CCC) coalitions, assess the burden of cancer, and develop and implement CCC plans to reduce cancer incidence and mortality.[426] Each program uses cancer incidence data to identify high-priority cancers. Some CCC plans identify melanoma as a problem in their communities and have objectives that address prevention. A review of published cancer plans identified 25 CCC plans that addressed sun safety in their goals or objectives, and 18 had chapters or sections devoted to discussion of UV exposure, sun protection, or skin cancer prevention.[427]

During 2007–2012, nine CCC programs received additional funding to implement skin cancer programs in various settings. Common intervention settings and strategies include school-based education and policies, educational outreach in recreational settings (e.g., pools, beaches, camps, and golf courses), environmental approaches in child care settings to reduce UV exposure, and education about the risks of indoor tanning.[304] Analysis of NCCCP programmatic data in 2013 revealed that 16 CCC coalitions have a skin cancer workgroup, and 13 CCC programs have annual objectives that specifically address preventing skin cancer in their action plans submitted to CDC.[428] Many objectives use strategies designed to improve education or knowledge in various settings to educate children, adolescents, and adults about how to reduce UV exposure from the sun and from indoor tanning.

In addition, many CCC programs are working with partners to address skin cancer prevention through environmental approaches that reach more people in the community, such as increased shade in recreational settings and schools. Two CCC programs are working with their partners on long-term objectives to reduce indoor tanning among adolescent females. Three NCCCP awardees received funding and technical assistance to use policy and environmental approaches for cancer control to address skin cancer prevention. Activities included educating stakeholders about the link between artificial UV exposure and melanoma and developing shade structure policies.

Agency for Healthcare Research and Quality

AHRQ provides scientific and administrative support for the independent U.S. Preventive Services Task Force (USPSTF). The USPSTF, in partnership with an AHRQ Evidence-Based Practice Center, completed a systematic evidence review on behavioral counseling in primary care to prevent skin cancer. The evidence review, the final USPSTF recommendations, and a consumer guide are available at http://www.uspreventiveservicestaskforce.org/uspstf/uspsskco.htm. Information about skin cancer screening is also available on the USPSTF website.

As part of its mission to improve health care, from primary prevention to chronic care management, AHRQ is exploring how to develop, strengthen, and sustain relationships among primary care practices, the community, and public health organizations in order to meet the needs of patients and families. These efforts are valuable to groups working to improve skin cancer prevention. To learn more, visit Building Relationships Between Clinical Practices and the Community to Improve Care on the AHRQ website (http://www.innovations.ahrq.gov/linkingClinicalPractices.aspx).

The AHRQ Innovations Exchange website (http://www.innovations.ahrq.gov) provides information about specific skin cancer prevention tools, such as how to use interactive kiosks, provide skin cancer screening and education at beaches, and work with members of the deaf community to improve cancer awareness (http://www.innovations.ahrq.gov/innovations_qualitytools.aspx?search=skin cancer).

U.S. Food and Drug Administration

At the federal level, FDA regulates indoor UV tanning devices under separate authorities, both as medical devices and as radiation-emitting electronic products. FDA published a performance standard (21 CFR 1040.20) to set requirements for indoor tanning devices in 1979 and amended this standard in 1985 to accommodate devices that emitted primarily UVA radiation.[348] FDA's current performance standard requires that a sunlamp product's label include a recommended exposure schedule (see example at http://tanresponsibly.com/uv-light).[358] FDA has advised manufacturers that this schedule should provide for exposures of no more than three sessions in the first week.[358] The performance standard contains requirements for the warning label on the product, the proportion of shortwave UV radiation, timer settings, and transmittance requirements for protective eyewear supplied with the device.

FDA inspectors inspect the manufacturing sites of sunlamp products (as resources allow) to verify compliance with FDA's performance standard. FDA also provides "model state regulations" for sunlamp products as guidance for states to use in their radiation protection programs. State inspectors routinely inspect tanning salons to ensure that the equipment in the salons carries appropriate labeling and a timer control as required by the FDA performance standard, in addition to any state requirements for operator training or procedures to ensure proper hygiene.

Under its medical device authority, FDA originally classified indoor tanning devices as low risk (Class I) medical devices.[351,429] However, based on advice from its advisors and consultants at a March 2010 Advisory Committee meeting and review by agency experts, the agency issued a final order in May 2014 that reclassified sunlamp products as moderate to high risk (Class II) devices.[349,350] Once effective, the order requires manufacturers of sunlamps to include a visible black box warning on the device that people younger than age 18 years should not use these devices. Manufacturers must receive 510(k) premarket clearance from FDA for newly marketed devices, which were previously exempt from any premarket review. Manufacturers

must demonstrate that their products have met certain performance testing requirements, address certain product design characteristics, and provide comprehensive labeling that presents consumers with clear information on the risks of use.

FDA also regulates over-the-counter drugs, including sunscreens. Under labeling changes that became effective in 2012, sunscreens labeled as both broad spectrum and SPF 15 (or higher) are labeled as reducing the risk of skin cancer and reducing the risk of early skin aging caused by the sun if they are used as directed and in combination with other sun protection measures. All sunscreen products are labeled as helping to prevent sunburn. Any product that is not broad spectrum, or that is broad spectrum but has an SPF of at least 2 but less than 14, will have a warning stating that the product has been shown only to help prevent sunburn, not skin cancer or early skin aging. In 2011, FDA proposed limiting the maximum SPF on sunscreen labels to "50+", because FDA did not have adequate data to show that products with an SPF higher than 50 provide any additional benefit compared with products with an SPF of 50 or lower (http://www.fda.gov/forconsumers/consumerupdates/ucm258416.htm).

Federal Trade Commission

The Federal Trade Commission (FTC) is responsible for investigating false, misleading, and deceptive advertising claims about products and services, including tanning devices. In May 2010, the agency issued a complaint and final order against the Indoor Tanning Association (ITA).[361] Among other things, the complaint alleged that ITA's advertising materials had represented that (1) tanning, including indoor tanning, does not increase the risk of skin cancer; (2) tanning, including indoor tanning, poses no danger; (3) indoor tanning is approved by the government; and (4) indoor tanning is safer than tanning outdoors because, in indoor tanning facilities, the amount of UV light is monitored and controlled. The complaint charged that these claims were false.

The settlement reached in this case bars ITA from making deceptive claims in the future and requires certain ITA advertisements to include health disclosures. In response to public comments opposing FTC's action, the agency noted that its investigation was informed by a thorough analysis of the available scientific evidence, including review of relevant scientific studies and consultation with experts from government, academia, and the industry. In connection with the ITA case, FTC released a consumer alert, stating that UV radiation from tanning devices damages the skin and poses serious health risks, including cancer, and that tanning is not necessary to get the health benefits of vitamin D.[430]

U.S. Environmental Protection Agency

To help people plan outdoor activities so they can reduce UV exposure, the National Weather Service and EPA publish the UV Index, a forecast of the risk of overexposure to UV radiation from the sun at a given location, date, and time. For more information, visit the following websites: http://www.epa.gov/sunwise/uvindex.html, http://www.epa.gov/sunwise/uviresources.html, or http://www2.epa.gov/sunwise/uv-index-scale.[431,432] The index ranges from 0 to 11+, with higher values indicating greater risk of overexposure. The forecast is calculated every day on the basis of the angle of the sun, ozone levels, expected cloud cover, and other local conditions.

In 2000, EPA launched SunWise, a health and environmental education program that teaches children and their caregivers how to protect themselves from overexposure to the sun. For more information about SunWise, visit the EPA website at http://www.epa.gov/sunwise.

National Park Service

The National Park Service (NPS), a bureau within the U.S. Department of the Interior, offers recreational opportunities for about 275 million visitors every year and manages 401 parks throughout the United States. For nearly 100 years, NPS has contributed to the health and well-being of Americans by providing places that inspire physical activity, promote physical and mental health, and foster community through the preservation of ecosystems and interpretation of a shared heritage. Hand in hand with its efforts to provide opportunities for fun in the most beautiful outdoor environments in the country, NPS is also dedicated to educating the public about the importance of sun protection.

NPS has collaborated with partners such as the EPA SunWise program and the National Council on Skin Cancer Prevention to educate the public about ways to enjoy our nation's treasures while keeping safe in the sun. In 2012, NPS and its partners created a public service announcement on sun safety to be used for the annual "Don't Fry Day" campaign (http://www2.epa.gov/sunwise/dont-fry-day). In addition, NPS teamed up with other federal partners to create a "Healthy Parks, Healthy People" sun-safety window display to educate the public on how to safely engage in outdoor activities in our national parks while preventing overexposure to harmful sun rays. NPS's Safe Adventures program bases its prevention strategies on science to promote well-being and outdoor recreation while providing tools, information, and guidance that empower the public to have a safe adventure in national parks.

Occupational Safety and Health Administration

The general duty clause of the Occupational Safety and Health Act states the following in Section 5(a)(1): "Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."[433] The Occupational Safety and Health Administration (OSHA) does not mandate employee exposure limits specific to UV radiation.[434] OSHA's Campaign to Prevent Heat Illness in Workers is designed to raise awareness and educate workers and employers about the dangers of working in the heat. OSHA collaborates with the National Oceanic Atmospheric Administration and other federal agencies, such as EPA and CDC, for a joint public information notice for sun-safety awareness and participates in the National Council on Skin Cancer Prevention's "Don't Fry Day."[435,436]

Affordable Care Act

The Affordable Care Act (Section 10907) created a 10% excise tax on indoor tanning services, which became effective on July 1, 2010.[390] The tax is only applicable to UV tanning services, excluding phototherapy sessions performed by a licensed medical professional. Tanning devices sold directly to consumers, facilities that offer tanning as an additional service to members without a separate fee, and sunless tanning products are not subject to the tax. The Affordable Care Act also requires that nongrandfathered health plans offered in the individual or group market provide benefits for and prohibit the imposition of cost-sharing requirements for USPSTF-recommended preventive services with a rating of "A" or "B." This requirement includes the USPSTF recommendation to counsel children, adolescents, and young adults aged 10–24 years with fair skin about minimizing their exposure to UV radiation to reduce risk of skin cancer (B rating). For this type of recommendation, which only applies to a specific population, decisions about whether an individual is part of this population and should receive the given preventive service should be made by the attending provider.[437,438]

Table A. Skin Cancer Prevention Recommendations by Federal Agencies and National Organizations

Agency	Recommendations
FEDERAL AGENCIES	
Centers for Disease Control and Prevention http://www.cdc.gov/cancer/skin/basic_info/prevention.htm	• Stay in the shade, especially during midday hours. • Wear clothing that covers your arms and legs. • Wear a hat with a wide brim to shade your face, head, ears, and neck. • Wear sunglasses that wrap around and block both UVA and UVB rays. • Use sunscreen with sun protection factor (SPF) 15 or higher and both UVA and UVB protection. • Avoid indoor tanning.
U.S. Environmental Protection Agency http://www.epa.gov/sunwise/actionsteps.html	• Do not burn. • Avoid sun tanning and tanning beds. • Generously apply sunscreen. • Wear protective clothing. • Seek shade. • Use extra caution near water, snow, and sand. • Check the UV Index. • Get vitamin D safely.
U.S. Food and Drug Administration http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm049090.htm	• Reduce time in the sun. • Dress with care. • Be serious about sunscreen. • Tips for applying sunscreen. • Protect the eyes. • Slip! Slop! Slap! Wrap!
Occupational Safety and Health Administration https://www.osha.gov/Publications/OSHA3166/osha3166.html	• Cover up. • Use sunscreen. • Wear a hat. • Wear UV-absorbent shades. • Limit exposure.

Agency	Recommendations
NATIONAL ORGANIZATIONS	
American Academy of Dermatology http://www.aad.org/spot-skin-cancer/understanding-skin-cancer/how-do-i-prevent-skin-cancer	• Seek shade when appropriate. • Wear protective clothing. • Generously apply a broad spectrum, water-resistant sunscreen. • Use extra caution near water, snow, and sand. • Avoid tanning beds.
American Academy of Pediatrics http://www.healthychildren.org/english/safety-prevention/at-play/pages/Sun-Safety.aspx	• Keep babies younger than 6 months out of direct sunlight. Find shade under a tree, umbrella, or the stroller canopy. • When possible, dress yourself and your kids in cool, comfortable clothing that covers the body, like lightweight cotton pants, long-sleeved shirts, and hats. • Select clothes made with a tight weave—they protect better than clothes with a looser weave. • Wear a hat or cap with a brim that faces forward to shield the face. • Limit your sun exposure between 10 AM and 4 PM, when UV rays are strongest. • Wear sunglasses with at least 99% UV protection (look for child-sized sunglasses with UV protection for your child). • Use sunscreen. • Set a good example.

American Cancer Society
http://www.cancer.org/cancer/skincancer-melanoma/moreinformation/skincancerpreventionandearlydetection/skin-cancer-prevention-and-early-detection-u-v-protection
	• Slip! Slop! Slap! Wrap!
	  ▪ Slip on a shirt.
	  ▪ Slop on sunscreen.
	  ▪ Slap on a hat.
	  ▪ Wrap on sunglasses to protect the eyes and skin around them.
	• Seek shade.
	• Protect your skin with clothing.
	• Use sunscreen.
	• Read the labels.
	• Be sure to apply sunscreen properly.
	• Wear a hat.
	• Wear sunglasses that block UV rays.
	• Avoid tanning beds and sunlamps.
	• Protect children from the sun.

National Council on Skin Cancer Prevention http://www.skincancerprevention.org/skin-cancer/prevention-tips	• Do not burn or tan. • Seek shade. • Wear protective clothing. • Generously apply sunscreen. • Use extra caution near water, snow, and sand. • Get vitamin D safely.

Table B. Community-Level Approaches to Preventing Skin Cancer: Recommendations from The Guide to Community Preventive Services

Setting	Target Audience	Intervention Components	Task Force Findings
EDUCATION AND POLICY INTERVENTION STRATEGIES			
Child care centers	Children, caregivers (staff, teachers, or parents), or both	**Include one or more of the following:** • Educational activities through classroom instruction. • Small media, such as brochures and flyers. • Activities to influence children's or students' behaviors, such as modeling, demonstration, or role-playing. • Activities to change the knowledge, attitudes, or behaviors of parents, caregivers, or teachers. • Environmental changes, such as making shaded areas available for outdoor activities. • Policy changes, such as scheduling outdoor activities to avoid hours of peak sunlight or allowing students to wear protective hats when outdoors.	Recommended based on evidence of effectiveness in increasing children's protection from excessive UV exposure (May 2013).
Primary and middle schools (kindergarten through 8th grade)	Children, caregivers (staff, teachers, or parents), or both		Recommended based on evidence of effectiveness in increasing children's sun protection behaviors and decreasing UV exposure, sunburn incidence, and formation of new moles (August 2012).
High schools and colleges	Adolescents and young adults, teachers, or parents or a combination of the three		Insufficient evidence (May 2013).
Health care settings	Providers, patients, or clients	**Include one or more of the following:** • Provider education sessions. • Internet-based education. • Videos. • Role-modeling.	Insufficient evidence (July 2002).
Outdoor recreational and tourism settings	Recreation staff, adults, and children	**Include one or more of the following:** • Educational brochures. • Sun-safety training for recreation staff. • Role-modeling by recreation staff. • Sun-safety lessons. • Interactive activities. • Signs or other prompts encouraging use of sun protection.	Recommended based on strong evidence of effectiveness in improving sunscreen use and improving participants' sun protective behaviors. (February 2014).

Setting	Target Audience	Intervention Components	Task Force Findings
Outdoor occupational settings	Workers	**Include one or more of the following:** • Provision of information to workers through instruction, small media, or both. • Additional activities intended to change the knowledge, attitudes, beliefs, intentions, or behaviors of workers, such as modeling or demonstrations. • Environmental or policy approaches, such as providing shade and sunscreen.	Recommended based on evidence of effectiveness in increasing outdoor workers' sun protective behaviors and in reducing sunburn (August 2013).
COMMUNITYWIDE INTERVENTION STRATEGIES			
Multicomponent, communitywide interventions	Communitywide in a defined geographic area	**A combination of the following across multiple settings:** • Individual-directed strategies. • Mass media campaigns. • Environmental and policy changes.	Recommended based on evidence of effectiveness in increasing sunscreen use (April 2012).
Mass media campaigns (when implemented alone rather than as part of a multicomponent intervention)	Communitywide, but may be aimed at specific audiences; typically uses broad distribution channels	**Dissemination of information and behavioral guidance to wide audiences through media channels such as the following:** • Print media (e.g., newspapers, magazines). • Broadcast media (e.g., radio, television). • Billboards. • Internet.	Insufficient evidence (June 2011).
INTERVENTION STRATEGIES TARGETING CHILDREN'S PARENTS AND CAREGIVERS			
Strategies targeting children's parents and caregivers	Children's parents and caregivers (e.g., nannies, other family members, lifeguards, teachers, coaches)	**Single or multicomponent interventions, including one or more of the following:** • Educational component using small media (e.g., educational brochures, newsletters, tip cards, postcard reminders), sun-safety lessons, interactive activities, and incentives for parents and children. • Environmental component (e.g., an increase in available shaded areas, free sunscreen, point-of-purchase prompts and discount coupons for hats, sun-safety logo T-shirts, sunscreen).	Insufficient evidence (July 2002).

Source: The Guide to Community Preventive Services (http://www.thecommunityguide.org/cancer/skin/education-policy/index.html).

Appendix 6: Abbreviations and Acronyms

25OHD	25-hydroxyvitamin D
AHRQ	Agency for Healthcare Research and Quality
BCC	basal cell carcinoma
BRFSS	Behavioral Risk Factor Surveillance System
CCC	Comprehensive Cancer Control
CDC	Centers for Disease Control and Prevention
CMS	Centers for Medicare & Medicaid Services
DHA	dihydroxyacetone
EHR	electronic health record
EPA	U.S. Environmental Protection Agency
FDA	U.S. Food and Drug Administration
FTC	Federal Trade Commission
HHS	U.S. Department of Health and Human Services
HINTS	Health Information National Trends Survey
IARC	International Agency for Research on Cancer
IOM	Institute of Medicine
ITA	Indoor Tanning Association
NCCCP	National Comprehensive Cancer Control Program
NCI	National Cancer Institute
NHANES	National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
NIH	National Institutes of Health
NMSC	nonmelanoma skin cancer
NPS	National Park Service
OSHA	Occupational Safety and Health Administration
P.L.A.N.E.T.	Plan, Link, Act, Network with Evidence-based Tools
RAYS	Raising Awareness in Youth About Sun Safety
RTIPs	Research-tested Intervention Programs
SAD	seasonal affective disorder
SAMHSA	Substance Abuse and Mental Health Services Administration
SCC	squamous cell carcinoma
SES	socioeconomic status
SHPPS	School Health Policies and Practices Study
SPF	sun protection factor
USPSTF	U.S. Preventive Services Task Force
UV	ultraviolet
UVA	ultraviolet A
UVB	ultraviolet B
UVC	ultraviolet C
WHO	World Health Organization
YRBS	Youth Risk Behavior Survey

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