7 · Ultraviolet Radiation and Skin Cancer

CHAPTER CONTRIBUTORS

COMMITTEE MEMBERS

Nanette Liegeois, MD, PhD (CHAIR)
Johns Hopkins University, School of Medicine, Oncology Center

Jill Adler, MS
LifeBridge Health Alvin & Lois Lapidus Cancer Institute

Alison Ehrlich, MD, MHS
Department of Dermatology, George Washington University Medical Center

Anne Fischer, MD, PhD
Department of Surgery, UT Southwestern Medical School

Roberta Herbst, MS
Maryland Skin Cancer Prevention Program,
Center for a Healthy Maryland

Leigh Marquess, RN
Caroline County Health Department

Catherine Musk, MS, RN
Center for Cancer Surveillance and Control,
Maryland Department of Health and Mental Hygiene

Laura Patrick, RN, MS
Caroline County Health Department

Amanda Schnitzer
Maryland Skin Cancer Prevention Program,
Center for a Healthy Maryland

William Sharfman, MD
Johns Hopkins Medical Institutions - Oncology Center

Barbara Summers
Child Education Consultant

Kurt Wenk, MD
Department of Dermatology, George Washington University Medical Center

7

ULTRAVIOLET RADIATION AND SKIN CANCER

Skin cancer is the most commonly diagnosed cancer in the United States, affecting more than 1 million Americans annually and accounting for about 2% of all cancer deaths.[1] There are three major types of skin cancer: basal cell carcinoma, squamous cell carcinoma, and malignant melanoma.

TERMS TO KNOW

There are three major types of skin cancer.

BASAL CELL CARCINOMA

Usually develops on sun-exposed areas of the body, especially the head and neck.

SQUAMOUS CELL CARCINOMA

Commonly appears on sun-exposed parts of the body such as the face, ear, neck, lip and back of the hands.

MELANOMA

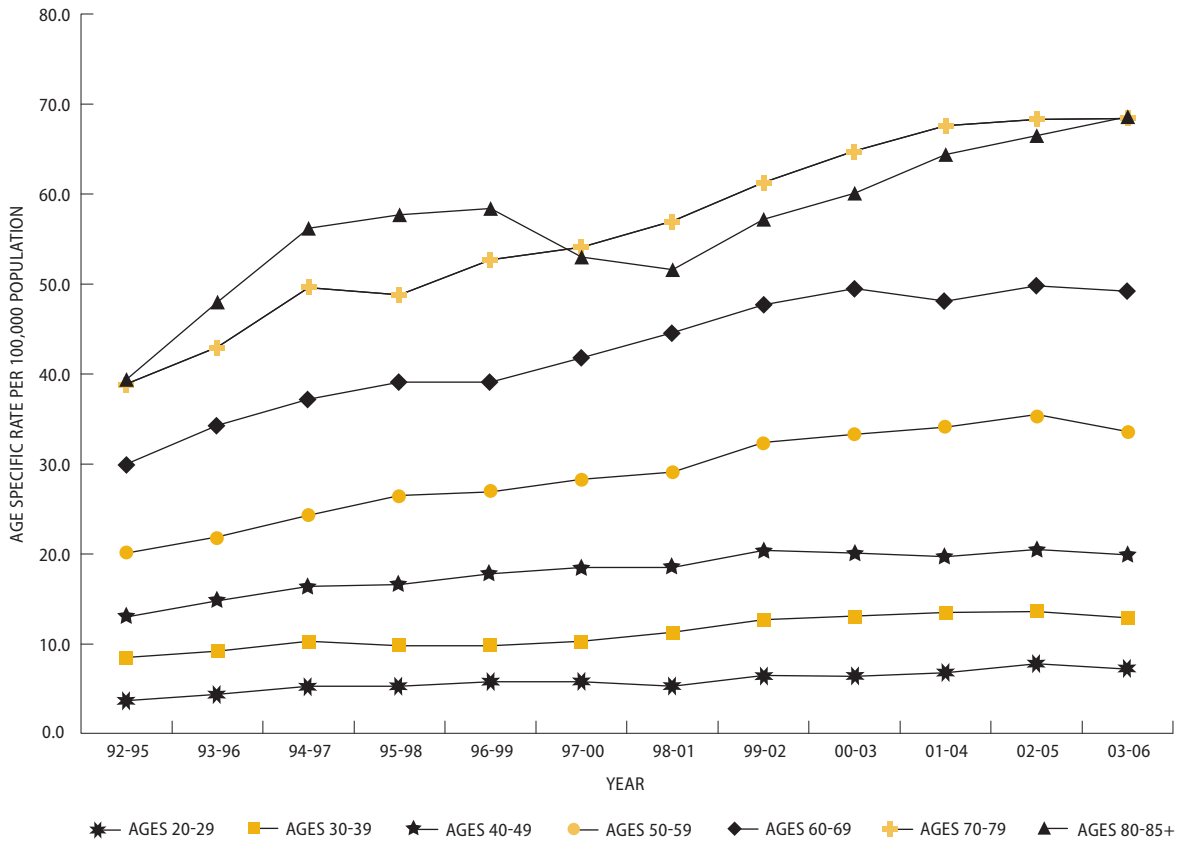
Develops in the cells of the skin that give it color (melanocytes).

BASAL CELL CARCINOMA usually develops on sun-exposed areas of the body, especially the head and neck. Squamous cell carcinoma also commonly appears on sun-exposed parts of the body such as the face, ear, neck, lip, and back of the hands, although it can also appear in the genital area.

Current estimates are that one in five Americans will develop skin cancer during the course of a lifetime.[2] Basal cell carcinoma makes up 75% of all skin cancers, and squamous cell carcinoma accounts for another 20%. Both basal and squamous cell carcinoma have high cure rates if treated early but can cause considerable disfigurement and occasionally death if treatment is delayed. Melanoma, while only accounting for 5% of all skin cancer, is the most deadly form of skin cancer and is responsible for 75% of all deaths from skin cancer. Melanoma develops in the cells of the skin that give it color (melanocytes) and is associated with high mortality if not diagnosed and treated at an early stage.

Medical professionals agree that exposure to the sun's ultraviolet rays appears to be the most important factor in the development of skin cancer. Ultraviolet radiation (UVR) is commonly divided into three bands: UVA, UVB, and UVC. UVC is completely absorbed in the stratosphere before reaching the earth's surface. The rays of UVB are shorter and are the primary cause of tanning and sunburn. The longer rays of UVA penetrate the skin more

FIGURE 7.1 Melanoma Age-Specific Incidence Rates, Maryland, 1992-2006



Source: Maryland Cancer Registry, 1992-2006.

deeply and contribute to wrinkling of the skin as well as tanning. Besides sunburn, skin cancer, and wrinkling, other negative effects of UVR include cataracts, macular degeneration, and immune system depression.[3]

Risk Factors

Risk factors for nonmelanoma and melanoma cancers are not the same; each is described below.[4]

Nonmelanoma skin cancer

- Being exposed to natural sunlight (ultraviolet radiation or UVR) or artificial sunlight (such as from tanning beds) over long periods of time.
- Having a fair complexion, which includes the following:
  - Fair skin that freckles and burns easily, does not tan, or tans poorly.
  - Blue or green or other light-colored eyes.
  - Red or blond hair.
- Having actinic keratosis.
- Having past treatment with radiation.
- Having a weakened immune system.
- Being male.

Melanoma skin cancer

- Having a fair complexion, which includes the following:
  - Fair skin that freckles and burns easily, does not tan, or tans poorly.
  - Blue or green or other light-colored eyes.
  - Red or blond hair.
- Being exposed to natural sunlight or artificial sunlight (such as from tanning beds) over long periods of time.
- Having a history of many blistering sunburns as a child.
- Having several large or many small moles.

- Having a family history of unusual moles (atypical nevus syndrome).
- Having a family or personal history of melanoma.
- Being white and male.

IN ADDITION, skin cancer is the most common cancer in solid organ transplant patients (especially transplants that require more immune suppression such as kidney and heart).[5]

Burden of Skin Cancer in Maryland

Melanoma

The incidence and mortality of melanoma skin cancer has been increasing in Maryland over the last ten years. In certain years Maryland's melanoma incidence rates have exceeded the national rate. Figure 7.1 demonstrates how the incidence rates have continued to climb over the past decade and how each increasing decade of life is associated with an increased risk of skin cancer.

Maryland has a unique challenge: more than 50% of Maryland counties exceed the national melanoma incidence rate for the time period 2002-2006 by 25% or more (Figure 7.2). Some of these counties surround the Chesapeake Bay and are known to have economies based on farming, fishing, and tourism, which can be associated with prolonged sun exposure. The Eastern Shore (representing the eastern Maryland peninsula of the Chesapeake Bay) has high rates of melanoma mortality (Figure 7.3) even in areas with lower rates of melanoma incidence (for example, Dorchester and Somerset Counties).

Nonmelanoma

PER RECOMMENDATIONS from the National Program of Cancer Registries, cancer registries in the US collect data on new cases of malignant melanoma and some cases of nonmelanoma carcinomas. However, these registries do not collect basal and squamous cell carcinomas. Nonmelanoma skin cancer comprises 95% of skin cancers; therefore, they pose a healthcare problem in the state of Maryland.[6]

Mortality from nonmelanoma skin cancer is mostly from Merkel cell and squamous cell carcinoma. Advanced disease is often associated with high morbidity in the instance of nonmelanoma skin cancer because the vast majority of cases occur on sun-exposed sites such as the head, neck, and hands such that surgery and postoperative radiation may produce severe morbidity with often permanent debilitation.

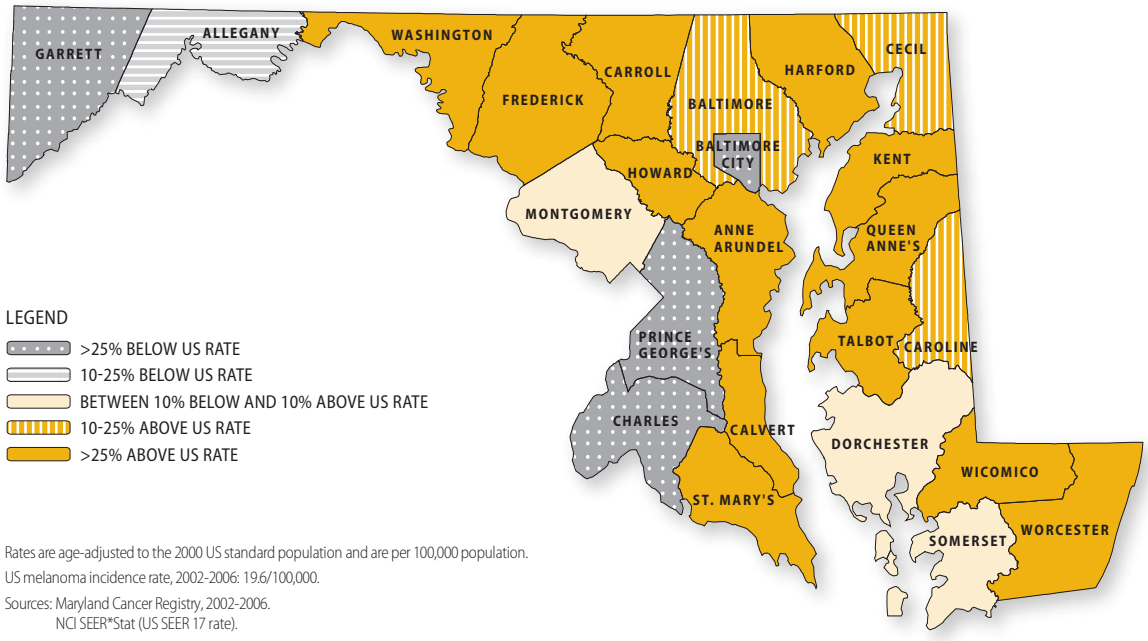
Maryland has several major hospitals that perform solid organ transplantation. These transplant patient populations are known to have an increased incidence of aggressive squamous cell cancers. The incidence of nonmelanoma skin cancers increases over time of immunosuppression and is the most common cancer in transplant patients. Skin cancers in these patients have more accelerated growth, recur locally, and more rapidly become metastatic.[7]

Disparities

- Many counties in Maryland have incidence and mortality rates greater than 25% above the US rate (Figure 7.2, Figure 7.3). These heightened rates may be attributed to Maryland's diverse geography, ranging from coastlines to mountains, which allows residents to partake in a wide variety of outdoor activities and sun-exposure-based occupations.
- The melanoma mortality rate for Maryland males is more than twice as high as for females. In 2006, the male mortality rate was 4.8 per 100,000 population compared with 1.8 per 100,000 for females (Table 7.1).
- Maryland continues to have a lower percentage of melanoma cases diagnosed at the local stage relative to US data. In 2006, 84.3% of all melanoma cancer cases in the US were diagnosed at the local stage.[8] In contrast, only 59.1% of melanoma cases in Maryland were diagnosed at the local stage. This disparity may be partially due to the large number of Maryland melanoma cases that remain unstaged at diagnosis, which measured 27.5% in 2006, an improvement from 38.9% unstaged in 2002.[9]
- Blacks or African Americans have lower five-year survival rates than whites after diagnosis of melanoma (US data only). For 1999-2006, five-year survival rates by race and gender were: 89.0% for white men, 93.7% for white women, 70.0% for black or African

FIGURE **7.2**

Maryland Melanoma Incidence Rates by Geographical Area: Comparison to US Rate, 2002-2006



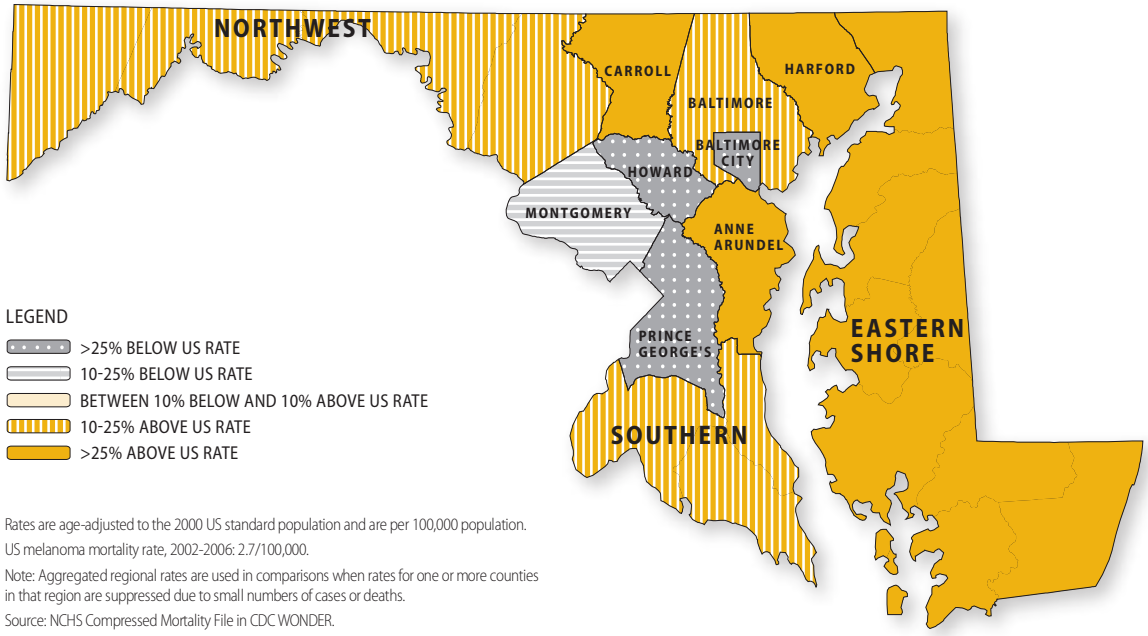
Rates are age-adjusted to the 2000 US standard population and are per 100,000 population.

US melanoma incidence rate, 2002-2006: 19.6/100,000.

Sources: Maryland Cancer Registry, 2002-2006.
NCI SEER*Stat (US SEER 17 rate).

FIGURE **7.3**

Maryland Melanoma Mortality Rates by Geographical Area: Comparison to US Rate, 2002-2006



Rates are age-adjusted to the 2000 US standard population and are per 100,000 population.

US melanoma mortality rate, 2002-2006: 2.7/100,000.

Note: Aggregated regional rates are used in comparisons when rates for one or more counties in that region are suppressed due to small numbers of cases or deaths.

Source: NCHS Compressed Mortality File in CDC WONDER.

TABLE 7.1 Melanoma Incidence and Mortality Rates by Gender and Race, Maryland and the US, 2006

	TOTAL	MALES	FEMALES	WHITES	BLACKS	OTHER
INCIDENCE 2006						
MD New Cases (count)	1,137	661	473	1,069	15	11
MD Incidence Rate	19.7	26.0	15.3	26.7	**	**
US SEER Rate	19.8	25.2	16.0	23.1	0.9	1.6
Mortality 2006						
MD Deaths (count)	172	113	59	166	s	<6
MD Mortality Rate	3.0	4.8	1.8	4.0	**	**
US Mortality Rate	2.7	4.1	1.7	3.1	0.4	0.5

Incidence and mortality rates are per 100,000 and are age-adjusted to 2000 US standard population.

Total includes cases reported as transsexual, hermaphrodite, unknown gender, and unknown race.
** MD incidence rates based on case counts of 1-15 are suppressed per DHMH/MCR Data Use Policy; MD mortality rates based on death counts of 0-15 are suppressed per DHMH/CCSC Mortality Data Suppression Policy.

<6 = MD death counts of 0-5 are suppressed per DHMH/CCSC Mortality Data Suppression Policy.

s = Counts are suppressed in CRF Cancer Report tables to prevent disclosure of data in other cell(s).

Sources: Maryland Cancer Registry, 2004-2006.
NCI SEER*Stat. (US SEER 17 rates)
NCHS Compressed Mortality File in CDC WONDER.

American men, and 77.9% for black or African American women. The overall five-year survival rate was 91.4%.[10]

Prevalence of Sun-Safe Behaviors in Maryland

Statistics regarding sun-safe behaviors among Marylanders are from the Maryland Behavioral Risk Factor Surveillance System (BRFSS).

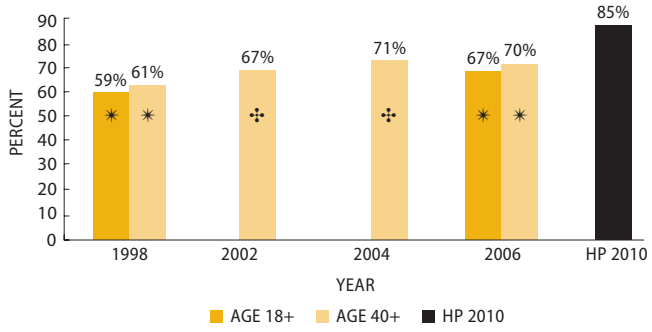
In 2006, 67% of adults age 18 years or older and 70% of those age 40 years or older used at least one of the following measures to protect themselves from UVR: avoiding the sun between 10:00 a.m. and 4:00 p.m., wearing sun-protective clothing, or wearing sunscreen with a sun-protective factor of 15 or higher (Figure 7.4). These numbers are increased from 59% of adults 18 or older and 61% age 40 or older who reported using one or more protective measures in 1998, which may reflect the success of continued state-wide educational efforts emphasizing the importance of sun safety.

However, in 2006 39% of adults stated that they never use sunscreen with an SPF of 15 or higher when outdoors for an hour or more, and in 2005 29% of adults reported having a sunburn within the previous 12 months. In addition, in 2006 68% of adults reported always or nearly always taking measures to protect their child's skin from UVR when the child (under age 13) is outdoors on a sunny day for an hour or more, which represents only a slight increase from 65% in 1998. These factors illustrate that there is still considerable room for improvement in sun-safe practices by Maryland adults.[11]

Primary Prevention

- Both the American Academy of Dermatology and the American Cancer Society strongly recommend sun avoidance and sun protection as forms of primary prevention of skin cancer.
- Sun-protective measures include avoiding midday sun between the hours of 10:00 a.m. and 4:00 p.m., wearing protective clothing, and applying sunscreen within an SPF of 15 or higher.
- Studies have shown that broad-spectrum sunscreen use prevents the occurrence of both squamous cell carcinoma and their precursors, called actinic keratoses.[12,13]
- While there is no evidence that sunscreen use prevents melanoma or basal cell carcinoma, studies looking at this were based on sunscreens that primarily blocked Ultraviolet B (UVB). Future reports will need to be conducted to

FIGURE 7.4 **Percentage of Maryland Adults Using Sun-Exposure Protection* by Age Group, Compared to Healthy People 2010 Target 1998-2006**



* Sun-exposure protection means percentage of adults who report "always" or "nearly always" using one or more of the following measures: a) avoid sun between 10:00 a.m. and 4:00 p.m.; b) wear sun-protective clothing when exposed to sunlight; c) use sunscreen with a sun-protective factor of 15 or higher; and d) wear a hat when outdoors. The BRFSS and MCS do not include questions regarding frequency of exposure to artificial sources of ultraviolet light.

Sources: ✶ Maryland BRFSS, 1998, 2006.
✣ Maryland Cancer Survey, 2002, 2004.
Healthy People 2010 Midcourse Review, US Department of Health and Human Services, 2006.

assess the efficacy of broader-spectrum agents that protect against both Ultraviolet A (UVA) and UVB.[14,15]

- Primary prevention also includes avoiding artificial sources of ultraviolet radiation produced by tanning beds. Numerous studies support that indoor tanning is a risk factor for both squamous and basal cell carcinoma, and, more recently, melanoma.[16, 17, 18]
- While vitamin D is considered necessary for the development and maintenance of strong healthy bones, the National Council on Skin Cancer Prevention does not recommend intentional exposure to natural or artificial ultraviolet radiation as a way of obtaining vitamin D. Instead, individuals with limited sun exposure can meet their daily vitamin D requirements by supplementing their diet with vitamin D-fortified foods and/or supplements.[19]

FAST FACT

Numerous studies support that indoor tanning is a risk factor for both squamous and basal cell carcinoma and, more recently, melanoma.

Education

Education efforts are vital for the prevention of skin cancer among Marylanders. Education directed toward the general public should emphasize the importance of the primary prevention measures discussed above.

IN ADDITION, advice regarding sunscreen should include; (1) use sunscreen with SPF 15 or higher; (2) apply it 20 minutes prior to exposure; (3) use 1 ounce of sunscreen per application; and (4) reapply sunscreen every two hours or after swimming or excessive sweating.

Several population groups warrant special consideration for educational efforts, including those in occupations requiring outdoor exposure, children and adolescents, school educators, professionals who routinely see the skin of their clients (barbers, hairdressers, cosmetologists, massage therapists, etc.), and solid organ transplant recipients or those who are immune-suppressed.

Currently, Maryland has no licensing requirement for barbers, hairdressers, or cosmetologists to have knowledge of or skills in early detection of skin cancer. This presents an educational opportunity because individuals employed in those professions have direct access to their clients' skin.

Healthcare provider education in and awareness of skin cancer detection is a key factor in patient survival. Many physicians do not receive sufficient education on skin cancer screening to feel competent in this area. A survey conducted at the Boston University School of Medicine found that 52% of fourth-year students rated

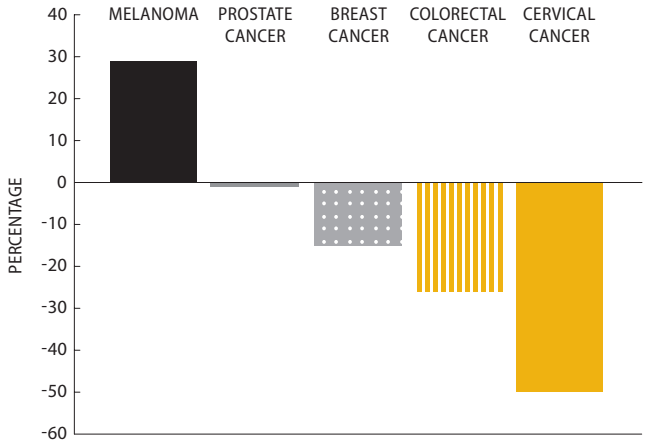
DID YOU KNOW?

In 2008, a Maryland statewide tanning bed law was passed that required on-site parental consent for minors. Howard County subsequently passed a law in 2009 banning all minors from indoor tanning, becoming the first jurisdiction in the country to do so.

themselves as unskilled in skin cancer examinations.[20] This deficit of skin cancer knowledge was also apparent in a survey of family practitioners; more than 50% of those surveyed stated that they lacked the confidence to recognize melanoma.[21]

Educational interventions and curriculum enhancement for providers can be effective.[22] While the mortality rates of some cancers over the period 1975-2000 have decreased, the melanoma mortality rates increased during that time period (Figure 7.5). For this reason, it is imperative to provide public and provider education in the early detection of skin cancer, including melanoma.

FIGURE 7.5 Changes in Overall Cancer Mortality, US 1975-2000



Source: SEER Cancer Statistics Review, 1975-2000, http://seer.cancer.gov/csr/1975_2000/

Public Policy

The development of state and national legislation supporting sun-safe behavior plays an important role in enforcing primary prevention recommendations and preventing skin cancer.

THE MARYLAND SKIN CANCER PREVENTION PROGRAM has been instrumental in influencing policy change by promoting skin cancer awareness among the public, physicians, and school educators as summarized within the Current Efforts section of this chapter.

The Maryland State Department of Education has also played a vital part through its development of numerous guidelines and policies designed to protect students and staff from sun overexposure. One of these policies was supported by a 2006 Maryland law allowing students to carry sunscreen products while in school. However, additional state policy changes may be needed to further encourage sun-safety practices among Maryland schoolchildren, including the integration of skin cancer prevention education within the curriculum and funding for the building of shaded structures on school property.

Another important area of public policy focuses on regulation of the indoor tanning industry. In 2008, a Maryland statewide tanning bed law was passed that required on-site parental consent for minors. Howard County subsequently passed a law in 2009 banning all minors from indoor tanning, becoming the first jurisdiction in the country to do so.[23] With these new laws Maryland joins at least 31 other states that have enacted legislation addressing youth access to tanning facilities.[24] However, research has shown that many states do not adequately enforce these laws, with low rates of annual inspections and citations for violations.[25] Although progress has been made, additional legislation may be needed to further restrict Maryland minors from indoor tanning businesses and to ensure these policies are enforced.

Policy and implementation efforts in Maryland can be modeled on those in Australia, which is known for implementing some of the most extensive, long-term, and successful skin cancer prevention programs addressing a high incidence of both melanoma and non-melanoma skin cancer.[26] These programs began in 1980 when the Anti-Cancer Council of Victoria developed the Slip! Slop! Slap! Campaign and continued in

1988 when the Victorian Health Promotion Foundation launched SunSmart, a broad-based prevention program focusing on public education in sun-safety behaviors and environmental change in various settings.[27] Recent studies have indicated that basal cell carcinoma, squamous cell carcinoma, and melanoma incidence rates in Australia have begun to stabilize among younger populations, which may reflect the success of these sun-protection behavior efforts over the past 30 years.[28,29] Australia's Cancer Council, together with other organizations, works to continue the favorable trend in skin cancer rates seen in these younger groups.[30]

Screening Recommendations of Professional Groups

Prominent professional and governmental groups have developed guidelines for skin cancer screening, but there is a lack of consensus among these groups. There is no clear direction or guidance for healthcare professionals and the public.

A SUMMARY OF THESE RECOMMENDATIONS can be found on the Skin Cancer page of the Maryland Cancer Plan Web site (www.marylandcancer-plan.org). In the absence of research-based evidence for skin cancer screening, however, there is anecdotal data to support the need for skin cancer screening by all primary care providers.

Despite a lack of consensus among groups that issue screening guidelines, the Skin Cancer Committee encourages healthcare providers, especially primary care providers, to perform routine skin exams and to educate patients on skin self exams. The early detection of skin cancer at a local stage and precancerous skin conditions enables less invasive treatment options.

Dermatologist Availability

A shortage of dermatologists exists within the United States, with an estimated total of only 10,600 physicians (or 3.6 per 100,000 population).[31]

THIS HAS TRANSLATED into wait times exceeding one month for new patient appointments, and has resulted in the hiring of physician assistants and nurse practitioners within clinics to aid with the increasing demand for dermatologic services. Despite the continued demand, there has been a lack of significant change in the number of dermatology residency training positions during the past three decades.[32] Telemedicine has been used to supplement the low availability of dermatologists within rural and underserved areas.

Treatment

Once a diagnosis of skin cancer is rendered, the following should be done:

- Appropriate staging is recommended for any cancer. Patients and physicians are referred to the 7th edition 2009 AJCC (American Joint Committee on Cancer) and UICC (Union International Contra Cancer) cancer staging manuals.

- In the United States, the NCCN (National Cancer Center Network) produces annual guidelines for treatment. On the www.nccn.org Web site, there are physician and patient guidelines.

Current/Ongoing Efforts in Maryland

Several organizations are involved in educating the public and providing skin cancer prevention and sun-safe behavior programs in Maryland.

The Maryland Skin Cancer Prevention Program

The Maryland Skin Cancer Prevention Program was established in 1997 by the Centers for Disease Control and Prevention and funded 2001-2009 by the Maryland Department of Health and Mental Hygiene. Program activities are carried out through a statewide coalition consisting of more than 90 members representing 63 public and private organizations as well as dedicated individuals. Messages are disseminated to the general public and providers through many vehicles including television/radio/print media, Web sites (http://www.sunguardman.org), poster contests, community events, provider outreach through the state medical society, museum exhibits, the SunGuard Your Skin elementary/middle school curriculum, and the SunGuardMan Mascot. Some of these activities are described in greater detail in the "Progress Report on the 2004-2008 Maryland Comprehensive Cancer Control Plan," which can be found at www.marylandcancerplan.org.

American Cancer Society

The American Cancer Society (ACS) is involved in providing public education on all aspects of the early detection and prevention of cancer. In addition to providing educational programs and materials to local communities, ACS is engaged in advocacy efforts that may ultimately lead to a decline in the incidence of skin cancer by reducing the exposure of young people to the harmful effects of tanning beds.

Environmental Protection Agency

The US Environmental Protection Agency has an educational program that targets children in grades K-8. The SunWise Program is an award-winning national environmental and health education program that teaches children and their caregivers how to protect themselves from overexposure to the sun. Organizations that work with children, including schools, camps, museums, and health departments, register online (www.epa.gov/sunwise) to receive a free SunWise Tool Kit with more than 50 standards-based, cross-curricular classroom activities for grades K-8; an ultraviolet (UV) sensitive Frisbee for hands-on experiments and fun; story and activity books; posters; a video; policy guidance; and more. As of February 2010, more than 34,000 educators at 28,000 US schools, camps, etc. have registered for SunWise, including more than 1,000 educators representing every jurisdiction in Maryland.

Many other national and governmental organizations promote and support skin cancer awareness and sun-safety education, such as the American Academy of Dermatology, the National Cancer Institute, the National Institutes of Health, and the Ulman Cancer Fund for Young Adults.

GOALS • OBJECTIVES • STRATEGIES

GOAL 1

Increase awareness of skin safe behaviors.

OBJECTIVE 1

By 2015, increase the proportion of Maryland adults who

- **Can name two sources and two dangers of UV radiation.**
- **Can name three sun-safe behaviors.**
- **Are aware of early detection options for skin cancer.**

STRATEGIES

1. **CONTINUE TO USE MEDIA OUTLETS** such as Web sites; print, radio, and television PSAs; billboards; and press releases to provide messages on sun-safe behaviors, the dangers of ultraviolet radiation, and early detection.
2. **PROMOTE SKIN CANCER PREVENTION AND DETECTION EDUCATION** through community events, health fairs, and continued partnerships with medical, outdoor occupational, and beauty industry members.
3. **PROMOTE MULTIDISCIPLINARY AND CONSISTENT AWARENESS** messages when addressing issues of vitamin D, sunscreen use, and nutrition and physical activity recommendations.
4. **DEVELOP METHODS** for obtaining baseline measurements and monitoring progress on Objective 1, for example:
   - Promote inclusion of questions on awareness of sun-safe behaviors in the Maryland BRFSS.
   - Create/implement a survey to measure awareness of sun-safe behaviors among Maryland adults.

OBJECTIVE 2

By 2015, increase skin cancer prevention and detection education for Maryland healthcare providers and beauty industry providers.

STRATEGIES

1. **COLLABORATE WITH MARYLAND MEDICAL AND BEAUTY INDUSTRY** providers to offer CMEs or other types of training in skin cancer recognition and education of patients on skin cancer prevention and detection.
2. **DISCUSS/PRESENT INFORMATION** on skin cancer prevention and detection at dermatological and other medical and nursing association conferences.
3. **FORM PARTNERSHIPS** with researchers to increase the number of written publications on skin cancer prevention and detection.
4. **DEVELOP METHODS** to obtain baseline measurement and monitor progress on Objective 2. For example, conduct a statewide assessment of educational opportunities available to and participated in by healthcare providers.

OBJECTIVE 3

By 2015, increase the proportion of childcare facilities, schools, and youth-focused organizations that provide education on skin safety to Maryland children and adolescents.

STRATEGIES

1. **PROMOTE/INTEGRATE THE USE** of sun safety educational curricula in elementary and middle schools through Web sites, mass media, and community events.
2. **EDUCATE CHILDCARE PROVIDERS** on sun-safe behaviors and the dangers of ultraviolet radiation for children and adolescents through in-person trainings, Web sites, mass media, and community events.
3. **FORM PARTNERSHIPS** with youth service, recreation, and sports organizations such as Girl Scouts, 4H, Little League, swimming leagues, etc. to provide opportunities for education on skin cancer prevention.
4. **CREATE/IMPLEMENT SURVEYS** of childcare facilities, schools, and youth-focused organizations regarding their use of educational curricula on sun safety.

GOAL 2

Increase the utilization of skin safe behaviors.

OBJECTIVE 1

By 2015:

- **Increase the percentage of Maryland adults to 44% who always or nearly always do at least two of the following (2006 Baseline: 36%):**
  - **Limit sun exposure between 10:00 a.m. and 4:00 p.m.**
  - **Use sunscreen with SPF of 15 or higher when outdoors for an hour or more on a sunny day.**
  - **Wear a hat with a broad brim when outdoors for an hour or more on a sunny day.**
  - **Wear sun-protective clothing when outdoors for an hour or more on a sunny day.**

  Source: Maryland BRFSS.

- **Increase the percentage of Maryland children (under age 13) who always or nearly always use sun-protection measures (including sunscreen and protective clothing) to 73% (2006 Baseline: 68%).**
  Source: Maryland BRFSS.

STRATEGIES

1. **ENCOURAGE FUNDING** for the building of covered structures and implementing signage at public beaches and parks reminding people to wear sunscreen.
2. **DEVELOP PROGRAMS** encouraging sun-safe behaviors for outdoor workers.
3. **DECREASE THE USE OF TANNING BEDS** while promoting alternate, safe sunless tanning options.
4. **INCREASE THE USE OF SUN-PROTECTIVE METHODS** for outdoor activities.
5. **REQUEST THE ADDITION OF QUESTIONS** on the Maryland Behavioral Risk Factor Surveillance Survey regarding avoiding artificial UVR, and on the Maryland Youth Risk Behavior Surveillance System regarding the use of sun-safe behaviors (as listed in Objective 1) along with avoiding artificial UVR.

OBJECTIVE 2

By 2015, decrease the percentage of Maryland minors who use artificial sources of ultraviolet light (i.e., tanning beds).

STRATEGIES

1. **INCREASE AWARENESS** of the Maryland law regarding parental consent for minors' use of tanning beds.
2. **ENSURE CONTINUED DISSEMINATION** of the DHMH Parental Consent Form for minors to use tanning booths.
3. **MODEL LEGISLATION** in Maryland based on the Howard County policy that prohibits minors from using tanning beds.
4. **REQUEST THE ADDITION OF QUESTIONS** on the Maryland Behavioral Risk Factor Surveillance Survey and the Maryland Youth Risk Behavior Surveillance Survey regarding tanning bed use by minors.

OBJECTIVE 3

By 2015, improve the early detection of skin cancer by increasing the percentage of melanoma cancers in Maryland diagnosed at the local stage to 74.1% (2006 Baseline: 59.1%).
Source: Maryland Cancer Registry.

STRATEGIES

1. **DECREASE THE NUMBER** of unstaged melanoma cases reported in the Maryland Cancer Registry in order to obtain more accurate data of melanoma stage at diagnosis.
2. **ENCOURAGE RESEARCH** on skin cancer detection, stage, mortality, and morbidity.

REFERENCES

1 American Cancer Society. Cancer facts & figures 2009. Report. Atlanta (GA): The Society; 2009.

2 Robinson JK. Sun exposure, sun protection, and vitamin D. JAMA 2005;294: 1541-43.

3 Environmental Protection Agency (US). The sun, UV, and you: a guide to sunwise behavior. Washington (DC): Environmental Protection Agency (US); 1999 June. EPA Pub No.: EPA430-K-99-035.

4 National Cancer Institute (US). Skin cancer prevention physician's data query (PDQ) [Internet]. Bethesda (MD): National Cancer Institute (US); 2006 July [cited 2010 July 23]. Available from: http://www.cancer.gov/cancertopics/pdq/prevention/skin/healthprofessional

5 Berg D, Otley CC. Skin cancer in organ transplant recipients: epidemiology, pathogenesis, and management. J Am Acad Dermatol. 2002 Jul;47(1):1-17; quiz 18-20.

6 See note 1

7 McGuire JF, et al. Nonmelanoma skin cancer of the head and neck I: histopathology and clinical behavior. Am J Otolaryngol. 2009 Mar-Apr;30(2): 121-133.

8 Altekruse SF, Kosary CL, Krapcho M, Neyman N, Aminou R, Waldron W, Ruhl J, Howlader N, Tatalovich Z, Cho H, et al., (eds). SEER cancer statistics review, 1975-2007 [Internet]. Bethesda (MD): National Cancer Institute (US); 2010 [cited 2010 Aug. 4]. Available from: http://seer.cancer.gov/csr/1975_2007/, based on November 2009 SEER data submission, posted to the SEER web site, 2010.

9 Maryland Department of Health and Mental Hygiene (US). Cancer report 2009, Cigarette Restitution Fund Program: Cancer Prevention, Education, Screening, and Treatment Program. Baltimore (MD): Maryland Department of Health and Mental Hygiene (US); 2009 Dec.

10 See note 8

11 Maryland Department of Health and Mental Hygiene (US). Maryland Behavioral Risk Factor Surveillance System [Internet]. Baltimore (MD): Maryland Department of Health and Mental Hygiene (US); 2006 [cited 2010 July 29]. Available from: http://www.marylandbrfss.org

12 van der Pols JC, Williams GM, Pandeya N, et al. Prolonged prevention of squamous cell carcinoma of the skin with regular sunscreen use. Cancer Epidemiol Biomarkers Prev. 2006;15:2546-2548.

13 Thompson SC, Jolley D, Marks R. Reduction of solar keratoses by regular sunscreen use. N Eng J Med. 1993;329:1147-1151.

14 Diffey BL. Sunscreens as a preventative measure in melanoma: an evidence-based approach or the precautionary principle? Br J Dermatol. 2009;161:25-27.

15 Dennis LK, Beane Freeman LE, VanBeek MJ. Sunscreen use and risk of melanoma: a quantitative review. Ann Intern Med. 2003;139:966-978.

16 Schulman JM, Fisher DE. Indoor ultraviolet tanning and skin cancer: health risks and opportunities. Curr Opin Oncol. 2009;21:144-149.

17 Ting W, Schultz K, Cac NN, et al. Tanning bed exposure increases the risk of malignant melanoma. Int J Dermatol. 2007;46:1253-1257.

18 International Agency for Research on Cancer Working Group on artificial ultraviolet light and skin cancer. The association of use of sunbeds with cutaneous malignant melanoma and other skin cancers: a systematic review. Int J Cancer. 2007;120:1116-1122.

19 National Council on Skin Cancer Prevention (US). Position statement on vitamin D [Internet]. Mount Airy (MD): National Council on Skin Cancer Prevention (US); 2009 [cited 2010 Feb 10]. Available from: http://www.skincancerprevention.org/News/NCSCPPositionStatementonVitaminDJuly2009/tabid/125/Default.aspx

20 Geller AC, Venna S, Prout M, et al. Should the skin cancer examination be taught in medical school? Arch Dermatol. 2002 Sep;138(9):1201-3.

21 Stephenson A, From L, Cohen A, Tipping J. Family physicians' knowledge of malignant melanoma. J Am Acad Dermatol. 1997 Dec;37(6): 953-7.

22 Mikkilineni R, Weinstock MA, Goldstein MG, Dube CE, Rossi JS. The impact of the basic skin cancer triage curriculum on provider's skin cancer control practices. J Gen Intern Med. 2001 May;16(5):302-7.

23 National Conference of State Legislatures (US). Tanning restrictions for minors: a state-by-state comparison [Internet]. Denver (CO): National Conference of State Legislatures (US); 2010 [cited 2010 Feb 10]. Available from: http://www.ncsl.org/default.aspx?tabid=14394

24 Ibid.

25 Mayer JA, Hoerster KD, Pichon LC, et al. Enforcement of state indoor tanning laws in the United States. Prev Chronic Dis. [Internet]. [cited 2010 Feb 8]; 2008;5(4). Available from: http://www.cdc.gov/pcd/issues/2008/oct/07_0194.htm

26 McCarthy WH. The Australian experience in sun protection and screening for melanoma. J Surg Oncol. 2004;86:236-245.

27 Montague M, Borland R, Sinclair C. Slip! Slap! Slop! and SunSmart, 1980-2000; Skin cancer control and 20 years of population-based campaigning. Health Educ Behav. 2001;28(3):290-305.

28 Staples MP, Elwood M, Burton RC, et al. Non-melanoma skin cancer in Australia: the 2002 national survey and trends since 1985. Med J of Aust. 2006;184:6-10.

29 Baade P, Coory M. Trends in melanoma mortality in Australia: 1950-2002 and their implications for melanoma control. Aust N Z J Public Health. 2005;25(4):383-386.

30 Cancer Council Australia. Australia national cancer prevention policy 2007-2009 [Internet]. Sydney (Australia): Cancer Council Australia; 2010 [cited 2010 Aug 4]. Available from: http://www.cancer.org.au/Policy/NationalCancerPreventionPolicy.htm

31 Kimball AB, Resneck JS. The US dermatology workforce: a specialty remains in shortage. J Am Acad Dermatol. 2008;59:741-745.

32 Ibid.