

Skin Cancer  
Causes, Prevention, and Treatment

Lauren Queen

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Jeffrey Lennon, Ph.D.  
Thesis Chair

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Sherry Jarrett, Ph.D.  
Committee Member

---

Virginia Dow, M.A.  
Committee Member

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Brenda Ayres, Ph.D.  
Honors Director

---

Date

### Abstract

The purpose of this thesis is to analyze the causes, prevention, and treatment of skin cancer. Skin cancers are defined as either malignant or benign cells that typically arise from excessive exposure to UV radiation. Arguably, skin cancer is a type of cancer that can most easily be prevented; prevention of skin cancer is relatively simple, but often ignored. An important aspect in discussing the epidemiology of skin cancer is understanding the treatments that are available, as well as the prevention methods that can be implemented in every day practice. It is estimated that one in five Americans will develop skin cancer during his or her lifetime, and that one person will die from melanoma every hour of the day. To an epidemiologist and health promotion advocate, these figures are daunting for a disease, especially for a disease that has ample means of prevention. However, even with sufficient prevention methods, a lack of education and promotion of a practice will not lead to favorable results. This thesis will aim to uncover the causes and treatments associated with skin cancer, the disease, distribution, and determinants of the disease, and finally, how the promotion of the practice of prevention of this disease can be furthered.

## Skin Cancer: Causes, Prevention, and Treatment

### **Skin Cancer**

Cancer, as defined by *Stedman's Medical Dictionary*, is a "general term frequently used to indicate any of various types of malignant neoplasms, most of which invade surrounding tissues, may metastasize to several sites, and are likely to recur after attempted removal and to kill the patient unless adequately treated" (2017). Thus, skin cancers are cancers that arise from the abnormal division or mutation of skin cells. There are three main types of skin cancer: squamous-cell skin cancer (SCC), basal-cell skin cancer (BCC), and melanoma. Basal-cell skin cancer and squamous-cell skin cancer are both part of a broader category known as nonmelanoma skin cancer, whereas melanoma is an aggressive cancer that typically presents as a mole. Almost 90% of skin cancer cases are caused by an overexposure of UV radiation (Gallagher, 2010). Overexposure of UV radiation typically would be result of excessive time in the sun, but recently, tanning beds have become more popular among younger generations and have contributed to the rise in skin cancer prevalence significantly as a carcinogenic agent. While UV radiation is the primary environmental cause in skin cancer, other factors may include, but are not limited to: smoking, HPV, genetic syndromes, ionizing radiation, or the use of immunosuppressive medications (Salidi, 2005). While there are many cases of skin cancer in the United States, there are far fewer cases of melanoma among the population. Melanoma, which is also known as malignant melanoma, comes from skin cells known as melanocytes; melanoma is particularly common in fair-skinned, or pigment-lacking individuals, and is almost always the result of UV light. Malignant melanoma is diagnosed by a biopsy of the sample in question, and typically will be diagnosed by a

dermatologist. A dermatologist is an individual who studies and diagnoses diseases related to the hair, skin, and nails. In diagnosing, dermatologists typically will follow the mnemonic “ABCDE” when looking at specific moles. The five important variables in looking for melanoma include: asymmetry, borders, color, diameter, and evolution over time. If the mole has irregular borders, varying colors, and a diameter greater than 6mm, it should be biopsied to be tested for melanoma (Gandhi, 2015).

### **Prevalence and Incidence of Skin Cancer**

Overall, skin cancer is the most common type of cancer; nonmelanoma accounts for over 5.4 million cases in more than 3.3 million people in the United States (Robbins, 2016). It is estimated that the incidence of malignant melanoma in Europe and the United States has almost tripled in the last 30 years (Katalinic, 2012). According to Robbins, over the last 30 years, more people have had skin cancer than all other cancers combined; he also states that 1 in 5 people will develop skin cancer over the course of his or her lifetime (2016). According to Robbins (2016), it is estimated that one person will die from melanoma every hour, and while melanoma accounts for less than 1% of skin cancer cases, melanoma accounts for the majority of deaths that result from skin cancer. It has been determined that 86% of melanomas come from over exposure to the sun, and an individual’s risk for melanoma doubles if he or she has experienced multiple sunburns (Robbins, 2016). The American Academy of Dermatology states that melanoma has a high prevalence in Australia and New Zealand, but is less common in Asia, Africa, and Latin America. Melanoma is more common in men than it is in women and is mostly found in Caucasian individuals. Men have a higher incidence rate of melanoma than women, since the incidence rate in men aged 80 and older is three times higher than that

of women aged 80 and older (AAD, 2016). The incidence rate is much higher in Caucasian individuals than it is in African Americans and Hispanics. In Hispanics, the incidence rate is 4 per 100,000, in African Americans the incidence rate is 1 per 100,000; however, in Caucasians, the incidence rate is 25 per 100,000 (AAD, 2016). The incidence rates of melanoma have increased in Caucasian women younger than 40 by 6.1% every year, which may be due to the increasingly popular use of indoor tanning and artificial UV light (AAD, 2016).

### **Epidemiology**

To understand the epidemiology of a disease, one must first understand the concept of epidemiology. Epidemiology is defined by Friis (2010) as “an interdisciplinary approach . . . concerned with the distribution and determinants of health and diseases, morbidity, injuries, disability, and mortality in populations. Epidemiologic studies are applied to the control of health problems in populations” (p. 282). The terminology of epidemiology is quite extensive but vital to understanding the concepts behind the study of disease prevalence and distribution in each population. Epidemiology has many aspects and characteristics that are used to reach a conclusion, which include: population focus, distribution, determinants, outcomes, quantification, and control of health problems (Friis, 2010). Population is defined as “all inhabitants of a given country or area considered together;” distribution is defined as “the occurrence of diseases and other health outcomes in various populations” while a determinant is “any factor that brings about a change in a health condition or other defined characteristic” (Friis, 2010, p. 282). The outcomes of disease included the morbidity and mortality of the disease; morbidity is the illness due to a disease, and mortality is the death due to a disease.

Epidemiology is a quantitative study, which “refers to counting the cases of illness or other health outcomes” (Friis, 2010, p. 282). In studying the determinants and distribution of a disease, one of the end goals is prevention. According to Friis, there are three types of prevention: primary, secondary, and tertiary. Primary prevention is before the disease ever occurs, secondary prevention is taking measures to prevent the disease while it is progressing, and tertiary prevention is during the later stages of the disease (Friis, 2010). Another important aspect of epidemiology is looking at the number of cases, both current cases and the number of new cases, in studying a disease; epidemiologists define this as the prevalence and incidence of a specific disease. The incidence of a disease is found by looking at the occurrence of new cases of the disease within a specific period, while the prevalence of a disease is the number of current cases of a specific disease at a given time (Friis, 2010). Another important factor associated with causation of a disease is different aspects of risk when determining the incidence and prevalence of a disease. A risk factor is defined by Friis (2010) as an “exposure that is associated with a disease, morbidity, mortality, or adverse health outcome” and risk assessment is “a methodology used to provide quantitative measurements of risk to health” (Friis, 2010, p. 282). Overall, epidemiology is a quantitative, observational study of the risks, prevalence, incidence, and outcomes of specific diseases. When healthcare professionals are observing the epidemiology of a certain disease, it is vital to have strong definitions of the terminology of the study method being used.

### **Skin Cancer in the United States**

The American Academy of Dermatology also reiterates that skin cancer is the most common cancer in the United States and that 20% of Americans will develop skin

cancer at some point in their lifetime. The American Academy of Dermatology states that over 8,500 people in the United States are diagnosed with skin cancer every day.

Typically, a nonmelanoma skin cancer patch can be removed via cryotherapy or by same-day Mohs surgery in a dermatology clinic, whereas a melanoma skin cancer requires extensive removal. The American Academy of Dermatology reported that melanoma incidence rates have double from 1982 to 2011; they also reported that men aged 50 and older have a higher risk of developing melanoma than the rest of the population; however, melanoma is the second most common form of cancer in females younger than 30 due to indoor tanning and overexposure to UV light (AAD, 2016). According to T. Kornek (2013), “The increase of new cases of skin cancer since the 1970s is attributed to altered leisure time activity with the associated increased UV exposure” (p. 287). It is interesting to note that even with an increase in skin cancer prevention awareness as technology has increased, skin cancer cases are still on the rise, rather than being reduced. This particular area of disease should be placed at the foremost agenda of the health promotion community because skin cancer is an entirely preventable disease. Because skin cancer can be prevented and has an attributable cause, it is vital that skin cancer prevention should be emphasized among communities in order to inhibit the increase of skin cancer.

There are many ways to prevent skin cancer, but in order to understand prevention, one must first understand the risk factors involved with skin cancer, or melanoma in particular. Overexposure to UV light, whether artificial or natural, is the ultimate risk factor for any type of skin cancer, and preventing this risk factor alone could prevent over three million cases of skin cancer each year (AAD, 2016). Another risk

factor associated with skin cancer is having sunburn at a young age. It is believed that having more than five sunburns before the age of 20 increases the risk of melanoma by 80%, and the risk of nonmelanoma skin cancer by 68%; the daily use of sunscreen could reduce melanoma, which as previously stated is the most deadly form of skin cancer, prevalence by almost half (AAD, 2016). While UV exposure and lack of sunscreen use are the most prevalent risk factors, genetic traits could also account for an increased risk of skin cancer. The risk factors associated with skin cancer increase in those who burn easily, have red or blond hair, or a family history of melanoma. As expected, those who have a history of nonmelanoma are more likely to develop melanoma than those who do not have a history of nonmelanoma skin cancer (AAD, 2016).

Statistically speaking, the presence of any type of skin cancer is on the rise.

According to S. Gandhi (2015),

SCC [squamous cell carcinoma] is the second most common NMSC [nonmelanoma skin cancer] and is increasing in incidence worldwide. A study in Manitoba, Canada revealed a 266% increase in annual incidence in SCC rates in men from 1960 to 2000 and a 215% increase in the incidence rate in women during the same time. Studies estimated the number of new cases in the white population in the United States in 2012 to be between 186,000 and 419,000. (p. 1326)

These numbers are astounding and continually increasing. It is vital that there is a shift in focus from skin cancer treatment to practical skin cancer prevention; unfortunately, the reality is that far too many people have already caused unchangeable damage to their skin and will require treatment for their skin cancer during their lifetime.

K. Buster (2012) constructed a study that compared skin cancer risk perceptions across ethnicity, age, education, gender and income. Buster reports,

Our analysis indicates that uncertainty and altered or inaccurate perceptions may be more common in the skin cancer risk perceptions of the elderly, ethnic minorities, and those with less education. Elderly subjects perceived their personal skin cancer risk as lower than others their age and reported a lack of clarity on skin cancer prevention strategies they should use. (p. 774)

It is interesting to see that skin cancer is most common in the elderly; however according to this study, they reported the highest level of lack of clarity in regards to successful prevention strategies. Lack of education among the population is where health promotion and advocacy play a role in the prevention of skin cancer; without education and promotion of safe practices, the prevalence of preventable diseases will rise. The public health profession needs to target the most affected classes of individuals, such as the elderly, and strongly push an agenda of prevention practice. In 2014, S. Yuce constructed a study that highlighted the prevalence of skin cancer among the elderly:

With the increase in lifespan, age related diseases including cancer also increase. With this in mind, in our study we evaluated treatment methods and results of patients who were older than age 65 and operated for skin cancer in the Plastic Surgery Clinic. . . . Patients older than age 65 who were operated between 2010 and 2014 for skin cancer in the Department of Plastic Surgery were included in our study. Age, gender, diagnosis, localization, operation, lymph node dissection and additional treatments were analyzed. 91 geriatric patients with skin cancer were detected. The average age of patients was 74.4 years. 47 (51.65%) patients

were female; 44 patients (48.35 %) were male. With respect to diagnosis, 58 (63.74%) had basal cell carcinoma, 27 (29.67%) had squamous cell carcinoma, and in 6 (6.59%) patients cutaneous melanoma was detected. A review of surgical operations showed that 22 (24.17%) patients had lesion excision + primary suturation, 19 (20.88%) had lesion excision + graft repair, 48 (52.75%) had lesion excision + local flap repair, and 2 (2.20%) had amputation. . . . In recent years, skin cancer, especially the incidence and mortality of cutaneous melanoma, has been seen more frequently in elders, compared to younger patients. In health controls, the mortality of skin cancer may be reduced by taking into account the geriatric age group. (p. 228)

This study showed how geriatric patients are some of the most common skin cancer victims. This is partially due to the nature of skin cancer; skin cancer does not immediately present itself, such as an unhealthy lifestyle and poor diet would soon lead to obesity. Rather, skin cancer often takes years or decades to appear but is often caused during young age.

Another reason that the elderly are a prevalent generation of skin cancer victims is that education and technology has increased since the time that the elderly were young. There is more information today regarding the importance of skin protection than there has been in the past. Because of this, many elderly may have unknowingly caused extensive damage to their skin when they were in their twenties and thirties, and are only now seeing the harm that was caused. For every treatment option, prevention is always the best form of treatment. To a public health promotion advocate, it is vital to stress the importance of skin care at a young age in order to prevent the incidence of melanoma and

nonmelanoma skin cancer in future decades. If the millennial generation understands the importance of skin care and routine skin checks, then prevention will become a common practice among all individuals; skin cancer prevalence and incidence can be reduced instead of constantly increasing.

Skin Cancer is especially prevalent among men in the United States. The CDC produced a graphic showing the number of male individuals by race or ethnicity that were diagnosed with melanoma in the United States between 1999 and 2013.

This figure shows that white men are the most susceptible to melanoma, whereas Hispanics and Asians are least likely to develop melanoma. Over time, it appears that melanoma has increased in almost every ethnicity, but especially in white men. The statistics among all races shows an overall increase in melanoma diagnoses over the 14-year period. This increase shows the importance of prevention in all races, not only those who have fair skin, but also in those with heavily pigmented skin.

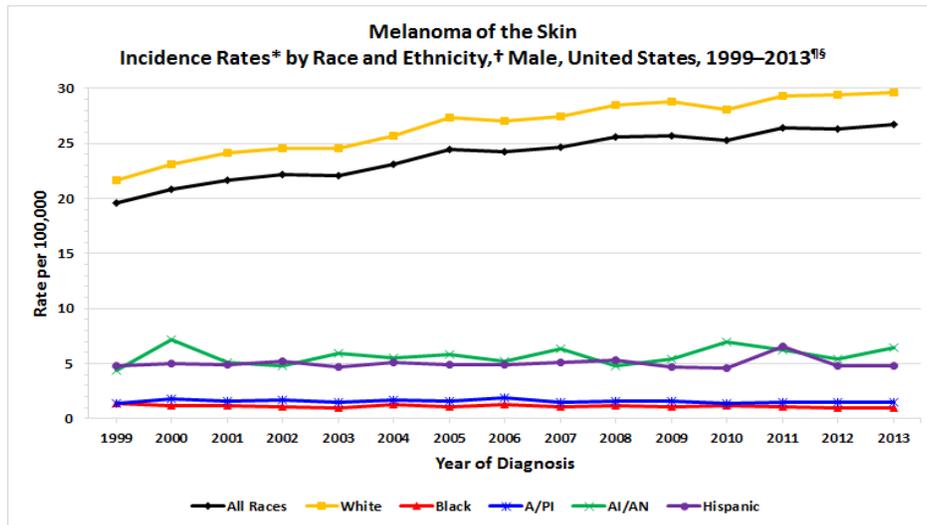


Figure 1. The representation of melanoma of the skin by race and ethnicity in males in the United States from 1999-2013.

### **Indoor Tanning and Skin Cancer**

G. Sharpe (2006) reported on skin cancer prevalence related to tanning bed use in the UK. His study concluded that

Recent surveys have shown that in many areas children under 16 years of age, boys and girls alike, use these [tanning beds] regularly. There is an urgent need for stricter regulation and enforced age limits on their use. The principles of sun protection, avoiding exposure during the middle part of the day, wearing protective clothing and the proper use of sunscreens, are well known but need to be constantly repeated. The public perception that sunbathing is safe if sunscreens are used is erroneous. With the long delay before the development of skin cancers, there is little prospect for a reduction in skin cancers in the UK in the next 10 years. (p. 333)

This conclusion shows that even though individuals know the principles of prevention, they are not properly used and often lead to further long-term skin damage.

The Center for Disease Control and Prevention has provided ample evidence showing the harm, as well as the alarming statistics, of indoor tanning. According to the CDC, 31% of white, high school girls regularly use an indoor tanning bed. The statistics continued to show that 32% of girls aged 18-21 use a tanning bed (CDC, 2016). The CDC explained how indoor tanning exposes individuals to UVA and UVB rays which can both lead to skin cancer, especially in those who began indoor tanning during adolescence or at a young age. Those who began tanning during adolescence have a much higher risk of developing melanoma in adulthood. The CDC reports that indoor tanning is a carcinogenic agent, can cause premature skin aging, and carries the risk of

causing blinding eye diseases if proper eye wear is not used; the CDC also rebuked the myth that indoor tanning is effective in treating acne and providing a source of Vitamin D (CDC, 2016). Overall, overexposure to UV light and indoor tanning provide the greatest risk factor, and increase the already present risk, to contracting nonmelanoma skin cancer or melanoma in individuals of any descent.

In a letter published by C. Karimkhani (2105) about the dangers of indoor tanning, “Karimkhani and colleagues called on the Surgeon General to announce that indoor ultraviolet (UV) tanning is causally linked to skin cancer, making the analogy to smoking and lung.” (p. 85). It is understood by the general public that smoking is the leading cause of lung cancer, and Karimkhani presents the idea that the same analogy should be associated with indoor tanning and skin cancer. It is unknown why the Surgeon General has not yet presented this causation; however, it is likely that the association will be made public in the next decade.

### **Prevention and Screenings**

K. Lacy (2013) concluded that “A common factor in all skin malignancies is chronic exposure to UV light. Various public health initiatives have focused on sun safety: current advice is targeted at adequate sun protection with broad spectrum, high Sun Protection Factor (SPF) creams, usually SPF 15-30, particularly for those with fair skin.” (p. 405). M. Linares (2015) mirrors this concept, “The most important risk factor is chronic ultraviolet exposure. Diagnosis is usually suspected in older, fair-skinned individuals with scaly, indurated lesions on sun exposed areas, primarily on the head and neck” (p. 646). As mentioned multiple times, over exposure to the sun is the leading cause of skin cancer, and can be prevented through proper measures such as

sunscreen use, avoiding the sun during peak times of the day, routine skin checks, and avoiding the tanning bed. Skin cancer screenings are often overlooked, however, as a measure of prevention, screenings are covered by most insurance companies.

J. Schmitt (2011) performed a study in Germany of the effectiveness of skin cancer screenings in individuals who are 14-34 years old and found that “In 5.5 % of all cases skin cancer screening resulted in the excision of a malignant or atypical melanocytic lesion. It remains unclear what proportion of these cases would have been detected in routine care.” (p. 608). This study shows that routine skin cancer screenings can detect skin cancer prior to the cancer becoming malignant, but often if this is not taken advantage of regularly, excisions must still be performed. K. Ullman (2016) demonstrated a different perspective on this issue; Ullman (2016) stated, “patients and their doctors should decide about screening on the basis of each patient’s specific circumstances” (p. 5). While it is valid that a healthcare treatment course should always be discussed with a physician, the circumstance in which a skin cancer screening would be detrimental to the patient’s health seems rare: T. Kornek (2013) echoes the importance of skin cancer prevention:

Due to demographic change, the population is becoming increasingly older both with respect to the overall age distribution as well as to the life expectancy of the individual. To assure a good state of health even at older ages, age preventive measures such as promotion of health and early detection of diseases play an important role. The prevention of skin cancer is of particular significance, as its incidence has risen dramatically in recent decades. (p. 283)

Again, this reiterates the importance of proper prevention, especially skin cancer screenings, due to the recent increase in skin cancer prevalence.

### **Prevention in Children**

Prevention is especially important in young children; being victim of a severe sunburn at a young age automatically increases the risk of developing skin cancer later in life. M. Masso (2006) published an article about the effects of teaching prevention to children:

Behavior theory suggests that it is easier to learn sun-safe habits early in life than reverse harmful habits later in life. However, the difficulty of attaining effective sun protection in young children that will form the basis of good life-long habits can be gauged from the experience in Australia where many years of educating young children about sun protection has still resulted in a situation where the practices among their adolescent peers are suboptimal and, for some practices, are getting worse. (p. 362)

This shows the difficulty of treating proper prevention techniques to children, and thus explains the reason for the dramatic increase in skin cancer prevalence and the need for various treatments of multiple types of skin cancer.

In 2008, K. Hart published an article about the three levels of prevention, specifically in children: primary, secondary, and tertiary. Hart (2008) stated, "Primary school-age children are generally more open and responsive to efforts to increase sun-safe behaviors and improve attitudes toward skin cancer prevention than are older children and adolescents, and because most children spend the majority of the peak hours for ultraviolet radiation at school, primary school instruction on sun-safe behaviors and

attitudes is a popular method of primary prevention.” (p. 68). This again stresses the importance of prevention in children, seeing as sunburn at a young age can increase the risk of developing skin cancer at an older age.

M. C. Cercato et al. (2008) published an article entitled “Self and Parent-Assessed Skin Cancer Risk Factors in School-Aged Children” that discusses the importance of understanding risk factors in children, since they often are susceptible to spending long hours in the sun, especially during summer vacation. Cercato et al. (2008) state:

The incidence of non-melanoma and melanoma skin cancer is rising in most countries and sun exposure is recognized as the major environmental risk factor in fair-skinned people. A meta-analysis on the cutaneous melanoma risk and ultraviolet sun radiation identified intermittent and intense sun exposure and history of sunburns, in childhood, in adulthood or over a life-span, as the major risk factors for melanoma. Other factors are family history among first degree relatives, a high density of freckles, fair hair, eye and skin color, pre-malignant skin cancer lesions and actinic damage indicators. (p. 133)

This statement explains how the incidence of skin cancer, both nonmelanoma and melanoma, is on the rise. Cercato (2008) warns that fair skinned individuals are at a high risk for developing skin cancer in adulthood if they have experienced sunburn as a child. Cercato (2008) continues to explain that there are other risk factors involved in developing skin cancer, which include: freckles, light skin tone, light hair and eye color, and family history.

### **Treatment of Skin Cancer**

According to the American Cancer Society, there are many ways to treat both nonmelanoma skin cancer and malignant melanoma. Nonmelanoma skin cancer is treated by curettage, Mohs surgery, cryotherapy, or laser therapy (ACC, 2016). Curettage and electrodesiccation involves removing of the lesion with a sharp instrument, and then applying an electric current to the area to destroy any other cancer cells and to control bleeding. Cryotherapy is a common technique that is performed using liquid nitrogen, which will destroy the cells. Cryotherapy is often used to treat precancerous skin. Laser therapy is used in the same way, except in laser therapy, a high-powered beam is placed on the precancerous skin and kills the abnormal cells on the outer layer of skin. Mohs surgery, commonly known as complete marginal assessment surgery, involves removing pieces of the tumor and viewing the fragments under a microscope until the entire cancer is removed. Typically the best treatment option for diagnosed malignant melanoma would be to excise the area around the malignant growth. In this procedure, a wide excision is performed to remove all abnormal cancerous cells, as well as the normal cells around the cancerous area. If the melanoma progresses to the lymph node, further procedures will be performed which may include radiation and biochemotherapy.

Mohs Surgery, developed in 1938 by Frederic Mohs, is a skilled procedure performed microscopically to treat skin cancer. L. Trost (2011) explained the history of Mohs surgery, as well as how it has continued to evolve up to the present:

Dr. Frederic E. Mohs first conceived of the concepts underlying Mohs micrographic surgery (MMS) in the 1930's while he was a Brittingham Research Assistant to Professor Michael F. Guyer, Chairman of the Department of Zoology at the University of Wisconsin. They were studying the potential curative effects

of injecting various substances into different neoplasms. During one experiment, a 20% solution of zinc chloride was injected and inadvertently caused tissue necrosis. Microscopic analysis showed that the tissue retained its microscopic structure as if it had been excised and processed for routine pathologic examination. Dr Mohs realized that this in situ fixation effect could be coupled with surgical excision to remove neoplasms in a microscopically controlled serial manner. In addition, he conceived of the idea of using horizontal frozen sections to evaluate 100% of the specimen margins (deep and peripheral) rather than traditional vertical sections or random step sections, which examine only 0.01% of the total surface area of an excised tumor. . . MMS has become the gold standard for treating many forms of primary and recurrent contiguous skin cancers and offers the highest cure rates coupled with tissue conservation compared with other modalities. (p. 135)

It is interesting to note that Mohs surgery was not originally accepted by many surgeons, but now it is widely used by many dermatologists as “part of a multidisciplinary approach to treating skin cancer” (Trost, 2011, p. 137). This multidisciplinary approach includes many options for treatment, as well as multiple lines of defense for combatting skin cancer. The first line of defense would be prevention, which includes sunscreen use and avoiding overexposure to the sun. The second line of defense would include skin cancer screenings; skin cancer screenings are important for early detection. Routine skin checks can often prevent the spread and metastasis of skin cancers that may be unknown to the individual. The final line of defense includes a variety of treatment courses, such as laser

therapy, cryotherapy, and Mohs surgery. In the case of combatting skin cancer, prevention is the most logical choice to preventing this disease.

### **Financial Consequences**

According to N. Hirst (2012), skin cancer treatments cost an estimated two billion dollars in the United States alone. Hirst performed a study to determine if the overall high cost of skin cancer treatment could be appeased through funding programs to promote sunscreen use; he discovered that active promotion of sunscreen use would be a long-term cost effective investment for individuals and for the government (Hirst, 2012). However, while this may be a wise investment in order to prevent the increase of skin cancer, the prevalence of skin cancer and the economic burden, which it accompanies, is ever increasing. T. Kornek (2013) states: “From a health economic viewpoint, prevention can be viewed as an investment that can minimize potential costs in the future and reduce avoidable disease burden. The benefits of prevention include not only a reduction of costs also a gain in quality of life, functional ability and health” (p. 294). Investing in healthcare is important to avoid the burden caused by diseases. G. Guy (2015) gives an example of how primary prevention can not only reduce incidence of skin cancer, but also of economic burdens:

Primary prevention efforts have been shown to reduce skin cancer incidence, mortality, and healthcare expenditures. For example, the Sunwise Program, a health and environmental education program that teaches children and their caregivers how to protect themselves from overexposure to the sun, could avert nearly 11,000 skin cancer cases, while saving \$2-\$4 in medical care costs and lost productivity for each dollar invested in the program” (Guy, 2015, p. 184).

Guy also states that

The number of adults treated for skin cancer increased between 2002-2006 and 2007-2011 to nearly 5 million adults annually. Average annual total treatment costs for skin cancer also increased substantially between these periods to \$8.1 billion annually. Increased skin cancer treatment costs resulted from an increase in the number of people treated for skin cancer and an increase in per person treatment costs. Annual spending increased more rapidly for skin cancers than for other cancers, suggesting that the economic burden of skin cancer is a particular cause for concern. (p. 184)

As Guy (2015) concludes, overexposure to the sun causes damage beyond skin cancer; it also causes a variety of financial burdens in caring for the skin cancer that could have been prevented.

### **Mortality of Skin Cancer**

While there are many therapies and treatments that can be used to try and eliminate melanoma and other skin cancers, they are not always successful. According to the American Academy of Dermatology, approximately 75% of skin cancer deaths are a result of melanoma, which only accounts for less than 1% of all skin cancers. On average one American will die from melanoma each hour of the day, accounting for over 10,000 deaths each year (AAD, 2016). The World Health Organization estimates that 65,000 people die from melanoma each year worldwide; these numbers are astounding seeing that there are ample ways to prevent the cultivation of melanoma. Often times, melanoma is happening when individuals are in their childhood and teenage years, but the effects of their lack of skin care is not seen until they are much older and begin noticing signs of

aging. Typically, signs of aging, which may include sagging skin, age spots, and wrinkles, are a direct result of overexposure to UV light; often skin damage begins in the adolescent years, and is not recognized until the later in life. This is the sole reason that annual skin checks and self-assessments are so important to the prevention of skin cancer and education about the effects of improper skin care.

There are many facets of skin cancer to consider when studying skin cancer and mortality in ethnic minorities. P. Bradford (2009) claims that “multiple studies have demonstrated 5-year melanoma survival rates of Blacks and Hispanics are consistently lower than those of Caucasians. Compared with Caucasians, Hispanics and Blacks tend to present with more advanced, thicker tumors and thus tend to have a poorer prognosis, with higher mortality. (p. 170). It is vital that skin cancer prevention is demonstrated to every race and ethnicity in order to eradicate mortality from a preventable disease; skin cancer prevention is the solution to the total eradication of mortality from skin cancer.

### **Education and Health Promotion of Skin Cancer Prevention**

As previously stated, the most important way to address skin cancer is prevention. Too often, sun damage is done when individuals are in their early teens and twenties, and they do not see the harm that they are doing until much later in life. It is vital that every individual, whether a ten-year-old girl or an 80-year-old man, wears some sort of sunscreen every single day. It is proved that this one action alone can reduce the risk of melanoma by over 50% (AAD, 2016). It could be argued that while skin cancer is the most common form of cancer, it is also the most preventable kind of cancer. While many cancers have to do with genetic mutations, skin cancer simply results from the overexposure to the sun, and the risk could be greatly reduced by applying a sunscreen-

containing moisturizer every day. Protecting the skin from sunburns, which also leads back to the daily application of sunscreen, can also reduce the risk of skin cancer.

There is an interesting program in place in Australia called SunSmart with promotes prevention. According to G. Guy (2015),

The SunSmart public education program promoting sun protection and skin cancer prevention messages through structural, environmental, and legislative initiatives was estimated to save 22,000 life years, while saving approximately \$2 for every dollar invested. Reducing indoor tanning, which is associated with an increased risk of NMSC and melanoma is also an important strategy for decreasing the burden of skin cancer. In Australia, it was estimated that stricter indoor tanning regulations, including age restrictions among minors aged 18 years [and younger], could prevent approximately 24 melanoma cases, 226 squamous cell carcinoma cases, and save \$256,000 in medical costs per 100,000 persons. (p. 184)

This program would be a useful public health method to emulate in the United States; by promotion protection and prevention through specific, effective initiatives, many lives could potential be saved from this preventable disease.

There are three levels to prevention: primary, secondary, and tertiary. In the case of skin cancer, primary prevention would involve the daily use of sunscreen and routine skin checks. Secondary prevention would entail cryotherapy and laser therapy to kill precancerous cells. Tertiary prevention would include Mohs surgery and radiation, if necessary. There is somewhat of a gray area between secondary and tertiary prevention, but there is no question that primary prevention is always the best option because it

allows the individual to prevent the disease before it happens. Of all three levels of prevention, primary prevention is the least painful, seeing as sunscreen use causes much less pain than cryotherapy or Mohs surgery. As health promotion advocates, it is so important to stress the necessity of routine skin checks and daily sunscreen use to the population as a whole. As important as sunscreen use and skin checks are to prevention, discouraging the use tanning beds and overexposure to the sun are vital to promoting skin cancer prevention (Narayanan, 2010). As shown, there are various factors in the prevention of skin cancer, which includes education, sunscreen use, regular skin cancer screenings, proper detection, and if necessary, the appropriate treatment course to eliminate the disease. Reducing the prevalence and incidence of a preventable disease first begins with discovering the cause of the disease and then providing the education and promotion necessary to the general public in order to further education and prevent an outbreak.

During the 2004-2005 school year, Y. Gilaberte (2008) and colleagues performed a study in Spain about health education for children regarding skin cancer. Although this study was performed more than a decade in the past, their findings about skin cancer education are still relevant today. Their study was outlined as follows:

The incidence of skin cancer is increasing worldwide, and Spain is no exception. SolSano is the first Spanish health education program for sun safety directed at elementary school children. The objective was to evaluate SolSano's effects on students' knowledge, attitudes and practices about sun safety. A non-randomized, before/after, community intervention without control group, with schools as the unit of intervention, was used for the study. Five thousand eight hundred and

forty-five children from 215 Aragonese Primary Schools (Grades 1–2) participated in the program in their classes during the 2004–2005 academic year. Our study demonstrates that significant knowledge can be acquired, attitudes regarding the healthiness of a tan can be modified and intentions to change sun protection behavior can be promoted by well-designed educational programs. (p. 209)

This study conducted by Gilaberte (2008) shows how important health education is regarding skin cancer, and proves that education can change outcomes. Often time, health promotion seems to not have a lasting effect, but with specific health strategies and cooperation, it is possible to reduce the outcome of skin cancer.

In conclusion, when analyzing the causes, prevention, and treatment of skin cancer, health education and promotion are the most important aspects of prevention. Of all cancers, skin cancer is the one type of cancer that can most easily be prevented; prevention of skin cancer is relatively simple, but often ignored. Since it is estimated that one in five Americans will develop skin cancer during his or her lifetime, and that one person will die from melanoma every hour of the day, advocacy of prevention practices is vital to reducing the number of skin cancer cases every year. Even with sufficient prevention methods, a lack of education and promotion of a practice will not lead to favorable results. Reducing the prevalence and incidence of a preventable disease first begins with discovering the cause of the disease and then providing the education and promotion necessary to the general public.

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