Understanding the Risk Factors that Increase Risk for Melanoma in Adolescent and Young Women: A Literature Review

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Research Question

What are risk factors that increase risk for developing melanoma in young and adolescent women?

Abstract

Melanoma is the deadliest form of skin cancer. There has been increasing rates of it among adolescent and young women in recent decades. This literature review investigates the risk factors contributing to this rise, focusing on behaviors specific to this demographic. This review analyzes 10 peer-reviewed articles from two databases, PubMed and CINAHL. Three key risk factors were identified, including excessive sun tanning, indoor tanning, and inadequate protective behaviors. Adolescent girls are more likely to engage in deliberate tanning both indoor and outdoor, and often neglect sun protection, despite being aware of the risks. All three of these behaviors increase melanoma risk substantially. Deliberate tanning increases skin exposure to the sun's harmful UV rays. Early use of indoor tanning is linked to earlier onset of the disease. Studies also reveal that adolescent girls are less likely to adopt skin-protective measures, further heightening their vulnerability to UV damage. This review highlights the importance of early education, behavior modification, and policy interventions to mitigate the rising melanoma rates in this population. Understanding and addressing these risk factors is crucial to reducing preventable melanoma cases in young women.

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Introduction

Skin Cancer is the most common form of cancer in the United States (US Centers for Disease Control and Prevention, 2024b). Skin cancer is the abnormal growth of skin cells, often developed on parts of your skin exposed to the sun but can also occur on other areas of the body (Mayo Clinic Staff, 2022). It is estimated that one in five Americans will develop skin cancer in their lifetime (American Academy of Dermatology, 2024). About 9,500 people in the US are diagnosed with skin cancer every day (American Academy of Dermatology, 2024). There are three main types of skin cancer: squamous cell carcinoma, basal cell carcinoma, and melanoma. Each year, around 6.1 million adults are treated for basal and squamous cell carcinomas (US Centers for Disease Control and Prevention, 2024b). While squamous cell carcinoma and basal cell carcinoma are more common, they are less dangerous (Halpern et al., 2022). Melanoma is less common, but much more serious (Halpern et al., 2022).

Melanoma is the most concerning and deadliest form of skin cancer. It starts in cells called melanocytes which are in the upper layer of skin. Melanoma occurs when DNA damage from UV radiation causes mutations in melanocytes which results in uncontrolled cellular growth (Halpern et al., 2022). In 2021, there were 90,365 new cases of melanoma reported in the US (US Cancer Statistics, 2024). Each year after that, the numbers have increased, meaning melanoma rates in the US have been increasing rapidly. From 1982 to 2011, melanoma rates have doubled, and from 2011 to 2019 there has been a 31.5% increase (American Academy of Dermatology, 2024). The majority of skin cancer related deaths are due to melanoma. It is estimated that there will be 8,290 deaths from melanoma in the US in 2024, averaging about 20 deaths per day (American Academy of Dermatology, 2024).

There are a variety of factors that leave certain groups more at risk to develop skin cancer than others. People with fair skin, freckles, light hair, and light eyes tend to be most vulnerable (Johns Hopkins Medicine, 2024). Genetics also play a part in developing this type of cancer, such that those with a family history of melanoma or other types are more at risk (Johns Hopkins Medicine, 2024). The main risk factor is UV radiation and sunlight exposure. This can be directly from the sun, or from UV tanning beds. Those who have had melanoma in the past have an increased risk of developing it again (American Academy of Dermatology, 2024). Dermatologists recommend patients to check their own skin for uncommon marks and moles to help detect skin cancer at early ages, this helps to catch the cancer at its earliest which gives patients the best chance at survival. Important prevention techniques include staying out of the sun when the UV is high, wearing sunscreen, wearing protective clothing, and avoiding tanning beds (Mayo Clinic Staff, 2022). Skin cancer is prominent both in males and females. Until the age of forty-nine more white woman tend to develop melanoma than white men, but at older ages, men are more likely to (Johns Hopkins Medicine, 2024).

Although it is preventable, the incidence of melanoma has been increasing in recent decades, affecting more adults and young people, it is one of the most common cancers among people less than 30 years of age (Wojcik et al., 2019). There has been an alarming surge in melanoma rates specifically in young women. Adolescent melanomas were very rare in the past, but more recently the numbers have been rising. The rate of melanoma among young Caucasian women in the US is increasing at a rate of 2.7% per year (Wong et al., 2013). Melanoma is the second most frequently diagnosed cancer in individuals, especially females aged 15-29 (Falzone et al., 2017). There are gaps in knowing what has caused this recent increase in young and adolescent women that are different from general risk factors of the cancer. Current literature

doesn't explain if risk factors have to do with behavior, demographics, education or access. Melanoma causes many problems impacting economic stability and quality of life. Understanding the risk factors for adolescent women developing melanoma is important to address the problems and to mitigate this rise. This literature review aims to identify and discuss risk factors that lead to increased melanoma risk for young and adolescent women.

Methods

In this research process the two databases used were Pubmed and CINAHL. Pubmed was chosen because it is a standard database for health sciences and biomedical literature. It provides data from a wide variety of medical journals. There were a large variety of studies related to skin cancer and the research question. CINAHL was chosen because it is a standard database for nursing and allied health literature. CINAHL offers many detailed and specific studies about skin cancer and melanoma that are different than Pubmed. Both databases include peer reviewed journal articles, making these both reliable resources. The process for selecting specific articles in this literature review is detailed and visualized in *Figure 1*.

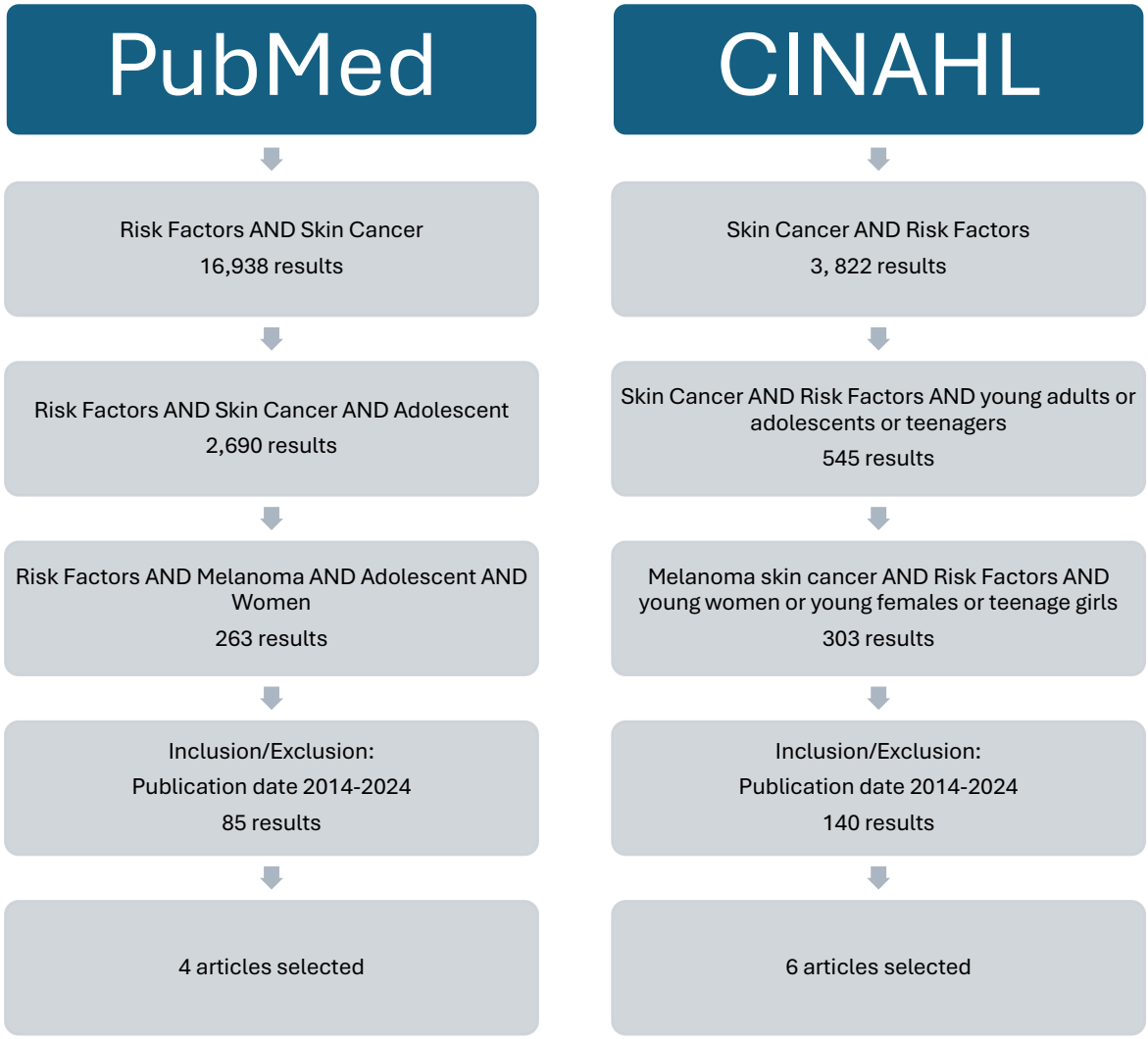
For Pubmed the first search terms were "Risk factors and skin cancer", which yielded 16,938 results. The second search terms were "risk factors and skin cancer and adolescent", this search led to 2,690 results. The third search included terms "risk factors and melanoma and adolescent and women" this narrowed down to 263 results. Then settings were changed to view results from 2014 to 2024 leading to 85 results. From these 85 results, 4 were chosen.

For CINAHL, the first search terms were "skin cancer and risk factors", this led to 3,822 results. The second search terms were "skin cancer and risk factors and young adults or adolescents or teenagers", from this search there were 545 results. The last search terms were "melanoma and risk factors and young women or young females or teenage girls", this yielded

303 results. By excluding all results outside of the 2014 to 2024 range, this lowered to 140 results, from these 140 results, 6 were chosen.

To be included, studies had to be peer-reviewed, published from 2014 to 2024, and focused on melanoma, certain risk factors, and young women. Those that did not include these characteristics were excluded. Exclusion criteria was used to exclude articles focused on different types of cancer and different interest groups.

Figure 1. Literature Review Article Selection Process



Results

The incidence of melanoma in young women and adolescent girls continues to increase. The literature review on this issue identifies three overarching risk factors for melanoma in this population. Behaviors relating to sun tanning, indoor tanning, and skin protection are factors that put adolescent and young women at risk for melanoma cancer. For a more detailed summary of the articles reviewed, see *Table 1*.

Sun Exposure

The main risk factor for developing melanoma is ultraviolet (UV) exposure. The natural source of UV radiation is from the sun. Sun exposure and frequent sunburn in childhood and adolescence substantially increases the risk for developing melanoma (McLoone et al., 2014). In a study examining birthplace UV levels, quartiles with a higher UV level were associated with increased melanoma risk (Wojcik et al., 2019). The strongest relation between birthplace UV and melanoma diagnosis was at adolescent ages 15-19 (Wojcik et al., 2019). Many of the reviewed articles discuss that adolescent girls are more likely to suntan than other population groups. In a study on Australian adolescents, 29% or about 1/3 of adolescent girls reported that they deliberately tan (McLoone et al., 2014). Adolescents think of tanning as a fun and cool activity to do with friends (Eastabrook et al., 2018). Many adolescent girls report that suntanning is a consuming and addictive aspect of their lives (Eastabrook et al., 2018).

Indoor Tanning

Many studies discussed the impacts of indoor tanning and its popularity among young women. UV exposure can also come from artificial sources such as tanning beds. Indoor tanning is a large risk factor for adolescent girls developing melanoma. There is a rising popularity of

indoor tanning in the US, this popularity has been followed by increasing melanoma incidence among young women over the past three decades (Stapleton et al., 2017). It is used at the highest rates by young Caucasian women, 17.2% reported indoor tanning in the past year. (Falzone et al., 2017). Women of a younger age use indoor tanning devices more frequently (Yuan et al., 2018). The use of indoor tanning before the age of 35 doubles the risk of melanoma (Stapleton et al., 2017). By 18 years old 44% of non-hispanic white girls have used a tanning bed once, 14% of women 18-29 reported indoor tanning at least once in the previous year (Gordon et al., 2016). In a study of women who started indoor tanning before 30 years were on average 2.2 years younger at diagnosis of melanoma than those who didn't indoor tan, and in addition to this, longer duration of use of tanning beds are significantly associated with higher risk of melanoma (Ghiasvand et al., 2017). Another category of indoor and sunless tanning is the use of spray on and mist tans. Sunless tanning was associated with female demographics, non-Hispanic white, reporting high sun sensitivity, and a family history of skin cancer (Dodds et al., 2018). While this type of sunless tanning is thought to be used as a safe alternative for UV tanning, sunless tanners in this study reported risky skin cancer behaviors such as decreased use of shade and protective clothing when outdoors, as well as increased report of sunburn (Dodds et al., 2018).

Protective Behaviors

Using protection such as sunscreen, wearing long sleeves, and wearing hats are ways to protect the body's skin from UV rays. Studies show that regular sunscreen use is significantly associated with reduced risk of melanoma among young adults (Watts et al., 2018). Only 13% of US high school girls in a particular study report wearing sunscreen regularly and 1/3 of them had reported a sunburn in the previous year (Falzone et al., 2017). In a different study, many women reported not using sunscreen and their reasoning was that it was not needed (Auerbach et al.,

2018). In this same study, adolescents compared to women, were more likely to not use sun protection as a desire to tan (Auerbach et al., 2018). These behaviors that many adolescent girls have such as deliberately tanning and not using protection while doing so is putting them at risk for melanoma. Younger women and adolescents tend to be less covered in the sun, allowing for greater sun exposure (Yuan et al., 2018). Compared to other populations such as younger children, males, and older women, adolescent girls wear clothes and bathing suits exposing much more of their skin to the suns UV rays. Adolescents are very informed of the dangers of UV exposure, but this knowledge has not changed their behavior of taking skin-protective measures (Eastabrook et al., 2018). Adolescents are less likely than any other age group to adopt skin-protective measures (Eastabrook et al., 2018).

Table 1. Detailed Summary of Articles Reviewed

	Authors	Publication Date	Article Title and Journal	Purpose	Sample Info	Type of Research	Research Findings	Limitations
1	Melissa Dodds, Sarah T. Aaron, Eleni Linos, Ingrid Polcari, Matthew D. Mansh	2018	Characteristics and Skin Cancer Risk Behaviors of Adult Sunless Tanners in the United States – JAMA Dermatology	The purpose of this is to assess the demographic characteristics and skin cancer risk behaviors of sunless tanners among adults in the US.	33,672 adults 18 or older	Cross-sectional study, population-based survey	This study suggests that sunless tanning is associated with risky skin cancer-related behaviors.	Unable to prove casual relationships or examine temporal associations. Self-reported data, lack of data on frequency of sunless tanning
2	M. V. Auerbach, C. J. Heckman, S. Darlow	2018	To Protect or not to protect: examining reasons for sun protection among young women at risk for skin cancer – Journal of Behavioral Medicine	The purpose of this article is to understand the low rates of sun protection in young woman at risk for skin cancer.	661 daily diary entries were received via text message over 14 days from 56 young women (ages 18-59) at moderate to high risk of developing skin cancer	Multi-level modeling, statistical analysis	Results suggest the potential value of interventions aimed at motives for sun-protection behaviors	Small sample, measures were all self-reported
3	Jordana K. Mcloone, Bettina Meiser, Janan Karatas, Mariana S. Sousa, Elvira Zilliacus, Nadine A. Kasparian	2014	Perceptions of Melanoma Risk Among Australian Adolescents: Barriers to Sun protection and recommendations for improvement – Australia and New Zealand	The purpose of this article is to explore adolescents perceptions of melanoma risk, sun protection, and barriers to sun protection.	100 students from six high schools, 14-16 years old	Focus groups/discussions	Poor adherence to skin protection, many teenagers at risk, social media interventions are not preferred	Not specific numeral data

			Journal of Public Health					
4	Tze-An Yuan, Frank Meyskens, Feng Liu-Smith	2018	A cancer registry-based analysis on the non-white populations reveals a critical role of the female sex in early-onset melanoma – Cancer Causes and Control	The purpose of this article is to explore why younger women exhibit higher incidence rates than men.	13,208 non-white melanoma patients from SEER and 15,226 from WHO CI5-Plus	Age-adjusted incidence	Results highlight importance of gender as one of the melanoma risk factors beyond traditional UV radiation	Study needs further investigation
5	Mallorie Gordon, Vivian M. Rodriguez, Elyse Shuk, Maria Schoenhammer, Allan C. Halpern, Alan C. Geller, Jennifer L. Hay	2016	Teen Daughters and their Mothers in Conversation: Identifying Opportunities for Enhancing Awareness of Risky Tanning Behaviors – Journal of Adolescent Health	The purpose of this article is to explore tanning behaviors and cancer risk in teenage girls.	22 interviews of teenage girls and their mothers discussing topics related to sun protection and tanning behavior	Interviews	Educational interventions should be used to raise melanoma risk awareness.	Self-reported, opinion based answers
6	Jerod L. Stapleton, Sharon L. Manne, Kathryn Greene, Katie Darobos, Amanda Carpenter, Shawna V.	2016	Sociocultural Experiences, Body Image, and Indoor Tanning Among Young Adult Women – Journal of Health Psychology	The purpose of this article to evaluate body image influences on indoor tanning behavior and how this is skin cancer risk behavior.	823 young adult (18-25) women in the US – from a web panel	Simple random sample survey	Findings suggest need for targeting body image constructs as mechanism of behavior change in indoor tanning behavioral interventions.	No evidence on skin cancer, only risk factors

	Hudson, Elliot J. Coups							
7	Alexa Solazzo, Alan Geller, Jennifer Hay, Najat Ziyadeh, Brittany Charlton, Lindsay Frazier, Bryn, Austin	2020	Indoor Tanning and Melanoma Risk: Long-Term Evidence From a Prospective Population-Based Cohort Study – Journal of Adolescent Health	The purpose of this is to test whether those who initiate tanning during adolescence are more likely to continue tanning in young adulthood, potentially increasing their risk for melanoma.	27,706 individuals aged 9–14 years, data for the present study were drawn from the 12 questionnaires from 1999 to 2014 in which an indoor UV tanning item appeared on the survey	Cohort study	Findings were that those who indoor UV tan by age 17 years consistently indoor tanned at least twice the prevalence as those who did not indoor UV tan by age 17 years.	Limited by population, only focused on mainly white and middle class
8	Katherine Wojcik, Loraine Escebedo, Ashley Wysong, Julia Heck, Beate Retz, Ann Hamilton, Joel Milam, Myles Cockburn	2019	High Birth Weight, Early UV Exposure, and Melanoma Risk in Children, Adolescents, and Young Adults - EPIDEMIOLOGY	The purpose of this is to determine if high birth weight or higher early-life ultraviolet (UV) radiation exposure would be associated with increased risk of melanoma in young patients.	1,396 cases of melanoma diagnosed before age 30 in 1988–2013 and 27,920 controls, obtained by linking cancer registry data to birth records in California	Population-based, case–control study	High birth weight (>4,000 g) was associated with 19% higher risk of melanoma (OR = 1.19; 95% CI = 1.02, 1.39), while low birth weight (<2,500 g) was associated with 41% lower risk, High birth weight and high early-life UV exposure may be important independent risk factors for melanoma diagnosis before age 30.	lack of behavior information, underpowered to detect effects among Hispanic persons, no information on genetic variants or family history of melanoma
9	Caroline Watts, Martin	2018	Sunscreen Use and Melanoma Ri	The purpose of this is to assess correlates of early-	Case participants	population-based, case-	Our findings provided evidence that regular	There are now much stronger sunscreens,

	Drummond, Chris Goumas, Helen Schmid, Bruce Armstrong, Joanne Aitken, Mark Jenkins, Graham Giles, John Hopper, Graham Mann, Anne Cust		sk Among Young Australian Adults – JAMA Dermatology	life sunscreen use and the association between sunscreen use and risk of cutaneous melanoma befo re age 40 years.	were aged 18 to 39 years and had received a confirmed first primary cutaneous melanoma diagnosis between July 2000 and December 2002; analysis included 603 cases and 1088	control family study	sunscreen use is significantly associated with reduced risk of cutaneous melanoma among young adults and identified several characteristics associated with less sunscreen use	unable to assess the association of sunscreen use with stage of melanoma
10	Suzette Eastabrook, Paul Chang, Myra Taylor	2018	Melanoma risk: adolescent females' perspectives on skin protection pre/post-viewing a ultraviolet photoaged photograph of their own facial sun damage – Global Health Promotion	The purpose of this study is to see the impact of photoaging photography on adolescent females' perspective of skin protection.	10 adolescent females, aged 16 and 17	In-depth interviews were collected from 10 adolescent females and were subsequently subjected to interpretive phenomenolog ical analysis	While photoaged photography does not alter suntanning intentions. Oof the major barriers to adolescent females' adoption of skin-protective behaviors is their belief in their own invincibility.	Limited number of interviews,

Discussion

Although there are many treatments and a high survival rate for melanoma, melanoma rates continue to rise in adolescent and young women. The aim of this literature review is to identify factors that put adolescents and young women at risk for melanoma. Knowing and understanding these risk factors is important to work on prevention and mitigation.

The overarching findings in this literature review indicate that sun tanning, indoor tanning, and protective behaviors are risk factors for melanoma in young and adolescent women. Findings show that these factors have to do with the specific behaviors and ideals of young and adolescent women. Adolescent girls are aware that UV exposure is a risk factor, and that protection is important, yet they choose to behave against this knowledge (McLoone et al., 2014). Two of the main reasons for wanting to tan are due to improving personal appearance and for social reasons (Falzone et al., 2017). Many girls utilize indoor tanning because they believe it enhances their physical attractiveness, increases their confidence, and allows for greater social acceptance (Stapleton et al., 2017). Social ideals and personal beliefs are driving these risk factors for young women to make themselves more susceptible to skin cancer. Another major barrier to adopting skin protection behaviors is adolescent girls' belief of invincibility (Eastabrook et al., 2018). Because melanoma is more common to develop or occur later in life, teenage girls don't worry as much about their present actions or don't think their present behaviors are affecting them (Eastabrook et al., 2018).

The findings within this literature review support current literature as it emphasizes the importance for education and intervention of skin cancer risk knowledge. Current literature is suggesting a comprehensive approach for education of UV exposure and promoting sun safety in schools (US Centers for Disease Control and Prevention, 2024a). Current literature also suggests

legislation on restricting indoor tanning for minors. This is a goal being worked towards in the US currently, with goals of decreasing rates of skin cancer and melanoma. Forty-four states have passed laws that in some form restrict minors from indoor tanning (AIM at Melanoma, 2023). Programs like education guidelines and tanning legislation in current literature address these risk factors with intentions of preventing and decreasing them.

Limitations

This literature review provided evidence from a limited number of sources. Only data from 10 articles and 2 databases were reviewed. This could account for a lack of information on the topic from other databases and sources. The sources were limited to the past 10 years, there may be new research discovered more recently or information could have been outdated. Most of the studies reviewed had samples that were primarily white which may have limited findings and generalized factors to one specific race. Some studies used participants that had developed melanoma, but some studies just studied behaviors of adolescent girls and women. It is limiting that although these are risk factors, not every case will turn into melanoma. As this is a broad topic, and a cancer that has many causes, this literature review focuses only on a few articles regarding behavioral risk factors that cause melanoma risk for adolescent and young women.

Further Research

While using sun protection, wearing protective clothing when exposed to UV rays, self-examining, and yearly dermatology screening can help avoid skin cancer and melanoma further research is needed to find more promising and accurate data and therefore to reduce prevalence. Research can lead to new treatments and new prevention efforts minimizing the prevalence of melanoma. Research on behaviors of adolescent girls can also help to find more effective ways to change behaviors and social ideals.

Further Practices

Skincare and skin protection techniques can be taught to children at a young age starting in schools. The importance of self-examining for moles and spots on skin should be known to all. Education interventions where risk factors and behaviors are identified, and potential outcomes are understood are key for both awareness and understanding. As for policy practices, giving more access to protective products such as sunscreen and more restrictions indoor tanning should be emphasized.

Conclusion

In conclusion, identifying risk factors for melanoma in adolescent and young women is important to address these issues now, before melanoma becomes even more prevalent. This literature review examined 10 articles from PubMed and CINAHL databases to determine these risk factors. The review found that behaviors of suntanning, indoor tanning, and protective behaviors are all correlated as factors that increase the risk of developing melanoma. These findings can be used to plan interventions, provide knowledge, and promote policy to reduce preventable melanoma cases.

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