


## UV and its Association with Skin Cancer in Dark Skin

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 @AdeAdamson

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### Conflict of Interest

- Member, American Academy of Dermatology (AAD) Skin of Color and Skin Cancer Work Group

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### Skin cancer prevention in skin of color is challenging

1. Incidence is much, much lower in darker skin types.
2. When skin cancer develops it is often later, and clinical outcomes much worse.

How can we approach prevention?

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### Outline

- Defining "skin of color"
- Scope of skin cancer problem
  - Basal Cell Carcinoma (BCC)
  - Squamous Cell Carcinoma (SCC)
  - Melanoma
- Prevention

} Non-Melanoma Skin Cancer

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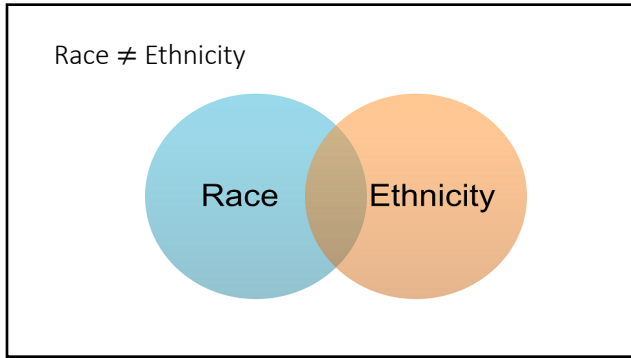
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### What is "Skin of Color"?

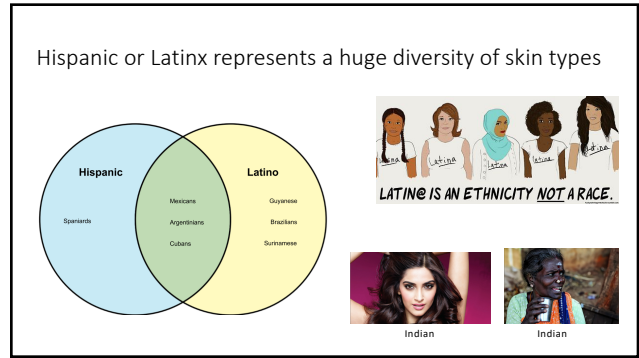
- Identifies individuals of racial groups darker than non-Hispanic white.
- Patients with skin of color have distinctive skin/hair characteristics, disorders, and skin practices.
- Their diversity makes it hard for skin cancer messaging.



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### Cancer Registries don't provide granular detail about skin type

**Compare Statistics by Data Type**

Step 1: Select a data type, statistic and population of interest

Statistic Type: Age-Adjusted Rates

Year Range: 1992-2015

Cancer Site: Melanoma of the Skin

Sub-site: All

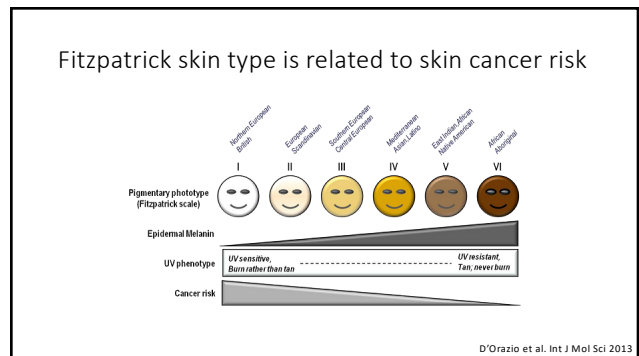
Race/Ethnicity:
 

- Choose Race/Ethnicity
- All Races (includes Hispanic)
- White (includes Hispanic)
- Black (includes Hispanic)
- Amer. Indian / AK Native (includes Hispanic)
- Asian / Pacific Islander (includes Hispanic)
- Hispanic (any race)
- Non-Hispanic White

Sex: All

Age Range: All Ages

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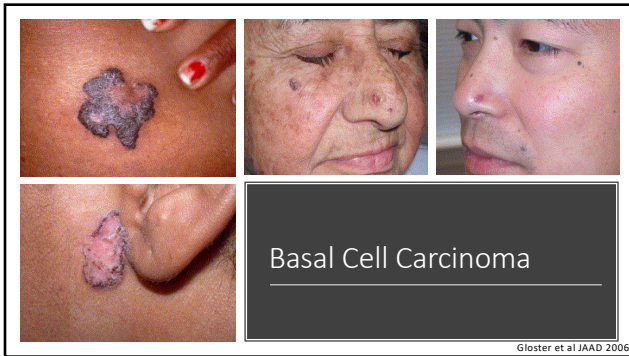
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- ### Basic skin cancer facts in skin of color
- Non-Hispanic Whites are 70x more likely to develop skin cancer.
  - Low incidence is likely due to increased epidermal melanin.
  - Inherent protection in dark skin up to SPF 15.
  - UV dose required to produce erythema is up to 33x greater in Black people than white people.
- These have implications for epidemiology of skin cancer in skin of color!**

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- Non-Melanoma Skin Cancer**

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**BCC incidence rates vary by racial group**

- Rate per 100,000 population:
  - 1-2 Black Americans
  - 5-6 Chinese Americans
  - 15-17 Japanese (residents of Hawaii/Okinawa 30/26)
  - 50-90 Hispanic Americans
  - 1500-2000 Non-Hispanic White Americans

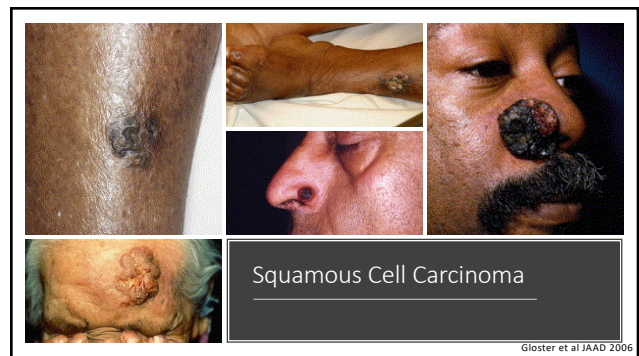
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**Risk Factors**

- Albinism
- Scars
- Ulcers
- Chronic infections
- Arsenic ingestion
- Immunosuppression
- Previous radiation treatment
- Genetic disorders xeroderma pigmentosum
- Trauma (physical and thermal)
- **UV Radiation**

**In skin of color (as in white people) BCC carries a low mortality rate.**

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**SCC incidence rates vary by racial group**

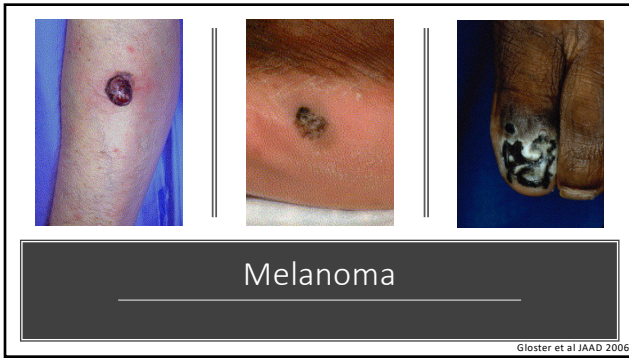
- Rate per 100,000 population:
  - 3 African American
  - 18-19 Chinese Americans
  - 23 Japanese (Hawaii) Americans
  - 15-30 Hispanics Americans
  - 1000-1500 Non-Hispanic White Americans

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**Risk Factors for developing SCC in Skin of Color**

- Albinism
- Chronic leg ulcers
- Chronic nonhealing wounds
- Discoid lupus
- Lichen Planus
- **UV light**
- Ionizing radiation
- Genetic syndrome
- Immunosuppression (transplant, AIDS)

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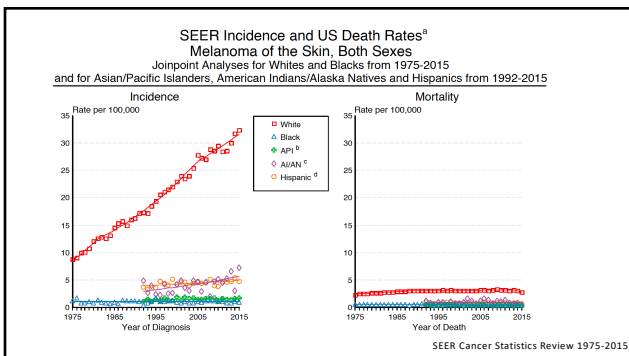
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**Melanoma incidence rates vary by racial group**

- Rate per 100,000 population:
  - 1 African American
  - 1.6 Asian/Pacific Islander
  - 4.9 Hispanics
  - 7 Indian/Alaskan Native
  - 37 Non-Hispanic White

Gloster et al JAAD 2006

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**Non-white race is associated with later detection**

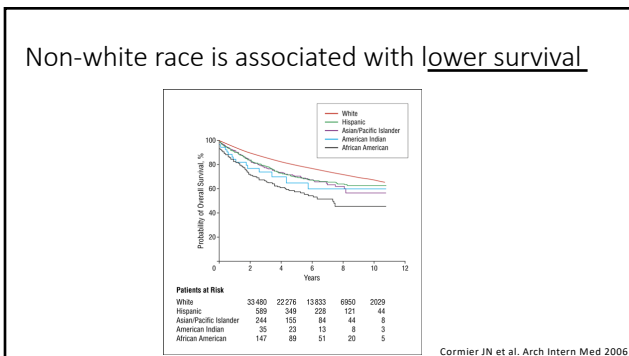
Stage	White	Black	Hispanic	AANAPI
Stage I	75.97	52.69	61.17	69.17
Stage II	12.83	22.82	16.48	15.33
Stage III	6.65	13.42	12.13	9.36
Stage IV	4.45	11.07	10.22	6.14

Stage	White RR	95% CI
I	0.69	0.62-0.77
II	1.76	1.43-2.18
III	2.02	1.51-2.70
IV	2.49	1.80-3.44

CI: Confidence interval; RR, relative risk.

Dawes et al. JAAD 2016

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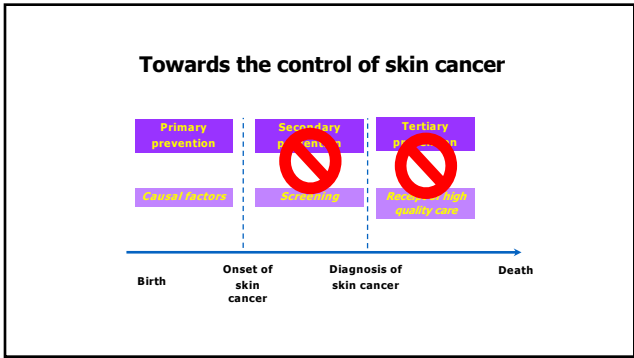
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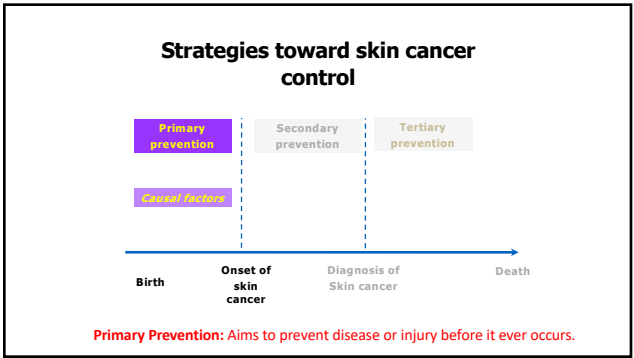
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Non-Melanoma Skin Cancer

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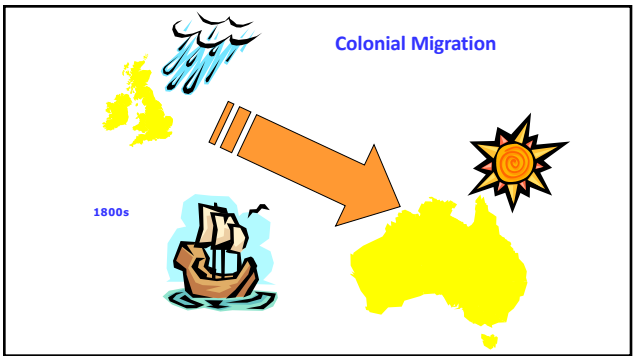
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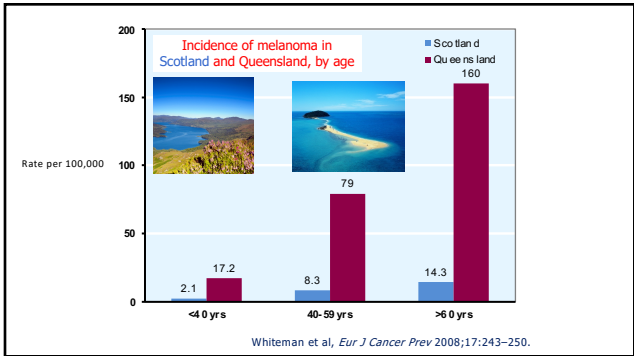
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**High levels of ambient sunlight are associated with higher rates of skin cancer**

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Is there a relationship between UV exposure and skin cancer in skin of color?

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# Nonmelanoma Skin Cancer

Basal Cell Carcinoma  
Squamous Cell Carcinoma

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There are very few studies of the association of sun exposure and BCC and SCC

- Halder et al reviewing **43 cases of SCC over 40 years** found most (65%) in non-sun exposed sites in Black Americans.
- McCall et al reviewed **35 cases of SCC over 5 years** found most (69%) in non-sun exposed sites in Black Americans.
- Mora et al reviewed **148 cases of BCC over 31 years** found most on the head and neck in Black Americans.
- Asuquo et al (in Nigeria) reviewed **5 cases of BCC over 4 years** found most (67%) on the head and neck.

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UV association with NMSC continued...

- Incidence of BCC is 2 times higher among ethnic Japanese in Hawaii, than of Japanese in Japan, suggesting UVR.

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JAMA Dermatology | Original Investigation  
**Nonmelanoma Skin Cancer in Nonwhite Organ Transplant Recipients**  
Ellen N. Prihazet, MD, MPH; Adam Drole, MD, MPH; Christina M. Shaw, MD, Brett Miller, MD, Mark Hoderick, MD, Carrie Koczkodaj, MD, Gregory E. Miller, PhD; Cynthia Lee Chang, MD

Table 4. Skin Cancer Type and Location by Race

Type	No. (%)		
	Black	Asian	Hispanic
SCCS			
Total No.	7	3	3
HPV associated	6 (85.7)	1 (33.3)	2 (66.7)
Sun-exposed site	0	2 (66.7)	1 (33.3)
Non-sun-exposed site	7 (100)	1 (33.3)	2 (66.7)
SCC			
Total No.	0	1	0
Sun-exposed site	NA	1 (100)	NA
Non-sun-exposed site	NA	NA	NA
BCC			
Total No.	2	1	1
Sun-exposed site	1 (50.0)	1 (100)	NA
Non-sun-exposed site	1 (50.0)	NA	1 (100)

Among 259 total patients  
Average 7.8 years (2-21) post transplant

- Black 190 (73.4)
- Hispanic 33 (12.7)
- Asian 35 (13.5)
- Pacific Islander 1 (0.4)

Even among these high-risk individuals UV exposure seems less important.

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JAMA Dermatology | Brief Report  
**UV Exposure and the Risk of Keratinocyte Carcinoma in Skin of Color**  
A Systematic Review  
Elysha Koltz, BA; Fabiana C. P. S. Lopes, MD; Matthew Arffa, MD; Juliana Pineider, BS; Roxanne Bogucka, MLIS, AHP; Adewole S. Adamson, MD, MPP

- 12 studies met inclusion criteria
- 8 Studies showed no association (UV exposure type was from phototherapy in all these studies)
- 4 Studies showed a positive association (UV exposure type was geographic location or job description)
- Moderate to low quality evidence

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Other Findings

- Studies primarily in East Asia (Japan, Taiwan, Korea)
- **ZERO** studies included patients of African descent
- One study included Chileans

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ORIGINAL ARTICLE **Cancer Science** WILEY

Epidemiology of nonmelanoma skin cancer in Japan: Occupational type, lifestyle, and family history of cancer

Honglin Cai<sup>1</sup> | Tomotaka Sobue<sup>2</sup> | Tetsuhisa Kitamura<sup>3</sup> | Norie Sawada<sup>4</sup> | Motoki Iwasaki<sup>5</sup> | Taichi Shimazu<sup>7</sup> | Shokichi Tsugane<sup>2</sup>

- Population: Japan
- Type of UV Exposure:
  - Occupation
- Outdoor workers were more likely to develop SCC (**but only men**)
- No increased likelihood among women
- No association observed for BCC in both sexes

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Cancer Causes Control (2010) 21:771-776  
DOI 10.1007/s12552-010-9564-x  
ORIGINAL PAPER

Early-life or lifetime sun exposure, sun reaction, and the risk of squamous cell carcinoma in an Asian population

Yen-Ching Chen<sup>1</sup>, David C. Christian<sup>1</sup>, Heng-Jen Jenny Su<sup>1</sup>, Yu-Mei Hsieh<sup>1</sup>, Thomas J. Smith<sup>1</sup>, Louise M. Ryan<sup>1</sup>, Sheen-Chou Chou<sup>1</sup>, Jialu Yu-Yun Lee<sup>1</sup>, Yun-Liang Lann Gao<sup>1</sup>


- Population: Taiwan
- Type of UV Exposure:
  1. Lifetime sun exposure
  2. Early-life (15-24 years old) sun exposure
- Positive association only for SCC in **women** for life-time sun exposure
- Positive association only for SCC in **men** for early-life sun exposure

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Mol Cell Toxicol (2016) 19:91-94  
DOI 10.1007/s13273-014-0011-1  
ORIGINAL PAPER

Implication of ultraviolet B radiation exposure for non-melanoma skin cancer in Korea

Sang Geun Lee<sup>1</sup>, Hong Seok Yoon<sup>1</sup>, Hyunjoo Bae<sup>2</sup>, Jongsik Ha<sup>2</sup>, Haeyong Park<sup>2</sup>, Yongseung Shin<sup>2</sup> & Sang Wook Soa<sup>1</sup>



- Population: Korea
- Type of UV Exposure:
  - UVB index based on geographic location in South Korea
- Positive association only for patients >60 years old

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Melanoma

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Meta-analysis of risk factors for cutaneous melanoma: II. Sun exposure

Sara Gandini<sup>a,\*</sup>, Francesco Sera<sup>b</sup>, Maria Sofia Cattaruzza<sup>c</sup>, Paolo Pasquini<sup>d</sup>, Orietta Picconi<sup>d</sup>, Peter Boyle<sup>e</sup>, Carmelo Francesco Melchi<sup>f</sup>

- 57 published studies (before 2002) on the association of UV exposure and melanoma.
- 2 included black people
- 1 included Hispanic people

**Its hard to make a case of a relationship without inclusion of darker skin types!**

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More studies have been done since this meta-analysis...

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**Review** ONLINE FIRST

December 16, 2020

### UV Exposure and the Risk of Cutaneous Melanoma in Skin of Color: A Systematic Review

Fabiana C. P. S. Lopes, MD<sup>1</sup>; Marc G. Steiman, BS<sup>2,3</sup>; Kate Sebastian, RN, MPH<sup>1</sup>; Roxanne Bogucka, MLIS, AHIP<sup>3</sup>; Elizabeth A. Jacobs, MD, MAPP<sup>3</sup>; Adewole S. Adomson, MD, MPH<sup>2,4</sup>

- 13 studies met inclusion criteria
- 2 studies showed an association (one among Black men, one among Hispanic men)
- Moderate to low quality evidence

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Vol. 9, 201-207, March 2000 Cancer Epidemiology, Biomarkers & Prevention 207

### Association of Surface Ultraviolet B Radiation Levels with Melanoma and Nonmelanoma Skin Cancer in United States Blacks

Gene Piantadosi,<sup>1</sup> Susan Devves,<sup>2</sup> and Mitchell Gull

with UVB radiation exposure from sunlight, decreasing latitude, and decreasing level of skin pigmentation (1-3). Furthermore, Blacks have much lower melanoma, SCC, and BCC incidence rates than whites (4, 5), and the dose of UV radiation required to produce a minimum perceptible erythema has been estimated to be 6-33 times greater in blacks than in whites (6, 7).

- Using SEER database examining the association of surface-levels of UVB with melanoma incidence and mortality in Black people between 1973 and 1994.
- **No association** between melanoma incidence and UVB exposure.

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### UV Radiation, Latitude, and Melanoma in US Hispanics and Blacks

Shasha Hu, MD, Fangchao Ma, MD, PhD, Fernando Collado-Mesa, MD, Robert S. Kirsner, MD

Table 3. Correlation Between Age-Adjusted (2000 US Population) Melanoma Incidence Rates and Mean Annual UV Index and Latitude of Residency by Race/Ethnicity and Sex

	Female			Male		
	Black	Hispanic	White	Black	Hispanic	White
Correlation coefficient with UV index (P value)	0.35 (.49)	0.56 (.24)	0.57 (.32)	0.93 (.01)	0.41 (.42)	0.65 (.24)
Correlation coefficient with latitude (P value)	-0.44 (.38)	-0.22 (.68)	-0.21 (.74)	-0.8 (.05)	-0.33 (.52)	-0.32 (.61)

Only significant association was among Black men

Hu et al. Arch Derm 2004

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### Association of UV Index, Latitude, and Melanoma Incidence in Nonwhite Populations— US Surveillance, Epidemiology, and End Results (SEER) Program, 1992 to 2001

Melody J. Eide, MD, MPH; Martin A. Weinstock, MD, PhD

Table 3. Correlation of Age-Adjusted Melanoma Incidence (2000 US Standard) in the SEER-11 Program From 1992 to 2001 With the Registry's Mean Annual UV Index (1997) or Latitude by Race, Ethnicity, and Sex

Variable	Pearson Correlation Coefficient (P Value)	
	Melanoma Incidence With UV Exposure	Melanoma Incidence With Latitude
<b>Men and Women</b>		
White, non-Hispanic	0.85 (.001)	-0.85 (.001)
White, Hispanic	-0.43 (.19)	0.37 (.27)
Black	-0.53 (.10)	0.53 (.09)
Native American	0.42 (.20)	-0.38 (.20)
Asian/Pacific Islander	-0.28 (.41)	0.19 (.57)
<b>Men*</b>		
White, non-Hispanic	0.80 (<.001)	-0.88 (<.001)
White, Hispanic	-0.40 (.19)	0.35 (.20)
Black	-0.47 (.19)	0.40 (.22)
<b>Women*</b>		
White, non-Hispanic	0.80 (.003)	-0.80 (.004)
White, Hispanic	-0.38 (.25)	0.34 (.31)
Black	-0.16 (.62)	0.17 (.61)

No association between melanoma and UV index in skin of color.

Eide et al. Arch Derm 2005

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ANTICANCER RESEARCH 16: 233-238 (2016)

### Ultraviolet Radiation Exposure and the Incidence of Oral, Pharyngeal and Cervical Cancer and Melanoma: An Analysis of the SEER Data

No association between melanoma and UV exposure by latitude in Black people.

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Published OnlineFirst: January 18, 2012; DOI: 10.1159/000320491

### Risk Factors for Malignant Melanoma in White and Non-White/Non-African American Populations: The Multiethnic Cohort

Suzanne Linn Park,<sup>1</sup> Luis La Marchand,<sup>2</sup> Lynne R. Wilcox,<sup>3</sup> Lawrence N. Kolonel,<sup>4</sup> Brent L. Henderson,<sup>5</sup> Zhenfeng Zhang,<sup>6</sup> and Hirotsugu Watanabe<sup>6</sup>

A multiethnic cohort study was conducted examining risk factors for melanoma in whites compared to "nonwhite/multiracials," defined as a group that includes Latino Americans, Japanese Americans, or Native Americans, **but excludes African Americans.**

Risk Factors **NOT** Associated with melanoma

- Ever-sunburned
- Lifetime number of sunburns
- Age at sunburn
- Family history of melanoma

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ORIGINAL ARTICLE

### High Birth Weight, Early UV Exposure, and Melanoma Risk in Children, Adolescents, and Young Adults

*Katherine Y. Wojcik,<sup>1</sup> Loraine A. Escobedo,<sup>2</sup> Ashley Wysong,<sup>3</sup> Julia E. Heck,<sup>3</sup> Beate Ritz,<sup>3</sup> Ann S. Hamilton,<sup>4</sup> Joel Milan,<sup>4</sup> and Myles G. Cockburn<sup>1,2,4</sup>*

- Population based study in California using state cancer registry
- Early UV exposure was associated with melanoma risk in non-Hispanic white children, adolescents, and young adults
- **No association among Hispanic patients**

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### Does Sunscreen reduce melanoma risk in skin of color?

- Only **one** clinical trial examined the role of sunscreen and melanoma.
  - 1,621 Queensland, Australia residents (age 25 – 75) randomized to sunscreen daily (arms and face) vs discretionary sunscreen use.
  - They were followed from 1992 – 2006.

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### Randomized Trial of Sunscreen for Melanoma prevention

**Melanoma (%)**

**Occurrence of First Melanoma, After First Year of Intervention**

Persons at risk:  
 No sunscreen intervention: 808, 804, 800, 798, 792, 788, 784, 780, 773, 764, 752, 746, 740, 736  
 Sunscreen intervention: 812, 808, 804, 800, 795, 788, 782, 780, 773, 763, 754, 747, 744, 741

- Melanoma incidence was reduced by 50%.
- However, **not statistically significantly** for melanoma overall.
- At 10-year follow-up (HR 0.5 95% CI 0.24-1.02, p=0.051)
- Sunscreen application was only to face, arms.
- SPF only 15

**No dark-skinned people this study!!!**

Green AC et al. JCO 2011

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**Should Black People Wear Sunscreen?**

In rare occasions, dark-skinned people can get skin cancer. But sunscreens won't help.

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**THE 411 ON SUNSCREEN**

EXPERTS SAY THERE ARE PROS & CONS TO WEARING SUNSCREEN ON DARK SKIN TONES

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### Primary Prevention: Behavioral Counseling

Original Investigation FREE

December 2016

#### Sun-Protection Behaviors Among African Americans

Latrice C. Pichon, PhD, Irma Corral, PhD, Hope Landrine, PhD, Joni A. Mayer, PhD, Gregory J. Norman, PhD

#### Skin Cancer Prevention Among Hispanics: a Review of the Literature

K. A. Miller<sup>1,2</sup>, G. K. Tai<sup>1,2</sup>, S. Y. Jiang<sup>1</sup>, O. Abudua<sup>1,2</sup>, S. Higgins<sup>1</sup>, A. Wysong<sup>1</sup>, M. G. Cockburn<sup>1,2</sup>

Audrey A. Jacobson, BA<sup>1</sup>, Ana Galvan, BS<sup>1</sup>, Claudia Canaan Lachapelle, MD<sup>1</sup>, Cheryl B. Welsh, MPH<sup>1</sup>, Robert S. Kriner, MD, PhD<sup>1</sup>, John Strassman, MD, PhD<sup>1,2</sup>

Ellen J. Cougle<sup>1,2</sup>, Jingli. Daponte<sup>1</sup>, Shenna V Hudson<sup>1,2</sup>, Amanda Medina-Fonseca<sup>1</sup>, Ana Natalia-Peters<sup>1</sup> and James S. Goydos<sup>1,2</sup>

Sun protection and exposure behaviors among Hispanic adults in the United States: differences according to acculturation and among Hispanic subgroups

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### USPSTF Recommendations (2018): Behavioral Counseling

Population	Recommendation	Grade
Young adults, adolescents, children, and parents of young children	Counsel young adults, adolescents, children, and parents of young children about minimizing exposure to ultraviolet (UV) radiation for persons aged 6 months to 24 years with fair skin types	B
Adults older than 24 years with fair skin types	Selectively counsel patients over 24 years old depending upon risk factors for skin cancer	C
Adults	Insufficient evidence to inform a recommendation	I


**Behavioral Counseling is not recommended for skin of color!**

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**Table II.** American Academy of Dermatology recommendations for photoprotection and early detection of skin cancer in people of color

- Seek shade whenever possible.
- Wear sun-protective clothing.
- Wear a wide-brimmed hat to shade the face and neck, and shoes that cover the entire foot.
- Wear sunglasses with UV-absorbing lenses.
- Apply broad-spectrum sunscreens with SPF  $\geq 30$ . Sunscreens without inorganic filters (titanium dioxide and zinc oxide) are generally better accepted by people of color because of their better cosmesis on dark skin.
- Apply sunscreen to dry skin 15-30 min before going outdoors. When outdoors, reapply every 2 h to all exposed skin, and after perspiring or swimming.
- Avoid exposure to indoor tanning beds/lamps.
- Take vitamin-D supplement: 400 IU daily for infants age  $\geq 1$  y, 600 IU daily age 1-70 y, and 800 IU daily age  $> 70$  y.
- Perform monthly self-skin examinations, paying close attention to subungual skin, palms, soles, mucous membranes, groin, and perianal area.

SPF, Sun-protection factor; UVR, ultraviolet radiation. Reprinted with permission from Agbai et al.<sup>10</sup>

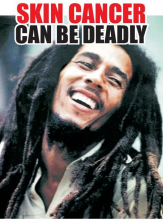


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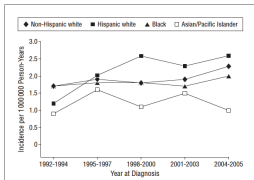
### Summary

- A significant proportion of skin cancers occur on non-sun exposed areas of the body.
- Sun protection is uncertain to reduce the burden of skin cancer in most patient with skin of color.
- Educating patients that skin cancer can occur in dark skin is important.
- Need better research into predisposing factors.

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Acral Lentiginous Melanoma (ALM) is the type of melanoma that killed Bob Marley, the reggae legend at 36.



**Figure 3.** Age-adjusted incidence rates of acral lentiginous melanoma by year of diagnosis based on race. Incidence rates are based on the Surveillance, Epidemiology, and End Results (SEER 13) registries (1992-2005) and reported per 1 000 000 person-years and age-adjusted to the US 2000 standard.\*

**The incidence of acral melanoma is the SAME between whites and blacks.**

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### Thank you

- Co-authors
- UT Austin Dell Medical School
- Michael Pignone, MD, MPH – UT Austin
- Nancy Thomas MD, PhD – UNC
- Michelle Wong, PhD
- The Eco Well

**Funders:**

- Dermatology Foundation
- NIH KL2 Program at UT Health Science Center at San Antonio
- Robert Wood Johnson Foundation
- American Cancer Society



Robert Wood Johnson Foundation

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