



Michele R. Sassi. *Sunset in the Desert, Rajasthan, India*. Photograph, 2007.

*Perceived low risk level of melanoma in Hispanic and black US populations have resulted in delayed diagnosis, advanced disease at presentation, and a poorer prognosis.*

## Melanoma in Hispanic and Black Americans

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**Background:** Although age-adjusted incidence rates (per 100,000) for melanoma are lower among Hispanics and blacks (4.5 and 1.0, respectively) compared with white non-Hispanics (21.6), melanomas among minority populations in the United States are more likely to metastasize and have poorer outcomes.

**Methods:** A review of the literature was conducted on melanomas affecting Hispanic and black Americans.

**Results:** Because of the low index of suspicion in both the medical community and these ethnic populations, diagnosis is often delayed, resulting in advanced presentation and a poorer prognosis.

**Conclusions:** More comprehensive medical training, expanded public educational campaigns, and increased awareness among patients of all skin types to perform self skin checks are recommended. Further studies elucidating the etiology and risk factors for melanoma among minority populations are warranted.

### Introduction

The incidence of cutaneous melanoma is increasing at an alarming rate. In the past several decades, its incidence has increased more rapidly than that of any other cancer. It has doubled over the last 25 years in the United States, rising an average of 6% annually during the 1970s and 2.4% annually in the last decade.<sup>1</sup> As a result, melanoma is among the top 10 new cancer diagnoses among American men and women.<sup>2</sup> Currently, it is the sixth most common cancer in the United States and is a leading cause of cancer deaths among young adults.<sup>1,3</sup>

It is predicted that 1 in 58 Americans will develop invasive melanoma over their lifetime — 1 in 41 men and 1 in 61 women.<sup>4</sup>

Early detection can improve clinical outcome. When melanoma is detected early and lesions are thin, the cure rate is 99%. When detected later and lesions are thicker, the mortality rate is in the 50% range.<sup>3,5</sup> Screening and early detection is therefore essential to optimize patient outcomes. Overall melanoma mortality, which has risen at a slower rate than incidence, has stabilized over the last decade and has even begun to fall in younger cohorts.<sup>1,4</sup> The decline in mortality has likely resulted from heightened awareness and surveillance, leading to earlier detection, primarily among white patients.<sup>6</sup>

### Epidemiology

Although age-adjusted incidence rates per 100,000 for melanoma are lower among Hispanics (4.5) and blacks (1.0) compared with white non-Hispanics (21.6),<sup>1</sup> mel-

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anomas among minority populations are more likely to metastasize and have poorer outcomes than among white non-Hispanics.<sup>7,8</sup> Among Hispanics in the United States, the incidence of melanoma has increased at an annual rate of 2.9% in the last 15 years ( $P < .05$ ), which is comparable to the 3.0% annual increase among white non-Hispanics.<sup>1</sup> An analysis of melanoma data from the California Cancer Registry between 1988 and 2001 reported that the incidence of invasive melanoma increased markedly among Hispanics in California compared to non-Hispanics and that thicker melanomas (associated with a worse prognosis) accounted for most of the increase, highlighting an emerging public health concern.<sup>9,10</sup>

## Pathogenesis

### *Risk Factors for Melanoma*

More than 95% of melanomas are diagnosed in white and light-skinned populations.<sup>1</sup> As a result, the majority of the epidemiologic evidence is drawn from observations of these populations, and most of the public education efforts have addressed these populations since they are at higher risk of developing melanoma. White and light-skinned individuals are thought to be more susceptible to the mutagenic activities of UV radiation because they lack protective melanin pigments.<sup>11</sup> Numerous epidemiologic studies have consistently reported UV radiation as the paramount modifiable risk factor for melanoma in white and light-skinned populations.<sup>12-16</sup> Other risk factors include personal or family history of melanoma, evolving nevus/nevi, adulthood, the presence of a large number of commonly acquired and dysplastic melanocytic nevi, large congenital nevus/nevi, Caucasian race, actinic keratoses, immunosuppression, tendency to burn and freckle rather than tan, history of three or more blistering sunburns in the first 10 to 20 years of life, and a genetic predisposition such as xeroderma pigmentosa or albinism.<sup>16-19</sup>

### *Melanoma Risk Factors in Non-White Populations*

While it is known that melanoma is commonly diagnosed at a more advanced stage in minority populations, the etiology is poorly understood.<sup>1</sup> Risk factors for melanoma among non-whites have not been elucidated. The increasing incidence in recent years has been attributed to continued ozone depletion, upward mobility across social class gradients by ethnic minorities, and increased intermittent sun exposure.<sup>20</sup> Sun exposure was previously thought to play a small role in melanoma development in minority populations.<sup>21,22</sup>

The lower incidence of melanoma in Hispanics and blacks was attributed to the protective effects of darker skin.<sup>7</sup> The epidermis of black Americans has a natural sun protection factor of 13.4, effectively filtering twice as much UVB radiation as the epidermis of white Americans.<sup>20</sup> The lower incidence of melanoma

among black Americans is thought to be due to increased melanin density and melanosomal distribution.<sup>7</sup> With increased melanin content, the larger melanosomes of black skin absorb and scatter more energy than the smaller melanosomes of lighter skin. For these reasons, UV radiation has been postulated to play a smaller role in the pathogenesis of skin cancer among darker-skinned populations.

A recent study found a significant inverse correlation with the absolute amount and distribution of melanin in the skin of darker pigmented individuals and the amount of photoprotection from UV-induced DNA damage.<sup>23</sup> Overall, those with increased melanin had more efficient DNA repair mechanisms, further reducing the likelihood of carcinogenesis. However, highly variable rates of nucleotide excision/repair among subjects within groups of similar ethnic backgrounds were noteworthy. While melanin may function as an optical filter, accurate and timely repair of UV-induced DNA damages are also critical in controlling the passage of mutations to daughter cells.

Conversely, another study found similar cytotoxic damage from cultured melanocytes of blacks and whites who were exposed to simulated sunlight containing both UVA and UVB rays.<sup>24</sup> Resistance to UVA radiation alone, however, was 2 times greater among melanocytes from blacks compared to whites. These results indicate that melanin confers only partial photoprotection. If photoprotection from melanin were complete, a linear relationship between skin color and incidence of melanoma would exist.<sup>20</sup>

Recent epidemiologic studies have suggested a positive association between UV radiation and melanoma development in non-whites, but some results are inconclusive.<sup>25-28</sup> For example, Hu et al<sup>25</sup> correlated melanoma incidence rates in 6 states in varying regions in the United States, comprising three-fourths of the US black and Hispanic populations, with estimated UV index and latitude of residency for each state. They found that melanoma incidence is associated with UV radiation exposure in both blacks and Hispanics in the United States.<sup>25</sup> Using a similar methodology, Eide and Weinstock<sup>28</sup> extracted data from the Surveillance, Epidemiology and End Results (SEER) database (containing smaller population) but did not find a significant association of UV exposure and melanoma incidence in black or Hispanic populations.

Since the most common sites of involvement are sun-protected, palmar, plantar, subungual, and mucosal surfaces, other unknown causative factors in the development of melanoma have been postulated.<sup>29</sup> Using genetic alterations and differing anatomic locations, several researchers have explored the theory that melanoma is a heterogeneous disease with varying etiologies.<sup>30,31</sup> Examining age-specific incidence rates separated by sex and anatomic site, Lachiewicz et al<sup>32</sup>

revealed a multimodal age distribution as well as different incidence patterns by anatomic site. Results from the use of the large-scale, population-based SEER program supported the “divergent pathway” model proposed by Whiteman et al<sup>31</sup> in 2003. This model hypothesized a separate pathway for individuals with a high propensity for melanocyte proliferation compared with those with an inherently low melanocyte proliferation. Individuals with high melanocyte proliferation develop melanomas on sites with unstable melanocytes, such as the trunk, with less or intermittent UV damage, whereas individuals with low melanocyte proliferation require chronic UV exposure.<sup>31</sup>

Significant gaps in our knowledge about the relationships of melanin density, melanin distribution, and DNA damage and repair mechanisms among individuals with different ethnic origins continue to exist. In large measure, analysis of melanoma incidence data in Hispanics and blacks is limited by the low incidence in these populations and by the lack of readily available cancer data for Hispanics who often are not identified by ethnic category in state cancer registries.<sup>33,34</sup> The inability to capture historical changes in sun exposure among ethnic minorities may also have an influence on increasing melanoma trends.<sup>35</sup> Although identification of cases has improved, the number of cases remains underestimated.<sup>35,36</sup>

A positive correlation of socioeconomic status and melanoma incidence has been reported in several epidemiologic investigations.<sup>37-40</sup> Individuals with higher incomes and education levels have been hypothesized to receive UV radiation from outdoor leisure activities as well as from travel to lower latitudes. Despite the fact that many ethnic minorities sustain chronic UV exposure from jobs in the labor force, such as agriculture and construction; individuals who receive intermittent UV exposure from recreational activity have been described to be at higher risk than outdoor workers.<sup>41,42</sup> Although ethnic minorities have in large part been omitted from occupational investigations,<sup>43</sup> a recent study reported increased proportionate mortality from melanoma among black American women employed in the machinery and transportation equipment manufacturing sector.<sup>44</sup> Of note, malignant melanoma has been associated with exposure to polychlorinated biphenyls (PCBs) in both the machinery and transportation equipment manufacturing industries.<sup>45,46</sup>

## Clinical Evaluation

### Clinical Presentation

When melanoma does occur among black Americans, certain histologic subtypes predominate. The most common melanoma growth pattern reported among black Americans is acral lentiginous melanoma (60%).<sup>47</sup> However, Stevens et al<sup>48</sup> found no significant difference between blacks and whites in their study. They at-

tribute the comparatively higher rate of plantar melanomas to the far lower incidence of melanoma at other anatomic sites.

In the presence of a primary site, melanoma among black Americans is commonly misdiagnosed and treated as a plantar wart, tinea nigra, or talon noir.<sup>49</sup> While most patients present with an isolated malignant lesion, a recent case series described 4 black patients with multiple acral lentiginous melanomas.<sup>47</sup>

A large review of black patients with melanoma revealed that a primary site was not identified in 4% of patients.<sup>8</sup> Absence of a primary site, however, is not limited to black patients; a similar frequency is reported among white patients. A recent study reported 2 cases of gastrointestinal metastases from melanoma among black patients where careful examination of the skin, nails, eyes, and oral mucosa failed to reveal a primary lesion.<sup>50</sup>

Superficial spreading melanoma is the most common histologic subtype reported among Hispanics and whites.<sup>19</sup> Of note, a retrospective review in California found a higher proportion of acral lentiginous melanomas were exhibited among Hispanic males (5.1%) vs white males (0.6%).<sup>9</sup> The lower extremity was the most common anatomic location reported for minorities<sup>51</sup>: the foot among black Americans<sup>19</sup> and the leg among Hispanic Americans from Puerto Rico.<sup>52</sup>

Several studies have reported advanced melanoma presentation in association with worsening survival rates among US blacks.<sup>7,8,18,53-55</sup> A review of 649 melanoma cases (36 in blacks and 613 in whites) was conducted at the Washington Hospital Center between 1981 and 2000. Compared with white patients, blacks were more likely to present with stage III/IV disease (12.7% and 32.1%, respectively), and the 5-year survival rate was also poorer among blacks (58.8%) compared with whites (84.8%).<sup>9</sup> Using data from the Florida Cancer Data System, Hu et al<sup>53</sup> reported a similarly higher percentage of late-stage diagnosis of melanoma among blacks residing in Miami-Dade County in Florida, from 1997 to 2001. Almost half (48%) of black patients presented with regional or distant-stage melanoma compared with 22% of white patients ( $P = .015$ ).

To date, only 3 published reports are available in the United States regarding data on stage at diagnosis among Hispanics.<sup>7,53,56</sup> A study using California Cancer Registry data, 1988 to 1993, evaluated 361 cases of invasive melanoma diagnosed in Hispanics. Compared with non-Hispanic whites, Hispanics (23%) were twice as likely to present with regional or distant disease ( $P < .01$ ).<sup>7</sup> An analysis of 81 melanoma cases from the New Mexico Melanoma Registry and New Mexico Tumor Registry between 1970 and 1986 found that 36% of Hispanics had melanoma 2 mm or thicker in depth, whereas only 16% of non-Hispanic whites had such advanced lesions.<sup>33</sup> The gap in melanoma stage at diagnosis likely contributes to differences in survival.

The scarcity of studies on melanoma among Hispanics partly reflects the small number of cases in many areas of the United States as well as limitations of ethnicity information in cancer registries.<sup>34,57</sup> Most published studies on skin cancer incidence and mortality describe data for whites only. Some include blacks, but very few include other racial groups such as Asian Americans or Hispanics.<sup>58</sup> Despite inherent limitations of classifying Hispanic race/ethnicity within all registry-based cancer data,<sup>7,57</sup> the consistent findings of more advanced melanoma presentation from large registry data support the validity of this pattern.

### Prognosis

Although the disproportionate number of cancer deaths among ethnic minorities has increasingly been studied, ethnic disparities with respect to melanoma outcomes have received limited attention.<sup>37,51,59,60</sup> Improved secondary prevention measures with earlier detection of thin (early-stage) melanoma may account for the improvement in melanoma survival in white populations from 68% in the early 1970s to 92% in recent years.<sup>1</sup> The disparity in melanoma stage at diagnosis likely contributes to the poorer survival rates among Hispanics and blacks since melanoma prognosis is intimately related to stage at diagnosis. The 5-year relative survival rate for localized melanoma (98%) falls to 64% and 16% for regional and distant stage, respectively.<sup>1</sup> Meanwhile, melanoma survival among Hispanics has not improved to the same degree as survival among whites. The 5-year survival rates of melanoma is 77.1% for white Hispanic males, 86.8% for white Hispanic females, 86.5% for non-Hispanic white males, and 92.2% in non-Hispanic white females.<sup>2</sup> The 5-year relative survival rate for blacks has changed little: 67% in 1974–1976 to 78% in 1995–2001 (not a statistically significant difference).<sup>1</sup>

### Prevention

Much of the current literature and most public health efforts have targeted melanoma in white populations. While prevention measures with earlier detection may account for improved survival rates in white populations, such advances have not occurred in other segments of the population. Hispanics and blacks continue to have poorer survival rates.<sup>2</sup> The more advanced stage of melanoma at presentation in Hispanics and blacks highlights the disparity in secondary prevention of melanoma in minority populations. The increasing incidence among Hispanic and black Americans emphasizes the need for sun protection and risk education among these populations.<sup>61</sup>

Evidence suggests that secondary prevention efforts such as skin cancer screenings are suboptimal in Hispanics and blacks. According to the National Health Interview Surveys among US adults, both Hispanics and blacks are screened for skin cancer less frequently than

are white non-Hispanics.<sup>62</sup> In 2000, 3.7% of white Hispanics and 6.2% of blacks had a recent skin examination by a physician compared to 8.9% of white non-Hispanics. Hispanic ethnicity is additionally correlated with decreased likelihood of having a recent skin cancer examination (odds ratio 0.61,  $P = .001$ ). As the incidence of skin cancer is lower among minorities, a better understanding of risk factors among these populations would aid in identifying more cost-effective screening efforts.

Hispanic ethnicity is also consistently associated with deficits in usage of other major cancer screening tests such as Pap tests, mammography, prostate-specific antigen (PSA) screening, and colorectal screening.<sup>63</sup> Socioeconomic status, sociocultural values, and skin cancer awareness are likely factors that account for differences in the delivery and utilization of health care resources among minority populations.<sup>64,65</sup> Poverty and lack of health insurance influence access and utilization of cancer screening services and treatment, thus contributing to current disparities in the cancer burden among minority groups.<sup>2,63,66,67</sup> Ineffective or insufficient public education has resulted in certain populations not learning about screening resources. A recent study on US media coverage from 1979 to 2003 found overall suboptimal media attention on skin cancer education; the amount of coverage on skin cancer has not increased since 1986. With only 6.6% of news coverage on dermatologic detection and 5.5% on self-detection of skin cancer, the media pay little attention to skin cancer education.<sup>68</sup>

Lastly, the delayed diagnosis of melanoma among Hispanics and blacks could also reflect lower skin cancer awareness. Understandably, darker-skinned individuals perceive themselves as having low or no risk for melanoma, as much of the public education efforts have targeted the white populations, especially those with blue eyes and blond or red hair. Lower skin cancer awareness could thus influence an individual's decision to seek timely medical care for suspicious skin lesions. Byrd et al<sup>18</sup> noted that the lack of public education about melanoma risk and prevention in black communities may be a major factor in its advanced presentation.

Ma et al<sup>69</sup> recently examined Hispanic and white non-Hispanic high school students in Miami-Dade County in Florida. They reported that white Hispanic students were more likely to tan deeply but were less likely to have heard of or been told how to perform skin self-examination. White Hispanics were also less likely to wear sun-protective clothing or to use sunscreen with a sun protection factor of 15 or higher and reported a greater use of tanning beds. They also believed their chance of developing skin cancer was less than that of white non-Hispanic students ( $P < .01$ ), which remained significant after adjustment for age, sex, family history, and skin sensitivity to sun. After adjustment, white Hispanic students were 2.5 times

more likely than white non-Hispanic students to have used a tanning bed in the past year. Overall, this suggests a lack of knowledge and differences in behavior during adolescence or even at younger ages.

A recent study compared skin cancer awareness among Hispanics to non-Hispanics with similar access to health care. Hispanics had a lower level of perceived risk and awareness of melanoma and nonmelanoma skin cancers compared with non-Hispanics. Hispanics also performed self examinations of their skin less frequently and were unaware of the clinical signs of skin cancer.<sup>58</sup>

## Conclusions

The delayed presentation of melanoma and the lower survival rates among Hispanics and blacks highlight an increasingly significant public health concern. The lowest survival rate and highest proportion of advanced presentation of melanoma are seen among blacks. The disparity in melanoma stage at diagnosis between Hispanics and whites also warrants attention since increases are occurring in both the Hispanic population and the incidence of melanoma in this population. Hispanics are among the fastest-growing minority groups in the United States; their numbers have increased more than 50% since 1990, and they are projected to comprise 17% of the total US population by 2020.<sup>70</sup> Thus, closer examination of melanoma epidemiology within this group is warranted.

Recent public health education and prevention efforts regarding melanoma in whites have led to a trend of earlier detection of melanoma at a localized stage in the white population.<sup>71</sup> However, such improvement in melanoma diagnosis has not been seen in blacks or Hispanics in the United States. Hispanics and blacks are the two largest racial/ethnic groups in the United States after non-Hispanic whites, comprising 12.5% and 12.3% of the total US population, respectively.<sup>72</sup> While the cost effectiveness of implementing primary prevention of melanoma with photoprotection may be debated in darker-skinned populations, public education regarding melanoma risk in blacks and Hispanics and the delivery of skin cancer screening and examinations represent the main potential areas of intervention to improve the stage at diagnosis in minorities. It is hoped that earlier diagnosis of melanoma at a more favorable stage will ultimately improve melanoma survival in minority populations.

## Disclosures

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## References

1. Ries LAG, Melbert D, Krapcho M, et al, eds. *SEER Cancer Statistics Review, 1975-2004*. National Cancer Institute, Bethesda, MD. [http://seer.cancer.gov/csr/1975\\_2004/](http://seer.cancer.gov/csr/1975_2004/). Accessed March 7, 2008.

2. Jemal A, Clegg LX, Ward E, et al. Annual report to the nation on the status of cancer, 1975-2001, with a special feature regarding survival. *Cancer*. 2004;101(1):3-27.
3. Greenlee RT, Murray T, Bolden S, et al. Cancer statistics, 2000. *CA Cancer J Clin*. 2000;50(1):7-33.
4. Jemal A, Siegel R, Ward E, et al. Cancer statistics, 2008. *CA Cancer J Clin*. 2008;58(2):71-96. Epub 2008 Feb 20.
5. Marks R. An overview of skin cancers: incidence and causation. *Cancer*. 1995;75(2 suppl):607-612.
6. Schaffer JV, Rigel DS, Kopf AW, et al. Cutaneous melanoma: past, present, and future. *J Am Acad Dermatol*. 2004;51(1 suppl):S65-S69.
7. Cress RD, Holly EA. Incidence of cutaneous melanoma among non-Hispanic whites, Hispanics, Asians, and blacks: an analysis of California cancer registry data, 1988-93. *Cancer Causes Control*. 1997;8(2):246-252.
8. Bellows CF, Belafsky P, Fortgang IS, et al. Melanoma in African-Americans: trends in biological behavior and clinical characteristics over two decades. *J Surg Oncol*. 2001;78(1):10-16.
9. Cockburn MG, Zadnick J, Deapen D. Developing epidemic of melanoma in the Hispanic population of California. *Cancer*. 2006;106(5):1162-1168.
10. O'Hanlon L. Invasive melanoma on the rise in California Hispanics. *Lancet Oncol*. 2006;7(3):199.
11. Tsai T, Vu C, DE Henson. Cutaneous, ocular and visceral melanoma in African Americans and Caucasians. *Melanoma Res*. 2005;15(3): 213-217.
12. IARC monographs on the evaluation of carcinogenic risks to humans: solar and ultraviolet radiation. *IARC Monogr Eval Carcinog Risks Hum*. 1992;55:1-316.
13. Lee JA, Scotto J. Melanoma: linked temporal and latitude changes in the United States. *Cancer Causes Control*. 1993;4(5):413-418.
14. Lee JA. Latitude, coastal or interior location and the evaluation of the melanoma epidemic in the United States. *Melanoma Res*. 1997;7(3):179-188.
15. Bulliard JL, Cox B, Elwood JM. Latitude gradients in melanoma incidence and mortality in the non-Maori population of New Zealand. *Cancer Causes Control*. 1994;5(3):234-240.
16. Armstrong BK, Kricke A. The epidemiology of UV induced skin cancer. *J Photochem Photobiol B*. 2001;63(1-3):8-18.
17. Marks R. Epidemiology of melanoma. *Clin Exp Dermatol*. 2000;25(6): 459-463.
18. Byrd KM, Wilson DC, Hoyle SS, et al. Advanced presentation of melanoma in African Americans. *J Am Acad Dermatol*. 2004;50(1):21-24; discussion 142-143.
19. Byrd-Miles K, Toombs EL, Peck GL, et al. Skin cancer in individuals of African, Asian, Latin-American, and American-Indian descent: differences in incidence, clinical presentation, and survival compared to Caucasians. *J Drugs Dermatol*. 2007;6(1):10-16.
20. Halder RM, Ara CJ. Skin cancer and photoaging in ethnic skin. *Dermatol Clin*. 2003;21(4):725-732, x.
21. Elder DE. Skin cancer. Melanoma and other specific non-melanoma skin cancers. *Cancer*. 1995;75(1 suppl):245-256.
22. Armstrong B, Kricke A. How much melanoma is caused by sun exposure? *Melanoma Res*. 1993;3(6):395-401.
23. Tadokoro T, Kobayashi N, Zmudzka BZ, et al. UV-induced DNA damage and melanin content in human skin differing in racial/ethnic origin. *FASEB J*. 2003;17(9):1177-1179. Epub 2003 Apr 8.
24. Yohn JJ, Lyons MB, Norris DA. Cultured human melanocytes from black and white donors have different sunlight and ultraviolet A radiation sensitivities. *J Invest Dermatol*. 1992;99(4):454-459.
25. Hu S, Ma F, Collado-Mesa F, et al. UV radiation, latitude, and melanoma in US Hispanics and blacks. *Arch Dermatol*. 2004;140(7):819-824.
26. Krishnamurthy S. The geography of non-ocular malignant melanoma in India: its association with latitude, ozone levels and UV light exposure. *Int J Cancer*. 1992;51(2):169-172.
27. Pennello G, Devesa S, Gail M. Association of surface ultraviolet B radiation levels with melanoma and nonmelanoma skin cancer in United States blacks. *Cancer Epidemiol Biomarkers Prev*. 2000;9(3):291-297.
28. Eide MJ, Weinstock MA. Association of UV index, latitude, and melanoma incidence in nonwhite populations: US Surveillance, Epidemiology, and End Results (SEER) Program, 1992-2001. *Arch Dermatol*. 2005; 141(4):477-481.
29. Bang KM, Halder RM, White JE, et al. Skin cancer in black Americans: a review of 126 cases. *J Natl Med Assoc*. 1987;79(1):51-58.
30. Curtin JA, Fridlyand J, Kageshita T, et al. Distinct sets of genetic alterations in melanoma. *N Engl J Med*. 2005;353(20):2135-2147.
31. Whiteman DC, Watt P, Purdie DM, et al. Melanocytic nevi, solar keratoses, and divergent pathways to cutaneous melanoma. *J Natl Cancer Inst*. 2003;95(11):806-812.
32. Lachiewicz AM, Berwick M, Wiggins CL, et al. Epidemiologic support for melanoma heterogeneity using the Surveillance, Epidemiology, and End Results Program. *J Invest Dermatol*. Epub 2007 Aug 23.
33. Black WC, Goldhahn RT Jr, Wiggins C. Melanoma within a southwestern Hispanic population. *Arch Dermatol*. 1987;123(10):1331-1334.
34. Poe GS, Powell-Griner E, McLaughlin JK, et al. Comparability of the death certificate and the 1986 National Mortality Followback Survey. *Vital Health Stat 2*. 1993(118):1-53.

35. Howe HL, Wu X, Ries LA, et al. Annual Report to the nation on the status of cancer, 1975-2003, featuring cancer among U.S. Hispanic/Latino populations. *Cancer*. 2006;107(8):1711-1742.
36. O'Brien K, Cokkinides V, Jemal A, et al. Cancer statistics for Hispanics, 2003. *CA Cancer J Clin*. 2003;53(4):208-226.
37. Harrison RA, Haque AU, Roseman JM, et al. Socioeconomic characteristics and melanoma incidence. *Ann Epidemiol*. 1998;8(5):327-333.
38. Gallagher RP, Elwood JM, Threlfall WJ, et al. Socioeconomic status, sunlight exposure, and risk of malignant melanoma: the Western Canada Melanoma Study. *J Natl Cancer Inst*. 1987;79:647-652.
39. Lee PY, Silverman MK, Rigel DS, et al. Level of education and the risk of malignant melanoma. *J Am Acad Dermatol*. 1992;26(1):59-63.
40. Reynolds P, Elkin EP, Layefsky ME, et al. Cancer in California school employees, 1988-1992. *Am J Ind Med*. 1999;36(2):271-278.
41. Armstrong BK, English DR. Cutaneous malignant melanoma. In: Schottenfeld D, Fraumeni JF Jr, eds. *Cancer Epidemiology and Prevention*. 2nd ed. New York, NY: Oxford University Press Inc; 1996:1282-1312.
42. Elwood JM. Melanoma and sun exposure. *Semin Oncol*. 1996;23(6):650-666.
43. Ghafoor A, Jemal A, Cokkinides V, et al. Cancer statistics for African Americans. *CA Cancer J Clin*. 2002;52(6):326-341.
44. Loomis D, Schultz M. Mortality from six work-related cancers among African Americans and Latinos. *Am J Ind Med*. 2000;38(5):565-575.
45. Loomis D, Browning SR, Schenck AP, et al. Cancer mortality among electric utility workers exposed to polychlorinated biphenyls. *Occup Environ Med*. 1997;54(10):720-728.
46. Sinks T, Steele G, Smith AB, et al. Mortality among workers exposed to polychlorinated biphenyls. *Am J Epidemiol*. 1992;136(4):389-398.
47. Hutcheson AC, McGowan JW IV, Maize JC Jr, et al. Multiple primary acral melanomas in African-Americans: a case series and review of the literature. *Dermatol Surg*. 2007;33(1):1-10.
48. Stevens NG, Liff JM, Weiss NS. Plantar melanoma: is the incidence of melanoma of the sole of the foot really higher in blacks than whites? *Int J Cancer*. 1990;45(4):691-693.
49. Halder RM, Shah SB. Skin cancer in African Americans. *Cancer*. 1995;75(2 suppl):667-673.
50. Dowell JE, Shen Y, Harford WV, et al. Case 1. Melanoma in African Americans. *J Clin Oncol*. 2005;23(15):3622-3624.
51. Cormier JN, Xing Y, Ding M, Lee, et al. Ethnic differences among patients with cutaneous melanoma. *Arch Intern Med*. 2006;166(7):1907-1914.
52. Bergfeld L, Newell GR, Sider JG, et al. Incidence and anatomic distribution of cutaneous melanoma among United States Hispanics. *J Surg Oncol*. 1989;40(4):222-226.
53. Hu S, Parker DF, Thomas AG, et al. Advanced presentation of melanoma in African Americans: the Miami-Dade County experience. *J Am Acad Dermatol*. 2004;51(6):1031-1032.
54. Crowley NJ, Dodge R, Vollmer RT, et al. Malignant melanoma in black Americans. A trend toward improved survival. *Arch Surg*. 1991;126(11):1359-1364; discussion 1365.
55. Reintgen DS, McCarty KM Jr, Cox E, et al. Malignant melanoma in black American and white American populations: a comparative review. *JAMA*. 1982;248(15):1856-1859.
56. Feun LG, Raub WA Jr, Duncan RC, et al. Melanoma in a southeastern Hispanic population. *Cancer Detect Prev*. 1994;18(2):145-152.
57. Rosenberg HM, Maurer JD, Sorlie PD, et al. Quality of death rates by race and Hispanic origin: a summary of current research, 1999. *Vital Health Stat 2*. 1999(128):1-13.
58. Pipitone M, Robinson JK, Camara C, et al. Skin cancer awareness in suburban employees: a Hispanic perspective. *J Am Acad Dermatol*. 2002;47(1):118-123.
59. Hemmings DE, Johnson DS, Tominaga GT, et al. Cutaneous melanoma in a multiethnic population: is this a different disease? *Arch Surg*. 2004;139(9):968-972; discussion 118-123.
60. Kirsner RS, Wilkinson JD, Ma F, et al. The association of Medicare health care delivery systems with stage at diagnosis and survival for patients with melanoma. *Arch Dermatol*. 2005;141(6):753-757.
61. Gloster HM Jr, Neal K. Skin cancer in skin of color. *J Am Acad Dermatol*. 2006;55(5):741-760; quiz 761-764.
62. Saraiya M, Hall HI, Thompson T, et al. Skin cancer screening among U.S. adults from 1992, 1998, and 2000 National Health Interview Surveys. *Prev Med*. 2004;39(2):308-314.
63. Swan J, Breen N, Coates RJ, et al. Progress in cancer screening practices in the United States: results from the 2000 National Health Interview Survey. *Cancer*. 2003;97(6):1528-1540.
64. Freeman HP. Poverty, culture, and social injustice: determinants of cancer disparities. *CA Cancer J Clin*. 2004;54(2):72-77.
65. Margolis ML, Christie JD, Silvestri GA, et al. Racial differences pertaining to a belief about lung cancer surgery: results of a multicenter survey. *Ann Intern Med*. 2003;139(7):558-563.
66. Ward E, Jemal A, Cokkinides V, et al. Cancer disparities by race/ethnicity and socioeconomic status. *CA Cancer J Clin*. 2004;54(2):78-93.
67. Jemal A, Murray T, Ward E, et al. Cancer statistics, 2005. *CA Cancer J Clin*. 2005;55(1):10-30. Erratum in: *CA Cancer J Clin*. 2005;55(4):259.
68. Stryker JE, Solky BA, Emmons KM. A content analysis of news coverage of skin cancer prevention and detection, 1979 to 2003. *Arch Dermatol*. 2005;141(4):491-496.
69. Ma F, Collado-Mesa F, Hu S, et al. Skin cancer awareness and sun protection behaviors in white Hispanic and white non-Hispanic high school students in Miami, Florida. *Arch Dermatol*. 2007;143(8):983-988.
70. Ramirez RR, de la Cruz GP. The Hispanic Population the United States: March 2002. Population Characteristics. Current Population Reports. Washington DC: US Department of Commerce, Economics and Statistics Administration, US Census Bureau; 2003.
71. Dennis LK. Analysis of the melanoma epidemic, both apparent and real: data from the 1973 through 1994 surveillance, epidemiology, and end results program registry. *Arch Dermatol*. 1999;135(3):275-280.
72. Census 2000. US Dept of Commerce Economics and Statistics Administration, US Census Bureau; 2002. <http://www.census.gov/prod/2002pubs/c2kprof00-us.pdf>. Accessed March 7, 2008.