ONLINE FIRST

Skin Examination Behavior

The Role of Melanoma History, Skin Type, Psychosocial Factors, and Region of Residence in Determining Clinical and Self-conducted Skin Examination

Nadine A. Kasparian, PhD; Richard Bränström, MSc (Psych), PhD; Yu-mei Chang, PhD; Paul Affleck, MA; Lisa G. Aspinwall, PhD; Aad Tibben, PhD; Esther Azizi, MD; Orna Baron-Epel, MPH, PhD; Linda Battistuzzi, PhD; William Bruno, MD, PhD; May Chan, PGDipCompSc; Francisco Cuellar, MD; Tadeusz Debniak, MD, PhD; Dace Pjanova, PhD; Slawomir Ertmanski, MA (Psych); Adina Figl, MD; Melinda Gonzalez, PH; Nicholas K. Hayward, PhD; Marko Hocevar, MD, PhD; Peter A. Kanetsky, MPH, PhD; Sancy Leachman, MD, PhD; Wilma Bergman, MD, PhD; Olita Heisele, PhD; Jane Palmer, RN; Barbara Peric, MD; Susana Puig, MD, PhD; Dirk Schadendorf, MD; Nelleke A. Gruis, PhD; Julia Newton-Bishop, MD; Yvonne Brandberg, PhD; for the Melanoma Genetics Consortium (GenoMEL)

Objective: To examine the frequency and correlates of skin examination behaviors in an international sample of individuals at varying risk of developing melanoma.

Design: A cross-sectional, web-based survey.

Setting: Data were collected from the general population over a 20-month period on behalf of the Melanoma Genetics Consortium (GenoMEL).

Participants: A total of 8178 adults from Northern (32%), Central (33%), and Southern (14%) Europe, Australia (13%), and the United States (8%).

Main Outcome Measures: Self-reported frequency of skin self-examination (SSE) and clinical skin examination (CSE).

Results: After adjustment for age and sex, frequency of skin examination was higher in both Australia (odds ratio [OR]$_{SSE}$=1.80 [99% CI, 1.49-2.18]; OR$_{CSE}$=2.68 [99% CI, 2.23-3.23]) and the United States (OR$_{SSE}$=2.28 [99% CI, 1.76-2.94]; OR$_{CSE}$=3.39 [99% CI, 2.60-4.18]) than in the 3 European regions combined. Within Europe, participants from Southern Europe reported higher rates of SSE than those in Northern Europe (OR$_{SSE}$=1.61 [99% CI, 1.31-1.97]), and frequency of CSE was higher in both Central (OR$_{CSE}$=1.47 [99% CI, 1.22-1.78]) and Southern Europe (OR$_{CSE}$=3.46 [99% CI, 2.78, 4.31]) than in Northern Europe. Skin examination behavior also varied according to melanoma history: participants with no history of melanoma reported the lowest levels of skin examination, while participants with a previous melanoma diagnosis reported the highest levels. After adjustment for region, and taking into account the role of age, sex, skin type, and mole count, engagement in SSE and CSE was associated with a range of psychosocial factors, including perceived risk of developing melanoma; perceived benefits of, and barriers to, skin examination; perceived confidence in one's ability to engage in screening; and social norms. In addition, among those with no history of melanoma, higher cancer-related worry was associated with greater frequency of SSE.

Conclusions: Given the strong association between psychosocial factors and skin examination behaviors, particularly among people with no history of melanoma, we recommend that greater attempts be made to integrate psycho-education into the fabric of public health initiatives and clinical care, with clinicians, researchers, and advocacy groups playing a key role in guiding individuals to appropriate tools and resources.

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Author Affiliations are listed at the end of this article.
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SKIN CANCER (INCLUDING MALIGNANT melanoma, squamous cell carcinoma, and basal cell carcinoma) is a common disease in all European-derived populations and has shown increases in incidence over the last century.[1,2] Incidence, however, varies by latitude and altitude, with regions closer to the equator and higher in altitude generally having higher rates of skin cancer.[3] Regular *clinical skin examination* (CSE) (visual inspection of the whole body conducted by a dermatologist or other health care provider) and *skin self-examination* (SSE) (careful and deliberate self-conducted examination of all areas of the skin for changes in spots or moles) are believed to increase the chances of detecting thinner, more curable melanoma lesions among individuals at high risk of developing this disease.[4,5] To our knowl-

edge, however, there have been no controlled trials assessing the effect of CSE on melanoma mortality, and there is only 1 study supporting the association between SSE and reduced melanoma mortality.[6]

Studies examining the frequency of SSE show that between 23% and 61% of individuals in the general community report engaging in SSE at least annually, while the annual prevalence of self-reported CSE in the general community ranges from 8% to 21%.[7] From a psychological perspective, the emotional, attitudinal, environmental, and social factors that may facilitate or impede performance of skin examination need to be better understood. Of particular interest is the question of whether cancer-related worry facilitates or inhibits engagement in health behaviors. Several competing hypotheses have been presented regarding how cancer-related worry may be associated with cancer screening and other preventive actions.[8] It is not clear how skin examination (SSE or CSE) may be influenced by a person's emotional responses to the threat of skin cancer, particularly among those with a personal or family history of the disease.

The aims of the present study, therefore, were 3-fold: (1) to examine the frequency of self-reported SSE and CSE in an international sample of individuals at varying risk of developing melanoma based on reported personal or family history of the disease; (2) to identify the psychosocial factors associated with performance of these health behaviors; and (3) to test the specific association between skin cancer–related worry and skin examination.

METHODS

STUDY SAMPLE AND RECRUITMENT

The study methodology has been described in detail elsewhere.[9,10] In brief, recruitment took place between January 2007 and September 2008 using a web-based survey designed specifically for the study. Recruiting centers were located in 12 countries (Australia, Germany, Israel, Italy, Latvia, the Netherlands, Poland, Slovenia, Spain, Sweden, the United Kingdom, and the United States) participating in the Melanoma Genetics Consortium (GenoMEL). In participating countries, recruitment was encouraged by press releases, mailed flyers, e-mail "cascades," and links from other websites. Potential participants were encouraged to visit the GenoMEL website (www.genomel.org), where they could find more information regarding the study and a questionnaire available in 10 different languages. Individuals younger than 16 years were advised to discuss their participation with an adult before completing the questionnaire. The study was approved by the relevant ethics committees.

MEASURES

The web-based questionnaire had a Flash-based interface (Adobe Systems Incorporated) feeding into a single MySQL database (http://www.mysql.com/) with technical realization by New Knowledge Directorate Ltd (www.nkd.org.uk). Efforts were made to make the survey as user-friendly as possible, incorporating color graphics, photographs, and varying ways of indicating response alternatives. A uniform protocol was used in the translation of the questionnaire into different languages. Each questionnaire translation was carried out by 2 independent bilingual professionals and additionally tested for clarity and readability by a small group of lay people. In addition to demographic questions, the survey consisted of 3 key sections developed on the basis of previous work: objective risk factors (ie, factors with a documented association with the development of melanoma), behavioral factors (of which only skin examination behaviors will be reported here), and psychosocial factors. A full list of the questionnaire items can be obtained on request from GenoMEL (info@genomel.org).

Objective risk factors were assessed using 10 multiple-choice items eliciting data on the characteristics related to increased risk for melanoma. For the present study, we used the information regarding personal history of melanoma, family history of melanoma (defined as having at least 1 first-degree relative diagnosed as having melanoma), skin type (according to the Fitzpatrick skin type classification[11]), and number of moles (larger than 6 mm or 1/4 inch).

In addition, participants were also categorized into 5 regions of current residence. These data were captured by asking participants to first indicate on an interactive, web-based map the region in which they currently lived. Next, participants specified the country (selected from a drop-down list) and then town or city in which they currently lived (specified in open-response format). On completion of data collection, the following categories were formed: Northern Europe (Sweden and Latvia), Central Europe (Germany, Poland, the United Kingdom, and the Netherlands), Southern Europe and Israel (Spain, Italy, Slovenia, and Israel), the United States, and Australia. The regional categories were based on latitude in Europe and cultural aspects in Australia and the United States. Both Australia and the United States have a higher incidence of melanoma than the European countries, and both countries have a longer history of public health campaigns targeting melanoma awareness and prevention. Israel was included in the Southern European group owing to geographic proximity.

Skin examination behaviors were assessed using 3 items: frequency of CSE (ie, frequency of visits to a general practitioner or dermatologist for a full-body skin examination), frequency of thorough SSE for changes or signs of skin cancer, and thorough SSE with the assistance of a partner.[12-14] Both of the items assessing SSE (ie, self-SSE and partner-assisted SSE) were used in the categorization of SSE frequency. To capture the full range of possible behaviors, a broad range of response options was provided for each item (ie, daily, weekly, monthly, twice a year, yearly, less often than yearly, or never).

PSYCHOSOCIAL FACTORS

A range of health beliefs and perceptions were assessed, according to a social-cognitive approach. Items and scales were developed on the basis of extensive previous published research, well-established theoretical models in health psychology (eg, the Health Belief Model[15]), as well as measures previously developed, tested and implemented in research at the Department of Psychology, University of Utah, United States. Variables included:

1. *Perceived risk of developing melanoma.*[16,17] Participants rated their lifetime risk of developing melanoma (or another melanoma for those with a previous diagnosis) relative to an average person of the same age, sex, and skin type, using a Likert scale from 0 (far below average) to 4 (far above average). Participants also rated their chances of developing melanoma in relation to 5 other health threats (heart disease, lung cancer, breast cancer, depression, and road traffic injury). A third item asked participants to indicate the level of risk that sun exposure posed to their health. Response options for the latter 2 items ranged from 0 (very high risk) to 4 (very low risk). A sum-

mary score was calculated for the 3 items ($\alpha_{English}=0.73$; $\alpha_{Dutch}=0.69$; $\alpha_{German}=0.64$; $\alpha_{Hebrew}=0.71$; $\alpha_{Italian}=0.61$; $\alpha_{Latvian}=0.71$; $\alpha_{Polish}=0.69$; $\alpha_{Slovenian}=0.68$; $\alpha_{Spanish}=0.64$; and $\alpha_{Swedish}=0.77$) and used in analyses.

2. *Perceived severity of melanoma* was assessed using 3 items to identify beliefs about the severity of consequences associated with melanoma, the ease with which melanoma can be cured, and the degree to which melanoma is perceived as a health threat ($\alpha_{English}=0.61$; $\alpha_{Dutch}=0.74$; $\alpha_{German}=0.68$; $\alpha_{Hebrew}=0.58$; $\alpha_{Italian}=0.65$; $\alpha_{Latvian}=0.77$; $\alpha_{Polish}=0.67$; $\alpha_{Slovenian}=0.60$; $\alpha_{Spanish}=0.62$; and $\alpha_{Swedish}=0.74$).[18] Response options ranged from 0 (strongly disagree) to 4 (strongly agree).

3. *Perceived benefits of, and barriers to, CSE* were each assessed using 3 items.[18] Possible benefits of CSE included early detection of suspected lesions, having peace of mind about one's health, and living a long and healthy life ($\alpha_{English}=0.65$; $\alpha_{Dutch}=0.61$; $\alpha_{German}=0.56$; $\alpha_{Hebrew}=0.64$; $\alpha_{Italian}=0.68$; $\alpha_{Latvian}=0.62$; $\alpha_{Polish}=0.60$; $\alpha_{Slovenian}=0.64$; $\alpha_{Spanish}=0.63$; and $\alpha_{Swedish}=0.64$). Possible barriers to CSE included time and financial costs, feeling uncomfortable or embarrassed, and feeling worried by CSE. Response options ranged from 0 (strongly disagree) to 4 (strongly agree).

4. *Perceived benefits of, and barriers to, SSE* were each assessed using 3 items.[18,19] Possible benefits of SSE included early detection of skin changes, feeling in control of one's health, and having good overall health ($\alpha_{English}=0.80$; $\alpha_{Dutch}=0.67$; $\alpha_{German}=0.79$; $\alpha_{Hebrew}=0.78$; $\alpha_{Italian}=0.77$; $\alpha_{Latvian}=0.79$; $\alpha_{Polish}=0.74$; $\alpha_{Slovenian}=0.71$; $\alpha_{Spanish}=0.78$; and $\alpha_{Swedish}=0.70$). Possible barriers to SSE were feeling worried by SSE, difficulties with practical aspects of SSE, and preference for clinical skin examination. Response options ranged from 0 (strongly disagree) to 4 (strongly agree).

5. *Self-efficacy for SSE* was assessed using a single item to identify participants' belief or confidence in their ability to detect a malignant skin lesion at an early stage.[18] Response options ranged from 0 to 4, with higher scores indicating greater self-efficacy.

6. *Skin cancer–related worry* was assessed using 3 items adapted from previous work.[20] Items assessed worry and fear in relation to the thought of developing skin cancer (eg, "the possibility of one day developing skin cancer worries me") ($\alpha_{English}=0.69$; $\alpha_{Dutch}=0.56$; $\alpha_{German}=0.72$; $\alpha_{Hebrew}=0.70$; $\alpha_{Italian}=0.68$; $\alpha_{Latvian}=0.63$; $\alpha_{Polish}=0.68$; $\alpha_{Slovenian}=0.56$; $\alpha_{Spanish}=0.71$; and $\alpha_{Swedish}=0.66$), with response options ranging from 0 (strongly disagree) to 4 (strongly agree).

7. *Social norms* were assessed using 2 items asking participants to estimate the proportion of their family and friends who currently practice skin examination ($\alpha_{English}=0.73$; $\alpha_{Dutch}=0.84$; $\alpha_{German}=0.84$; $\alpha_{Hebrew}=0.85$; $\alpha_{Italian}=0.62$; $\alpha_{Latvian}=0.72$; $\alpha_{Polish}=0.80$; $\alpha_{Slovenian}=0.83$; $\alpha_{Spanish}=0.78$; and $\alpha_{Swedish}=0.79$). Response options ranged from 0 (none) to 4 (all), with an additional option to indicate uncertainty.[18]

DATA ANALYSIS

Data were analyzed using Prediction Application Software (PASW) Statistics 17.0. Differences in SSE and CSE according to age, sex, melanoma history, and region were examined using Pearson χ^2 tests. For the bivariate analyses, Spearman rank correlation coefficients (r_s) were used to examine associations between skin examination behaviors and psychosocial variables. To assess determinants of CSE and SSE, 6 separate multivariate logistic regression analyses were carried out, with region included as a covariate in all regression models. This allowed examination of potential differences in determinants according to melanoma history (ie, no history, family history, personal history).

The rationale for (1) assessing the 3 melanoma history groups separately and (2) using different outcome measures for the 3 groups was based on clinical relevance[21] and on expected differences in skin examination behaviors between groups. For SSE behaviors, the outcome variable was transformed into 3 dichotomous variables, categorizing participants into those who reported engagement in SSE ever (yes/no), at least once per year (yes/no), and at least once per month (yes/no). The same transformation was undertaken for CSE. To facilitate comparisons between continuous predictor variables, scores were standardized into z scores, with a mean of 0 and an SD of 1.

To examine the potential linear or curvilinear association between skin cancer–related worry and skin examination, skin cancer–related worry scores were divided into 3 equally sized categories representing low, moderate, or high levels of worry. Since level of worry varied between groups with different history of melanoma, cutoff scores were based on score distribution within each group, with equal numbers of respondents in each category. Finally, to examine potential regional differences in the association between psychosocial factors and skin examination behaviors, separate logistic regression analyses were carried out for each region among those with no history of melanoma only. Outcome and predictor variables were treated as previously described.

RESULTS

RESPONSE RATE AND SAMPLE CHARACTERISTICS

During the 20-month study recruitment period, the GenoMEL website received a total of approximately 58 110 unique visits. This included visits to the study questionnaire as well as visits to a range of other resources and materials featured on the website. A total of 11 403 individuals accessed the questionnaire during this period. Of these, 220 respondents were excluded owing to age (ie, individuals younger than 15 years were excluded owing to stipulation by the ethics committees) or missing data on sex. Of the remaining 11 183 participants, 8178 (73%) successfully completed at least 80% of items in the web-based questionnaire, with 32% of these respondents from Northern Europe, 33% from Central Europe, 14% from Southern Europe and Israel, 13% from Australia, and 8% from the United States. Across regions, the mean (SD) age of the sample ranged from 35.0 (14.0) years in Australia to 42.5 (12.6) years in the United States. Seventy-three percent of the sample were women, and 27% were men. A detailed description of the demographic characteristics of the study sample has been reported previously.[9]

SKIN EXAMINATION BEHAVIORS

Frequency of skin examination was strongly associated with melanoma history; participants with a personal history of melanoma reported the highest rates of SSE ($\chi^2_{SSE}=304.3$, $P<.001$) and CSE ($\chi^2_{CSE}=71.8$, $P<.001$) compared with those with a family history or no history of melanoma (**Table 1**). Among respondents with no history of melanoma, SSE was more frequently reported by women than men and was also more common among older than younger participants. Similarly, CSE was also

Table 1. Frequency of Skin Self-examination and Clinical Skin Examination According to Age, Sex, and Melanoma History

Characteristic	Melanoma History, No. (%)								
	No History			Family History			Previous Melanoma		
	Ever	Yearly	Monthly	Ever	Yearly	Monthly	Ever	Yearly	Monthly
Skin Self-examination									
Sex									
Men	1267 (67.1)	947 (50.2)	530 (28.1)	99 (86.1)	82 (71.3)	42 (36.5)	153 (96.2)	142 (89.3)	118 (74.2)
Women	3531 (69.6)	2690 (53.0)	1557 (30.7)	369 (86.4)	316 (74.0)	186 (43.6)	379 (95.5)	364 (91.7)	298 (75.1)
P value	<.05	<.05	<.05	NS	NS	NS	NS	NS	NS
Age, y									
<25	1024 (60.1)	757 (44.4)	457 (26.8)	72 (82.8)	58 (66.7)	31 (35.6)	22 (95.7)	18 (78.3)	13 (56.5)
25-30	843 (70.3)	648 (54.0)	345 (28.8)	62 (91.2)	53 (77.9)	26 (38.2)	31 (100.0)	30 (96.8)	24 (77.4)
31-40	1310 (70.9)	975 (52.8)	534 (28.9)	120 (84.5)	104 (73.2)	60 (42.3)	140 (96.6)	135 (93.1)	109 (75.2)
41-50	784 (71.9)	613 (56.2)	361 (33.1)	94 (82.5)	78 (68.4)	44 (38.6)	171 (96.1)	163 (91.6)	137 (77.0)
>50	837 (74.8)	644 (57.6)	390 (34.9)	120 (91.6)	105 (80.2)	67 (51.1)	168 (93.9)	160 (89.4)	133 (74.3)
P value	<.001	<.001	<.001	NS	NS	NS	NS	NS	NS
Clinical Skin Examination									
Sex									
Men	610 (32.2)	285 (15.1)	14 (0.7)	60 (52.6)	37 (32.5)	1 (0.9)	145 (92.4)	131 (83.4)	14 (8.9)
Women	1577 (31.1)	708 (14.0)	14 (0.3)	259 (60.1)	173 (40.1)	3 (0.7)	355 (91.5)	332 (85.6)	37 (9.5)
P value	NS	NS	NS	NS	NS	NS	NS	NS	NS
Age, y									
<25	395 (23.2)	175 (10.3)	8 (0.5)	44 (50.0)	22 (25.0)	1 (1.1)	21 (95.5)	19 (86.4)	4 (18.2)
25-30	388 (32.3)	173 (14.4)	5 (0.4)	40 (59.7)	28 (41.8)	0	26 (89.7)	25 (86.2)	3 (10.3)
31-40	609 (32.9)	249 (13.4)	11 (0.6)	89 (62.2)	59 (41.3)	0	127 (90.7)	121 (86.4)	19 (13.6)
41-50	370 (33.7)	167 (15.2)	2 (0.2)	72 (62.6)	46 (40.0)	2 (1.7)	164 (92.7)	152 (85.9)	15 (8.5)
>50	425 (38.2)	229 (20.6)	2 (0.2)	74 (56.1)	55 (41.7)	1 (0.8)	162 (91.5)	146 (82.5)	10 (5.6)
P value	<.001	<.001	NS	NS	NS	NS	NS	NS	NS

Abbreviation: NS, not significant.
[a] Please note that the frequencies reported in this table do not sum to the total study sample size because there were some participants who never engaged in skin self-examination or clinical skin examination, and in a small number of cases data were missing.

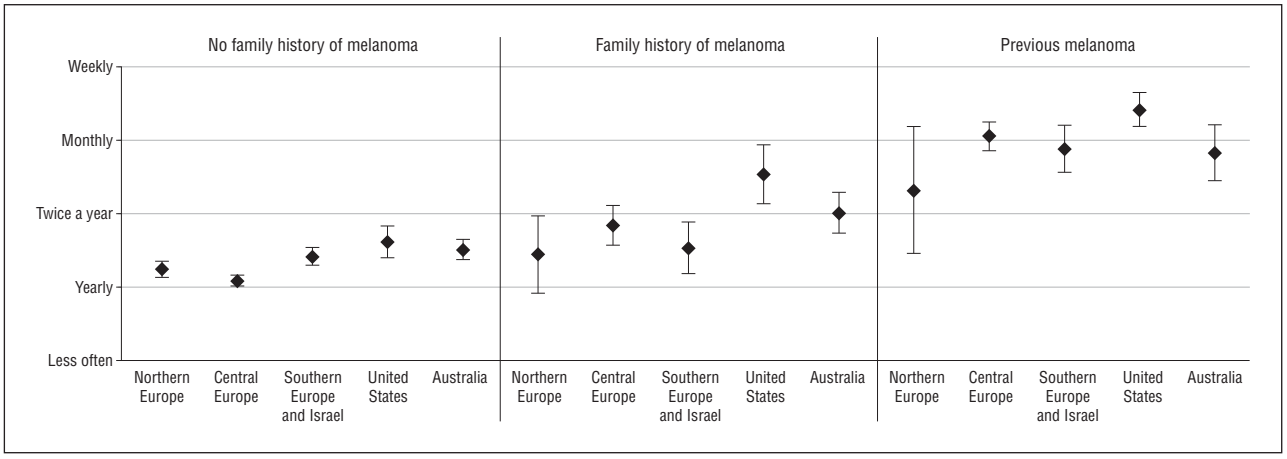

Figure 1. Mean reported frequency of skin self-examination (SSE), including 95% CIs, according to region and adjusted for age and sex distribution. Minimum score, 0 (never engage in SSE); maximum score, 6 (daily engage in SSE).

more common among older participants. Age and sex differences in frequency of reported skin examination were not found for those with a personal or family history of melanoma.

Overall, reported performance of SSE and CSE was highest in the United States and Australia (**Figure 1** and **Figure 2**). After adjusting for age and sex, and using Europe as the referent (combining Northern, Southern, and Central Europe), we found that the frequency of skin examination was higher in both Australia (OR_{SSE}=1.80 [99% CI, 1.49-2.18]; OR_{CSE}=2.68 [99% CI, 2.23-3.23]) and the United States (OR_{SSE}=2.28 [99% CI, 1.76-2.94]; OR_{CSE}=3.39 [99% CI, 2.60-4.18]). Within Europe, with Northern Europe serving as the referent, participants from Southern Europe reported higher rates of SSE (OR_{SSE}=1.61 [99% CI, 1.31-1.97]), and frequency of CSE was higher in both Central (OR_{CSE}=1.47 [99% CI, 1.22-1.78]) and Southern Europe (OR_{CSE}=3.46 [99% CI, 2.78-4.31]). Furthermore, with Central Europe serving as the referent, the rates of SSE and CSE reported in Southern Europe were higher (OR_{SSE}=1.44 [99% CI, 1.21-1.72]; OR_{CSE}=2.36 [99% CI, 1.97-2.28]).

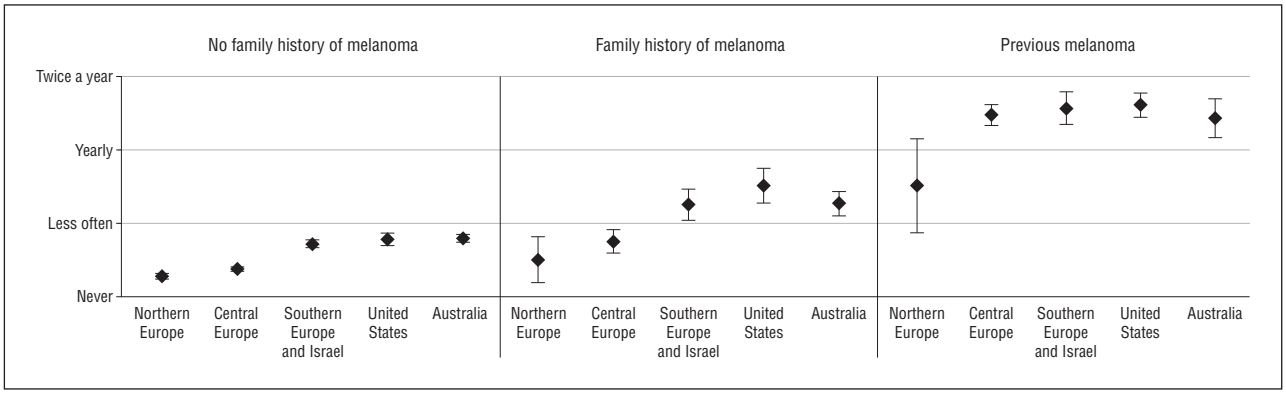

Figure 2. Mean reported frequency of clinical skin examination (CSE), including 95% CIs, according to region and adjusted for age and sex distribution. Minimum score, 0 (never engage in CSE); maximum score, 6 (daily engage in CSE).

Table 2. Descriptive Statistics and Correlations Between Psychosocial Factors and Frequency of Skin Examination According to Melanoma History

	Score, Mean (SD) (Range)			Spearman ρ	
Characteristic[a]	No History of Melanoma	Family History of Melanoma	Personal History of Melanoma	SSE	CSE
Perceived risk	1.95 (0.74) (0-4)	2.70 (0.75) (0.5-4)	3.41 (0.57) (0.2-4)	.25[b]	.36[b]
Skin cancer–related worry	2.78 (0.70) (0-4)	3.16 (0.68) (0.33-4)	3.48 (0.65) (1-4)	.22[b]	.26[b]
Perceived severity	3.18 (0.60) (0-4)	3.44 (0.57) (0-4)	3.48 (0.56) (1.33-4)	.16[b]	.17[b]
Perceived benefits of SSE	2.79 (0.69) (0-4)	2.98 (0.67) (0-4)	3.24 (0.74) (0-4)	.38[b]	NA
Perceived benefits of CSE	2.70 (0.73) (0-4)	2.92 (0.71) (0-4)	3.09 (0.81) (0-4)	NA	.29[b]
Perceived barriers to SSE	2.15 (0.76) (0-4)	2.16 (0.79) (0-4)	2.09 (0.84) (0-4)	–.19[b]	NA
Perceived barriers to CSE	1.64 (0.78) (0-4)	1.38 (0.86) (0-4)	1.16 (0.77) (0-4)	NA	–.32[b]
Self-efficacy for early detection	2.28 (1.14) (0-4)	2.58 (1.02) (0-4)	3.00 (1.07) (0-4)	.24[b]	.24[b]
Social norms for skin examination	1.12 (0.96) (0-4)	1.58 (0.99) (0-4)	1.49 (0.95) (0-4)	.32[b]	.31[b]

Abbreviation: CSE, clinical skin examination; NA, not applicable; SSE, skin self-examination
[a] For all psychosocial items, response options ranged from 0 to 4.
[b] $P < .001$.

ASSOCIATION BETWEEN OBJECTIVE RISK FACTORS, PSYCHOSOCIAL FACTORS, AND SKIN EXAMINATION BEHAVIORS

All psychosocial variables were positively correlated with both SSE and CSE, except for perceived barriers to skin examination, which, as expected, were negatively correlated with frequency of reported skin examination (**Table 2**).

To assess determinants of SSE, separate logistic regression analyses were carried out for each of the 3 melanoma history groups, with all models including region as a covariate (**Table 3**). For participants with *no history of melanoma*, the likelihood of engagement in SSE at least once per year increased among those with 1 or 2 or more than 5 moles larger than 6 mm in diameter and among those with greater perceived risk of developing skin cancer, perceived severity of skin cancer, perceived benefits of SSE, self-efficacy, and social norms. Greater perceived barriers to SSE, however, were associated with a decreased likelihood of SSE. Furthermore, the odds of SSE were greater among those with higher levels of skin cancer–related worry. For participants with a *family history of melanoma,* the likelihood of SSE increased with greater perceived benefits of SSE, greater self-efficacy, and greater social norms for SSE. Finally, for participants with a *personal history of melanoma*, the likelihood of reporting monthly SSE increased with greater perceived benefits of SSE only.

Separate logistic regression analyses were also carried out to identify determinants of CSE in each of the 3 melanoma history groups (**Table 4**). For participants with *no history of melanoma*, the likelihood of ever having had a CSE increased among those aged between 25 and 40 years and those older than 50 years. The likelihood of engagement in CSE also increased with increas-

Table 3. Association Between SSE and Age, Sex, Skin Type, Mole Count, and Psychosocial Factors Among Persons With Varying Melanoma Histories[a]

Characteristic	OR (99% CI) for SSE[b]		
	No History of Melanoma (Annual SSE)	Family History of Melanoma (Annual SSE)	Personal History of Melanoma (Monthly SSE[b])
Sex			
Men	1 [Referent]	1 [Referent]	1 [Referent]
Women	1.02 (0.84-1.24)	1.00 (0.44-2.31)	0.70 (0.33-1.48)
Age, y			
<25	1 [Referent]	1 [Referent]	1 [Referent]
25-30	1.26 (0.98-1.63)	1.21 (0.33-4.38)	2.55 (0.40-16.34)
31-40	1.12 (0.90-1.42)	0.80 (0.28-2.32)	2.48 (0.55-11.18)
41-50	1.16 (0.88-1.53)	0.85 (0.26-2.77)	2.74 (0.61-12.25)
>50	1.31 (0.99-1.73)	1.17 (0.37-3.75)	2.22 (0.49-10.13)
Skin type			
1 or 2	1 [Referent]	1 [Referent]	1 [Referent]
3	1.03 (0.86-1.24)	0.56 (0.26-1.22)	0.88 (0.43-1.79)
4	1.03 (0.73-1.46)	1.40 (0.24-8.21)	1.07 (0.20-5.82)
Moles >6 mm, No.			
None	1 [Referent]	1 [Referent]	1 [Referent]
1-2	1.33 (1.09-1.61)[c]	0.93 (0.39-2.21)	0.98 (0.36-2.67)
3-5	1.28 (0.99-1.64)	1.32 (0.46-3.82)	0.79 (0.29-2.16)
>5	1.52 (1.14-2.02)[c]	3.12 (0.98-9.94)	2.04 (0.78-5.37)
Perceived risk	1.60 (1.41-1.82)[c]	1.69 (0.95-3.03)	1.61 (0.84-3.09)
Perceived severity	1.20 (1.04-1.39)[c]	1.07 (0.57-2.02)	1.48 (0.77-2.85)
Worry			
Low	1 [Referent]	1 [Referent]	1 [Referent]
Moderate	1.21 (0.98-1.49)	1.47 (0.63-3.43)	0.64 (0.26-1.61)
High	1.48 (1.14-1.92)[c]	1.82 (0.51-6.51)	0.93 (0.37-2.30)
Perceived benefits of SSE	2.05 (1.79-2.36)[c]	1.90 (1.06-3.40)[d]	1.84 (1.18-2.86)[c]
Perceived barriers of SSE	0.57 (0.50-0.65)[c]	0.75 (0.43-1.32)	0.83 (0.54-1.27)
Self-efficacy	1.23 (1.13-1.34)[c]	1.60 (1.10-2.32)[c]	1.04 (0.76-1.42)
Social norms	1.73 (1.57-1.91)[c]	1.83 (1.19-2.80)[c]	1.29 (0.89-1.86)

Abbreviations: OR, odds ratio; SSE, skin self-examination.

[a]The region in which participants were living (ie, Northern, Central, or Southern Europe; the United States; or Australia) was included as a covariate in all models.

[b]The rationale for assessing the 3 melanoma history groups separately and using a different outcome measure for those with a personal history of melanoma was based on clinical relevance.

[c]$P < .001$.

[d]$P < .01$.

ing number of moles larger than 6 mm in diameter and with greater perceived risk, perceived benefits of CSE, self-efficacy, and social norms. Greater perceived barriers to CSE were associated with a reduction in the likelihood of CSE. For participants with a *family history of melanoma*, the likelihood of annual CSE increased with greater perceived benefits of CSE and social norms and decreased with greater perceived barriers to CSE. Furthermore, participants with a *family history of melanoma* were more than 3 times as likely to engage in annual CSE if they had 5 or more moles larger than 6 mm in diameter. For participants with a *personal history of melanoma*, greater perceived severity and greater self-efficacy increased the likelihood of reporting annual CSE.

The patterns of association between psychosocial factors and SSE and CSE were identical across regions; however, some of the weaker associations did not reach statistical significance. In particular, cancer-related worry was significantly associated with SSE in Northern Europe only. The association between perceived severity and SSE did not reach statistical significance in Northern Europe, the United States, or Australia, and self-efficacy was associated with SSE and CSE in Central Europe only. The association between CSE and perceived benefits of CSE was not significant in Northern Europe and Australia, and perceived risk and social norms did not reach statistical significance in the United States model.

COMMENT

A number of striking differences were found in the prevalence and correlates of skin examination behaviors reported by participants from different regions and with varying levels of experience with melanoma. Overall, 53% of women with no history of melanoma reported engaging in SSE at least once per year compared with 74% of women with a family history and 92% of women with a previous melanoma diagnosis. A similar pattern of results was found for men. One-third of women and men with no history of melanoma had never engaged in SSE compared with approximately 4% of participants with a personal history of the disease. The frequency of SSE reported in this study was generally higher than that reported in previous studies,[7] and this may be attributed to a potential bias of ascertainment of interested or mo-

Table 4. Association Between CSE and Age, Sex, Skin Type, Mole Count, and Psychosocial Factors Among Persons With Varying Melanoma Histories[a]

Characteristic	OR (99% CI) for CSE[b]		
	No History of Melanoma (Ever Having CSE[b])	Family History of Melanoma (Annual CSE)	No History of Melanoma (Annual CSE)
Sex			
Men	1 [Referent]	1 [Referent]	1 [Referent]
Women	1.04 (0.85-1.27)	1.62 (0.74-3.53)	0.77 (0.30-1.95)
Age, y			
<25	1 [Referent]	1 [Referent]	1 [Referent]
25-30	1.40 (1.06-1.85)[c]	2.71 (0.77-9.49)	0.46 (0.04-6.21)
31-40	1.35 (1.05-1.74)[c]	1.54 (0.53-4.54)	0.88 (0.09-8.61)
41-50	1.13 (0.84-1.53)	1.81 (0.59-5.56)	0.87 (0.10-7.83)
>50	1.42 (1.05-1.92)[c]	1.47 (0.48-4.45)	0.38 (0.04-3.53)
Skin type			
1 or 2	1 [Referent]	1 [Referent]	1 [Referent]
3	1.01 (0.83-1.22)	0.83 (0.42-1.64)	0.94 (0.39-2.28)
4	1.38 (0.95-2.01)	0.61 (0.11-3.38)	0.81 (0.11-5.94)
Moles >6 mm, No.			
None	1 [Referent]	1 [Referent]	1 [Referent]
1-2	1.59 (1.28-1.97)[d]	0.60 (0.25-1.44)	0.31 (0.09-1.07)
3-5	2.22 (1.71-2.89)[d]	1.46 (0.56-3.77)	0.53 (0.15-1.90)
>5	3.51 (2.64-4.66)[d]	3.72 (1.47-9.39)[d]	1.68 (0.47-6.07)
Perceived risk	1.39 (1.21-1.59)[d]	1.54 (0.91-2.60)	2.11 (0.99-4.49)
Perceived severity	1.04 (0.88-1.21)	0.84 (0.46-1.55)	2.42 (1.14-5.15)[c]
Worry			
Low	1 [Referent]	1 [Referent]	1 [Referent]
Moderate	1.19 (0.95-1.50)	0.96 (0.43-2.14)	0.79 (0.26-2.38)
High	1.16 (0.88-1.52)	1.61 (0.58-4.53)	0.92 (0.31-2.75)
Perceived benefits of CSE	1.42 (1.24-1.64)[d]	1.64 (1.01-2.67)[c]	1.08 (0.64-1.81)
Perceived barriers to CSE	0.54 (0.48-0.62)[d]	0.45 (0.29-0.70)[d]	0.66 (0.39-1.14)
Self-efficacy	1.14 (1.05-1.24)[d]	1.06 (0.76-1.48)	1.61 (1.12-2.32)[d]
Social norms	1.45 (1.31-1.59)[d]	1.43 (1.00-2.04)[c]	1.46 (0.92-2.29)

Abbreviations: CSE, clinical skin examination; OR, odds ratio.

[a] The region in which participants were living (ie, Northern, Central, or Southern Europe; the United States; or Australia) was included as a covariate in all models.

[b] The rationale for assessing the 3 melanoma history groups separately and using a different outcome measure for those with a personal history of melanoma was based on clinical relevance.

[c] $P < .01$.

[d] $P < .001$.

tivated participants. It is also possible that differences between the present findings and those reported previously may be accounted for, to some degree, by age differences: the present study comprised a relatively young community-based sample. However, it seems unlikely that a younger sample would account for higher rates of SSE than previous studies. Moreover, comparisons with previous studies are difficult because they do not take into account the potential contribution of historical effects (ie, differences in skin examination behaviors over time)[22] or variations between studies in terms of the measurement of reported skin examination behaviors.[7]

As expected, participants with no history of melanoma reported the lowest levels of annual CSE (15% and 14% for men and women, respectively), compared with those with a family history (33% and 40%, respectively), and those with a personal history (83% and 86%, respectively). Studies suggest a range of different reasons for low CSE uptake, including a lack of time, forgetfulness, a perceived lack of suspect lesions, and the belief that CSE is not personally relevant or important.[23] Surprisingly, we did not find sex differences in CSE behavior. This is interesting given that most studies examining CSE have reported lower rates of uptake among men.[23-25] A lack of sex differences in the present study may be attributed, at least to some degree, to the method of participant recruitment. Most published studies investigating the prevalence of CSE have sampled skin cancer clinic attendees. Most of these studies have found that women are more likely than men to present for CSE.[23-25] In contrast, studies assessing CSE uptake in the community rarely report a sex difference in frequency of CSE.[26]

This study is also unique in its examination of reported SSE and CSE practices across a range of different regions. After adjusting for age and sex, the highest rates of SSE and CSE were found in Australia and the United States, with participants from Northern Europe reporting the lowest rates of CSE and lower rates of SSE than participants in Southern Europe. These variations between regions are difficult to interpret in the context of the present study, and a range of factors may contribute to this pattern of results, including differences between regions in health care systems, views on population-based screening for melanoma, sociocultural beliefs and practices, public education and media campaigns about skin cancer and the importance of early detection, and

environmental and behavioral factors such as latitude and patterns of sun exposure. The variation in skin examination behavior between regions is also difficult to interpret owing to the varying recruitment strategies used in different countries, with some study centers using media-based recruitment strategies (eg, Australia), while others promoted the study via e-mail cascades (eg, the United Kingdom and the Netherlands) or adopted a mail-based approach (eg, Sweden). However, despite these interpretative difficulties, the present study provides an empirical basis for greater exploration of the mechanisms influencing regional or cross-cultural differences in skin examination, with a view to generating data that will guide the development of appropriate and culturally sensitive skin cancer–related health promotion programs and resources in different regions.

The findings also provide strong support for a psychological approach to understanding differences in skin examination behaviors across various risk groups. Among individuals with no history of melanoma, greater frequency of SSE was associated with greater perceived risk of developing melanoma, greater perceived severity of the consequences of melanoma, greater confidence in one's ability to perform SSE (ie, self-efficacy), more positive social norms, and greater perceived benefits of, and fewer perceived barriers to, SSE, with similar findings for CSE. The relative strengths of the associations between each of these psychological variables and skin examination behavior were comparable, highlighting the complexity of health behavior (and health behavior change) among individuals in the community, as well as the diversity of attitudes, beliefs, and skills that may determine whether an individual engages in skin examination. Higher levels of skin cancer–related worry were also found to increase the likelihood of SSE, suggesting that fear of developing skin cancer may motivate, as opposed to inhibit, SSE, but only among those with no history of melanoma. Why this association was not found for those with a personal or family history of melanoma is unclear, and more work is required to better understand the association between emotional responses to skin cancer and skin examination behaviors in individuals at greater risk of melanoma. Of course, it is also likely that the performance of SSE and CSE influences psychological, social, and cultural attitudes and beliefs about skin cancer and skin examination, and future prospective studies are needed to further elucidate the nature of these complex relationships.

Fewer psychological variables were found to be associated with reported SSE and CSE behaviors among those with a personal or family history of melanoma. *Perceived benefits of SSE*, however, was a common determinant of SSE across all groups, indicating the importance of subjective beliefs and perceptions about screening, independent of the role of objective risk factors such as melanoma history, age, skin type, and mole count. Differences in the patterns of association between psychosocial factors and skin examination behaviors according to melanoma history are difficult to understand in this context. One possibility is that personal or family experiences of melanoma may serve as *teachable moments*, defined as life events or transitions that inspire or motivate a person to make significant behavior change(s) to improve their health.[27] The extent to which a melanoma diagnosis may serve as a teachable moment for behavior change may depend on whether it increases perceptions of personal risk and prompts a strong distress response[28]; however, limited evidence for this concept has been found,[14] and the present findings do not appear to support this approach. Another possibility is that physician recommendation may play a strong role in determining performance of skin examination behaviors among those at increased risk. For example, Kasparian et al[29] found that among individuals with a strong family history of melanoma, physician recommendation was one of the strongest determinants of both CSE and SSE. This finding is consistent with the broader cancer literature, which shows that physician recommendation is the single most important predictor of whether an individual has ever had a cancer screening test or has recently practiced screening.[30]

Given the limited available data on cross-cultural and community-based skin examination practices, the findings of the present study make an important contribution to the literature; however, this study is not without its limitations. Due to the cross-sectional study design, the data cannot elucidate the causal direction of associations, nor does this study provide population-based estimates of skin examination behavior, and because the findings are based on self-report, it is not possible to rule out the influence of socially desirable responding. Although efforts were made to standardize the way in which the questionnaires were translated into different languages, psychometric testing was not undertaken. Furthermore, owing to the varying recruitment strategies used in different centers and the predominance of participants from Europe and Australia, conclusions regarding differences between regions are difficult to interpret and should be made with caution. Between 62% (Southern Europe) and 80% (United States) of survey respondents in each region were women, and the mean age of participants varied between 35.0 and 42.5 years, indicating that the study sample comprised a relatively young population, with sex variability between regions. The relatively large proportion of participants with a personal or family history of melanoma also indicates that the recruitment strategy may have appealed to people interested in, or concerned about, skin cancer–related issues. Nevertheless, given the strong association between psychosocial factors and skin examination behaviors found in this study, particularly among people with no history of melanoma, we recommend that greater attempts be made to integrate psycho-educational interventions into the fabric of clinical care, with clinicians, researchers, and advocacy groups playing a key role in guiding individuals to appropriate tools and resources.

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Author Affiliations: School of Women's and Children's Health, Faculty of Medicine, University of New South Wales, Kensington, NSW, Australia (Dr Kasparian); Department of Oncology-Pathology, Karolinska Institutet, Stockholm, Sweden (Drs Bränström and Brandberg); Department of Biostatistics and Epidemiology, University of Pennsylvania, Philadelphia (Drs Bränström and Ka-

netsky); Section of Epidemiology and Biostatistics, Leeds Cancer Research UK Centre, Leeds Institute of Molecular Medicine, University of Leeds, Leeds, England (Drs Chang and Newton-Bishop, Mr Affleck, and Ms Chan); Department of Psychology (Dr Aspinwall) and Huntsman Cancer Institute and Department of Dermatology, School of Medicine (Dr Leachman), University of Utah, Salt Lake City; Center for Human and Clinical Genetics (Dr Tibben) and Department of Dermatology (Drs Bergman and Gruis), Leiden University Medical Center, the Netherlands; Dermatology Department, Sheba Medical Center, Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, Israel (Dr Azizi); Health Promotion Program, School of Public Health, Haifa University, Haifa, Israel (Dr Baron-Epel); Departments of Health Sciences (Dr Battistuzzi) and Internal Medicine and Medical Specialties (Dr Bruno), University of Genoa, Italy; Department of Dermatology, Hospital Clinic Barcelona, Barcelona, Spain (Drs Cuellar and Puig and Ms Gonzalez); International Hereditary Cancer Center, Pomeranian Medical University, Szczecin, Poland (Drs Debniak and Ertmanski); Latvian Biomedical Research and Study Center, Riga, Latvia (Drs Pjanova and Heisele); Skin Cancer Unit, Deutsches Krebsforschungszentrum Stiftung des Öffentlichen Rechts, Heidelberg, Germany (Drs Figl and Schadendorf); Queensland Institute of Medical Research, Brisbane, Australia (Dr Hayward and Ms Palmer); Department of Surgical Oncology, Institute of Oncology, Ljubljana, Slovenia (Drs Hocevar and Peric).

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Correspondence: Nadine A. Kasparian, PhD, School of Women's and Children's Health, Old CCIA Bldg, Level 0, Sydney Children's Hospital, High Street, Randwick, New South Wales 2031, Australia (N.Kasparian@unsw.edu.au).

Author Contributions: Drs Kasparian, Bränström, Chang, Newton-Bishop, and Brandberg and Ms Chan had full access to the study data and take responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Kasparian, Bränström, Affleck, Aspinwall, Gonzalez, Leachman, Palmer, Gruis, Newton-Bishop, and Brandberg. *Acquisition of data:* Kasparian, Bränström, Affleck, Azizi, Baron-Epel, Battistuzzi, Bruno, Chan, Cuellar, Debniak, Pjanova, Ertmanski, Figl, Gonzalez, Hayward, Hocevar, Kanetsky, Leachman, Bergman, Heisele, Palmer, Peric, Puig, Schadendorf, Gruis, Newton-Bishop, and Brandberg. *Analysis and interpretation of data:* Kasparian, Bränström, Chang, Aspinwall, Tibben, Gonzalez, Kanetsky, and Newton-Bishop. *Drafting of the manuscript:* Kasparian, Bränström, Affleck, Debniak, Ertmanski, Gonzalez, and Gruis. *Critical revision of the manuscript for important intellectual content:* Kasparian, Bränström, Chang, Affleck, Aspinwall, Tibben, Azizi, Baron-Epel, Battistuzzi, Bruno, Chan, Cuellar, Pjanova, Figl, Gonzalez, Hayward, Hocevar, Kanetsky, Leachman, Bergman, Heisele, Palmer, Peric, Puig, Schadendorf, Gruis, Newton-Bishop, and Brandberg. *Statistical analysis:* Bränström, Chang, Aspinwall, and Newton-Bishop. *Obtained funding:* Gruis and Newton-Bishop. *Administrative, technical, and material support:* Kasparian, Bränström, Affleck, Battistuzzi, Chan, Pjanova, Ertmanski, Figl, Gonzalez, Hayward, Hocevar, Kanetsky, Heisele, Palmer, Peric, Schadendorf, and Newton-Bishop. *Study supervision:* Brandberg.

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Notable Notes

The Genocide of Individuals With Albinism in Africa

In addition to their everyday struggle with skin cancer, stigma, discrimination, and the resultant isolation associated with such ordeals, individuals with albinism in Africa are also plagued by another, more immediately pressing plight—bounty hunters. Among the many myths and misconceptions surrounding albinism (eg, albinism is contagious, the mother of a child with albinism was impregnated by a white man, intercourse with a woman with albinism will cure human immunodeficiency virus), a notion exists that body parts of people with albinism possess magical powers and medicinal properties.[1] Consequently, during the past decade, more than 100 individuals with albinism have been murdered in Burundi, Tanzania, and other African countries, as their body parts are harvested and sold by witch doctors for thousands of dollars in underground markets.[1] Furthermore, graves of individuals with albinism must often be sealed with cement and buried indoors so that they may be guarded against grave robbers hunting for body parts.

In response to these acts, organizations such as the National Organization for Albinism and Hypopigmentation (NOAH) and Asante Mariamu (named in honor of Mariamu Staford, a Tanzanian woman whose arms were severed by assailants) have lobbied for increased worldwide awareness and intervention. In 2008, Tanzania's President, Jakaya Mrisho Kikwete, vowed to stop the attacks and appointed Al-Shymaa Kway-Geer, a woman with albinism, to Parliament.[2] This was followed by an amendment to the Tanzania Witchcraft Act, which made witchcraft illegal and murder of an individual with albinism a capital offense. Personally inspired by Staford's story, Virginia Congressman Gerry Connolly proposed a resolution aimed at African governmental officials that insisted on swift sentencing for offenders and precautions to prevent future attacks.[3] In March 2010, this legislation (House Resolution 1088) was passed by the US House of Representatives by a vote of 408 to 1.[3] A similar resolution was also passed by the European Parliament in September 2008; however, the local response has been underwhelming, and there have been only a paltry number of convictions.[2]

Mariamu Staford was recently fitted with artificial limbs in the United States, but thousands of individuals with albinism in Africa continue to face persecution. Local campaigns are necessary to debunk falsehoods and to advance social integration. Attainable solar protection supplies and routine ophthalmologic and dermatologic health care are essential owing to the increased risk of blindness and cutaneous carcinomas associated with albinism. Most pressing, worldwide awareness movements, local government intervention, and strict law enforcement are critical to ensure the continued existence of individuals with albinism in Africa.

For more information on how to get involved, one can visit NOAH's "Stop Albino Slaughter" page at http://sas.albinism.org/, and donations can be made online to Asante Mariamu at http://asante-mariamu.org/Asante_Mariamu/Home.html, the Tanzania Albino society at http://tanzaniaalbinosociety.net/, and Hats on for Skin Health at http://hatsonforskinhealth.org/.

Barry Ladizinski, MD
Andres E. Cruz-Inigo, MD
Aisha Sethi, MD

Author Affiliations: Departments of Dermatology, Duke University Medical Center, Durham, North Carolina (Dr Ladizinski), Mayo Clinic, Rochester, Minnesota (Dr Cruz-Inigo), and University of Chicago, Chicago, Illinois (Dr Sethi).
Contact Dr Ladizinski at the Department of Dermatology, Box 2822, Duke University Medical Center, Durham, NC 27710 (barryladizinski@gmail.com).

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