

Examining the Pathways Linking Lower Socioeconomic Status and Advanced Melanoma

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BACKGROUND. Low socioeconomic status (SES) is associated with more advanced melanoma at diagnosis and decreased survival. Exploring the pathways linking lower SES and thicker melanoma will help guide public and professional strategies to reduce deaths. **METHODS.** The authors surveyed 566 newly diagnosed patients at Stanford University Medical Center, Veterans Affairs Palo Alto Health Care System, and University of Michigan. SES was assessed by education level (high school/general education degree or less [HS], associate/technical school degree, or \geq college graduate). All data was obtained by self-report among patients within three months of their diagnosis. **RESULTS.** HS-educated individuals were significantly more likely than college graduates to believe that melanoma was not very serious (odds ratio [OR], 2.90; 95% confidence interval [CI], 1.79-4.71) and were less likely to know the asymmetry, borders (irregular), color (variegated), and diameter (>6 mm) (ABCD) melanoma rule or the difference between melanoma and ordinary skin growths (OR, 0.34 [95% CI, 0.23-0.52] and 0.26 [95% CI, 0.16-0.41] respectively). Physicians were less likely to have ever told HS-educated versus college-educated individuals they were at risk for skin cancer (OR, 0.46; 95% CI, 0.31-0.71) or instructed them on how to examine their skin for signs of melanoma (OR, 0.40; 95% CI, 0.25-0.63). HS-educated individuals were less likely to have received a physician skin examination within the year before diagnosis (OR, 0.54; 95% CI, 0.37-0.80). **CONCLUSIONS.** Decreased melanoma risk perception and knowledge among low-SES individuals and decreased physician communication regarding skin examinations of these individuals may be key components of the consistently observed socioeconomic gradient in mortality. The current findings suggest the need to raise melanoma awareness among lower-SES patients and to increase physician awareness of socioeconomic disparities in clinical communication and care. *Cancer* 2012;118:4004-13. © 2011 American Cancer Society.

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INTRODUCTION

Individuals of lower socioeconomic status (SES), whether measured by educational level, income, or similar measures, have lower incidence rates of melanoma than those of higher SES.¹ However, low SES has been associated repeatedly with thicker, more advanced melanoma at diagnosis and increased mortality.²⁻⁴ Given the increasing burden of thicker melanoma among lower-SES groups in the United States⁵ and the potential to reduce overall morbidity/mortality by addressing socioeconomic disparities in survival, it is important to understand the mechanisms by which lower SES individuals develop more advanced disease.

Our analysis of 566 patients with newly diagnosed melanoma⁶ confirmed an association between melanoma thickness at diagnosis and low SES, as measured by education level. In our study, individuals with a high school (HS) or an associate degree were more likely to have thicker tumors (>1 mm) than those with a college degree or higher ($P = .0122$).

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However, few studies have explored the possible pathways between lower SES and more advanced melanoma.^{2,3,7,8} To this end, we surveyed 566 patients of mixed SES with recently diagnosed melanoma to explore 5 possible areas of importance in this relation: 1) attitudes and perceptions regarding melanoma; 2) basic knowledge about melanoma detection; 3) communication with physicians on issues of melanoma screening; 4) perceptions of barriers to health care access for melanoma screening and treatment; and 5) performance of physician screening and self-screening, both of which were associated with thinner melanoma detection in the study cohort.⁶

MATERIALS AND METHODS

Study Participants

Approval for melanoma case ascertainment was obtained from the institutional review boards of Stanford University Medical Center (SUMC), Veterans Affairs Palo Alto Health Care System (VAPAHCS), and the University of Michigan (UM). Individuals aged ≥ 18 years with a recent diagnosis of invasive, cutaneous melanoma >2 mm and a random sample of one-third of individuals who had tumors ≤ 2 mm were surveyed within 3 months of diagnosis (by biopsy date) in the melanoma clinics of these institutions from May 17, 2006 through March 31, 2009, as previously described.⁹ Patients with in situ melanoma or mucosal, genital, perianal, or ocular primary melanoma were excluded. Overall, 566 of 719 patients (response rate, 79%) completed the survey.

Variable Definition

The data obtained included patient demographics, education level, previous history of melanoma, and information on skin self-examination (SSE)-associated practices in the year before diagnosis. SES was assessed for the following education groups: 1) HS/general education degree or less, 2) associate or technical school degree, or 3) college graduate or more.¹⁰ Questionnaire items addressed 5 different areas: 1) attitudes and perceptions regarding melanoma, 2) awareness of melanoma and SSE, 3) health care access and physician screening for skin cancer, 4) physician-patient communication, and 5) barriers to accessing/receiving health care. All questions referred to the year before diagnosis except for questions on risk perception and physician-patient communication, which assessed life-long perceptions and communication patterns.

Attitudes and perceptions regarding melanoma were assessed by questions using a 5-point scale (extremely,

quite, somewhat, a little, or not at all) asking about perceived risk and seriousness of melanoma. Awareness of melanoma was assessed using yes/no questions regarding knowledge about the asymmetry, borders (irregular), color (variegated), and diameter (>6 mm) (ABCD) rule for melanoma, the difference between melanoma and ordinary skin growths, and what kind of mole to look for when examining one's skin.

SSE within the last year was measured as described previously⁹ by 1) the frequency of mole examination (never, every 1-2 months, every 6 months, or every year), 2) the use of a picture aid illustrating a melanoma tumor during SSE, and 3) whether patients routinely examined some or all of their skin (of 13 possible areas). Questions on health care use assessed where patients usually went when they were sick or needed health advice during the prior year, whether they had a physician they consulted regularly for routine care during this year, whether a physician examined their skin during any visits and, if so, whether the physician looked at their whole skin or just a particular lesion.

Physician-patient communication was assessed using yes/no questions regarding whether a physician ever talked with patients about skin cancer, instructed them on SSE, or told them they had atypical/dysplastic moles; whether they were at risk for skin cancer or to keep an eye on certain moles; and whether patients ever told a physician they had noticed a change in their moles. Questions on barriers to accessing/receiving health care asked about the cost and difficulty of consulting a dermatologist or obtaining health insurance covering a skin examination/dermatology visit. If a patient, significant other, or friend first spotted the lesion that eventually was diagnosed as melanoma, then the patient answered questions about possible reasons for not consulting a physician right away (too time consuming, not concerned about the skin lesion, or more concerned about other health problems). These questions used a 5-point Likert response scale: strongly agree, agree, neither agree nor disagree (neutral), disagree, or strongly disagree.

Statistical Analysis

We conducted multivariable logistic regression analyses to assess the effects of SES on the measures described above. Five-point scale certainty responses were dichotomized as quite/extremely versus somewhat/a little/not at all for analysis; Likert scale responses were dichotomized as strongly agree/agree versus neutral/disagree/strongly disagree. Multivariate linear regressions were used to

Table 1. Socioeconomic Status as Assessed by Educational Level: Frequencies According to the Primary Confounders of Age, Sex, and Nevus Count

Confounder	Educational Level: No. of Patients (%)			Total No., N = 566
	High School Degree/GED or Less, N = 198	Associate/ Technical School Degree, N = 97	Four-Year College Degree or More, N = 271	
Age, y				
≤40	25 (24.7)	22 (21.8)	54 (53.5)	101
41-50	32 (31.4)	25 (24.5)	45 (44.1)	102
51-60	47 (35.1)	26 (19.4)	61 (45.5)	134
61-70	40 (33.9)	14 (11.9)	64 (54.2)	118
>70	54 (48.7)	10 (9)	47 (42.3)	111
<i>P</i>				.003 ^a
Sex				
Men	121 (35.1)	51 (14.8)	173 (50.1)	345
Women	77 (34.8)	46 (20.8)	98 (44.3)	221
<i>P</i>				.15 ^a
Nevus count				
0-20	146 (39)	58 (15.5)	170 (45.5)	374
21-50	33 (28.5)	26 (22.4)	57 (49.1)	116
>50	19 (25)	13 (17.1)	44 (57.9)	76
<i>P</i>				.04 ^a

Abbreviations: GED, general education degree.

^a*P* values indicate the results from chi-square analyses.

calculate the odds ratios for “yes,” “quite/extremely,” or “strongly agree/agree” responses in lower educated versus college-educated patients.

Decisions to include covariates as potential confounders in the models were based on a significant association between the covariate and the independent (SES) and dependent (5 groups of patient characteristics) variables and either the statistical significance of the covariate’s inclusion in the models or a change of 10% in the size of the SES measure’s beta parameter upon inclusion of the covariate. Potential confounders examined included the above sociodemographic variables, previous history of melanoma, and histologic subtype.¹¹ Analyses were conducted using the SAS statistical software package (version 9.2; SAS Institute, Inc., Cary, NC).

RESULTS

Demographics

Patients ranged in age from 18 years to 99 years, and 61% of respondents were men. Approximately 95% of the sample was white. Slightly less than 48% of the sample had received a 4-year college degree or further education, 17% had an associate or technical degree, and 35% had an HS degree or less. All logistic regression models were adjusted by age, sex, and nevus count, as these covariates were

identified as confounders of many of the associations examined. Table 1 indicates the frequency of educational level according to each of these 3 measures.

Attitudes and Perceptions Regarding Melanoma

Table 2 indicates how patients responded to questions regarding attitudes and perceptions about melanoma as well as the odds ratios (ORs) for answering “yes,” “quite,” or “extremely” by lower education versus college education calculated from logistic regression models. Lower education was strongly associated with higher odds that a patient had never thought of himself or herself as being at risk for melanoma (OR, for HS vs college education, 2.32; 95% confidence interval [CI], 1.58-3.40). Similarly, patients with lower education had almost 3 times the odds of always having believed melanoma was not very serious (OR, 2.90; 95% CI, 1.79-4.71) and were less than half as likely to have believed that their melanoma risk was higher than that of their peers (OR, 0.40; 95% CI, 0.26-0.63). Lower education was associated with moderately increased worry about melanoma; patients with HS and associate degrees were 31% and 62% more likely, respectively, to have been “quite/extremely” worried about melanoma before diagnosis.

Table 2. Attitude and Perception Variables: Frequencies by Education and Odds Ratios With 95% Confidence Intervals for Lower Education Versus College Education Adjusted by Age, Sex, and Nevus Count

Variable	No. of Answers		OR (95% CI) for Answering Yes/Agree for Lower Education Versus College Education
	Yes/Quite/Extremely	No/Not at All/Little/Somewhat	
I never thought of myself at melanoma risk			
High school	123	72	2.32 (1.58-3.40)
Associate degree	59	37	2.40 (1.48-3.91)
College	111	157	Referent
I always thought melanoma was not very serious			
High school	55	140	2.90 (1.79-4.71)
Associate degree	18	78	1.62 (0.86-3.04)
College	34	234	Referent
I thought I had a higher melanoma chance compared with my peers			
High school	35	156	0.40 (0.26-0.63)
Associate degree	23	72	0.54 (0.31-0.92)
College	97	170	Referent
I was "quite" or "extremely" worried about melanoma			
High school	67	127	1.31 (0.87-1.96)
Associate degree	36	59	1.62 (0.99-2.67)
College	75	193	Referent

Abbreviations: CI, confidence interval; OR, odds ratio.

Knowledge About Melanoma Detection

Lower education was strongly associated with reduced knowledge about melanoma detection (Table 3). Patients with HS and associate degrees were much less likely than college-educated patients to know about the ABCD rule for melanoma (OR, 0.34 [95% CI, 0.23-0.52] and 0.58 [95% CI, 0.36-0.94], respectively), to know the difference between melanomas and ordinary skin growths (OR, 0.26 [95% CI, 0.16-0.41] and 0.53 [95% CI, 0.32-0.88], respectively), or to know what kind of mole to look for when examining their skin (OR, 0.39 [95% CI, 0.25-0.59] and 0.53 [95% CI, 0.32-0.87], respectively).

Skin Self-Examination

Education was modestly associated with measures of SSE (Table 3). Compared with college-educated patients, HS-educated patients (but not those with associate degrees) had statistically significantly lower odds of routinely examining the skin on any of their body (OR, 0.52; 95% CI, 0.32-0.83) and at least half of their body (OR, 0.67; 95% CI, 0.46-0.97) or of ever having used a picture of melanoma as an aid in SSE (OR, 0.56; 95% CI, 0.35-0.90). There was no significant association between

education and whether patients carefully examined all of their moles at least yearly.

Health Care Access and Physician Skin Examination

Patients with an associate degree, but not those with an HS degree or less, were less likely (OR, 0.59; 95% CI, 0.31-1.15) to have had a physician's office, clinic, or health center they regularly attended during the year before melanoma diagnosis compared with college-educated patients (Table 4), although the difference was not statistically significant. Patients with an HS or associate degree were about as likely as college-educated patients to have a health professional they consulted regularly for routine care, but they were significantly less likely to have received a skin examination for skin cancer from a health professional (OR, 0.54 [95% CI, 0.37-0.80] and 0.52 [95% CI, 0.32-0.87], respectively). There was no significant difference by educational level in the number of times patients visited a health care provider in the year before diagnosis ($P = 0.78$; data not shown).

Of the 258 patients who reported receiving a skin examination for cancer, 240 specified whether they received a complete skin examination or whether they

Table 3. Knowledge About Melanoma and Skin Self-Examination Variables: Frequencies by Education and Odds Ratios With 95% Confidence Intervals for Lower Education Versus College Education Adjusted by Age, Sex, and Nevus Count

Variable	No. of Answers		OR (95% CI) for Answering Yes/Agree for Lower Education Versus College Education
	Yes/Agree	No/Disagree/Neutral	
Melanoma awareness measures			
I knew the ABCD rule for melanoma			
High school	55	132	0.34 (0.23-0.52)
Associate degree	40	56	0.58 (0.36-0.94)
College	142	123	Referent
I knew the difference between melanomas and ordinary skin growths			
High school	33	159	0.26 (0.16-0.41)
Associate degree	27	68	0.53 (0.32-0.88)
College	114	153	Referent
I knew what kind of mole to look for if I examined my skin			
High school	45	142	0.39 (0.25-0.59)
Associate degree	31	63	0.53 (0.32-0.87)
College	124	144	Referent
Skin self-examination measures			
I routinely examined the skin on at least some of my body			
High school	149	49	0.52 (0.32-0.83)
Associate degree	86	11	1.41 (0.69-2.88)
College	230	41	Referent
I routinely examined the skin on at least half of my body			
High school	81	117	0.67 (0.46-0.97)
Associate degree	45	52	0.76 (0.48-1.22)
College	141	130	Referent
I have used a picture of melanoma in a poster or handout to help look at my skin at least once			
High school	34	156	0.56 (0.35-0.90)
Associate degree	25	69	0.91 (0.53-1.55)
College	75	190	Referent
I carefully examined all of my moles, including those on my back, at least once a year			
High school	93	97	0.73 (0.50-1.08)
Associate degree	50	46	0.89 (0.55-1.43)
College	147	115	Referent

Abbreviations: ABCD rule, asymmetry, borders (irregular), color (variegated), and a greatest dimension >6 mm; CI, confidence interval; OR, odds ratio.

only had a particular lesion examined. Among these 240 patients, those with HS and associate degrees were significantly less likely than those with college degrees to report having received a complete skin examination (OR, 0.46 [95% CI, 0.31-0.68] and 0.50 [95% CI, 0.30-0.82], respectively).

Physician-Patient Communication

Less educated patients were significantly less likely to report that a physician had ever talked with them about every melanoma-related issue assessed. Patients with an HS or associate education were significantly less likely than patients with a college education to have ever been

told by a physician that they were at risk of skin cancer (OR, 0.46 [95% CI, 0.31-0.71] and 0.56 [95% CI, 0.3-0.95], respectively) or that they should keep an eye on certain moles (OR, 0.61 [95% CI, 0.40-0.94] and 0.54 [95% CI, 0.31-0.93], respectively) (Table 5). HS-educated patients also were significantly less likely than college-educated patients to have ever been told by a physician that they had atypical/dysplastic moles (OR, 0.44; 95% CI, 0.25-0.79). Patients with an HS or associate education also had less than half the odds of ever having been instructed by a physician on how to look at their skin for signs of melanoma (OR, 0.40 [95% CI, 0.25-0.63] and 0.43 [95% CI, 0.24-0.77], respectively) or

Table 4. Health Care Access and Physician Skin Examination Variables: Frequencies by Education for Odds Ratios With 95% Confidence Intervals by Lower Education Versus College Education Adjusted by Age, Sex, and Nevus Count

Variable	No. of Answers		OR (95% CI) for Answering Yes/Agree for Lower Education Versus College Education
	Yes/Agree	No/Disagree/Neutral	
During the year before melanoma diagnosis, when I was sick or needed health advice, there was a physician's office, clinic, or health center I usually went to			
High school	173	20	1.02 (0.55-1.89)
Associate degree	75	18	0.59 (0.31-1.15)
College	240	31	Referent
At the time, I had a physician who I saw regularly for routine care, such as a physical examination or check-up			
High school	161	33	0.90 (0.54-1.51)
Associate degree	72	20	0.90 (0.49-1.66)
College	222	49	Referent
During at least 1 visit, a physician examined my skin for cancer			
High school	81	110	0.54 (0.37-0.80)
Associate degree	33	58	0.52 (0.32-0.87)
College	144	121	Referent
During this skin examination, my physician looked at my whole skin and not just at a particular lesion			
High school	36	36	0.46 (0.31-0.68)
Associate degree	17	13	0.50 (0.30-0.82)
College	94	44	Referent

Abbreviations: CI, confidence interval; OR, odds ratio.

having spoken with their physician about skin cancer at all (OR, 0.43 [95% CI, 0.29-0.63] and 0.46 [95% CI, 0.28-0.76], respectively). Those without a college degree were not significantly less likely to have ever noticed a change in any of their moles (data not shown). However, among patients who had ever noticed such a change (N = 310), patients who had an HS degree were significantly less likely to have ever told a physician about it compared with those who had a college education (OR, 0.38; 95% CI, 0.19-0.76).

Barriers to Accessing/Receiving Health Care

Three variables assessed possible reasons patients may have had for not consulting a dermatologist for a skin examination before their diagnosis of melanoma (Table 6). Cost was significantly more likely to be an issue for patients who had associate degrees compared with those who had college degrees (OR, 2.18; 95% CI, 1.01-4.69); there were no other significant associations between education and responses to these variables.

Other variables assessed possible reasons for not consulting a physician after a patient or spouse/significant

other (N = 390) spotted a skin lesion that eventually was diagnosed as melanoma. Compared with college-educated patients, patients with HS and associate degrees were significantly more likely to report having a competing concern about other health problems (OR, 3.40 [95% CI, 1.69-6.84] and 3.59 [95% CI, 1.60-8.04], respectively). No other clear associations were observed.

DISCUSSION

Individuals of lower SES experience later stage melanoma at diagnosis, higher case-fatality rates, and decreased survival.^{3,8,12,13} Recent studies have revealed disproportionate rates of advanced disease among less educated individuals and those living in poor areas, among Medicaid patients in California, and in Massachusetts residents living in lower SES census tracts or zip codes, independent of sociodemographic variables, comorbidities, and tumor characteristics.^{3,8,13-15}

We sought to understand why individuals of lower SES have higher rates of thicker, more advanced melanoma. We hypothesized that differences in perceptions

Table 5. Physician-Patient Communication Variables: Frequencies by Education and Odds Ratios With 95% Confidence Intervals for Lower Education Versus College Education Adjusted by Age, Sex, and Nevus Count

Variable	No. of Answers		OR (95% CI) for Answering Yes/Agree for Lower Education Versus College Education
	Yes/Agree	No/Disagree/Neutral	
Ever told by a physician that I was at risk for skin cancer			
High school	49	143	0.46 (0.31-0.71)
Associate degree	25	70	0.56 (0.33-0.95)
College	108	158	Referent
Ever told by a physician that I have atypical or dysplastic moles			
High school	18	165	0.44 (0.25-0.79)
Associate degree	13	81	0.69 (0.35-1.35)
College	52	211	Referent
Ever told by a physician to keep an eye on certain moles			
High school	44	147	0.61 (0.40-0.94)
Associate degree	21	73	0.54 (0.31-0.93)
College	90	173	Referent
Ever instructed or given materials on how to look at my skin for signs of melanoma			
High school	33	155	0.40 (0.25-0.63)
Associate degree	17	77	0.43 (0.24-0.77)
College	90	174	Referent
Ever talked with my physician about skin cancer			
High school	73	121	0.43 (0.29-0.63)
Associate degree	34	61	0.46 (0.28-0.76)
College	150	117	Referent
Ever noticed a change in any of my moles			
High school	100	90	0.82 (0.56-1.21)
Associate degree	53	42	0.76 (0.47-1.24)
College	158	109	Referent
Ever told a physician that a mole or moles had changed (N = 310; only answered if had previously noticed a change in a mole)			
High school	75	25	0.38 (0.19-0.76)
Associate degree	43	10	0.65 (0.28-1.54)
College	137	20	Referent

Abbreviations: CI, confidence interval; OR, odds ratio.

about melanoma, basic knowledge about melanoma detection, patient-physician communication, and physician and self-screening may play a part. By examining the responses from a mix of patients who were diagnosed with thin and thick melanomas, we can begin to describe a pattern among individuals with lower SES that involves minimal perception of the risks of melanoma and less awareness of melanoma's early warning signs, is marked by less communication from physicians regarding melanoma risk factors and screening/detection, and culminates in far fewer SSEs and physician skin examinations (PSEs).

Greater knowledge about melanoma has been associated with thinner tumors¹⁶ and shorter delays from lesion discovery to diagnosis.¹⁷ We observed striking educational differences in risk perception and knowledge about melanoma; less educated patients were far less likely to 1) perceive themselves at risk for melanoma, 2) understand that melanoma is serious, or 3) know about the ABCD rule or about differences between melanoma and ordinary skin growths. A 1995 national survey indicating that only 12% of Americans with less than HS education knew that melanoma was a type of skin cancer also speaks to strong educational disparities in awareness.¹⁸

Table 6. Barriers to Health Care Variables: Frequencies by Education and Odds Ratios With 95% Confidence Intervals for Lower Education Versus College Education Adjusted by Age, Sex, and Nevus Count

Variable and Educational Level	No. of Answers		OR (95% CI) for Answering Yes/Agree for Lower Education Versus College Education
	Agree/ Strongly Agree	Disagree/ Strongly Disagree /Neutral	
Possible reasons for not seeing a dermatologist for a skin examination			
It cost too much for a dermatologist to examine my skin			
High school	16	169	1.41 (0.69-2.87)
Associate degree	13	79	2.18 (1.01-4.69)
College	18	247	Referent
I did not know how to get health insurance to pay for a skin examination			
High school	11	176	1.07 (0.48-2.40)
Associate degree	9	82	1.60 (0.67-3.83)
College	16	249	Referent
I did not know how to arrange to see a dermatologist for a skin cancer examination			
High school	14	172	1.61 (0.74-3.53)
Associate degree	9	85	1.86 (0.76-4.55)
College	14	253	Referent
Possible reasons for not seeing a physician after patient or significant other spotted the unusual mole eventually diagnosed as melanoma (only answered if patient or significant other first spotted the mole; N = 390)			
I did not have time to go to physician			
High school	14	102	0.98 (0.47-2.04)
Associate degree	7	57	0.70 (0.28-1.78)
College	23	148	Referent
I was concerned about other health problems			
High school	27	87	3.40 (1.69-6.84)
Associate degree	15	49	3.59 (1.60-8.04)
College	14	157	Referent
I was not really too concerned about the mole			
High school	39	76	1.10 (0.66-1.83)
Associate degree	23	41	1.14 (0.62-2.10)
College	55	117	Referent

Abbreviations: CI, confidence interval; OR, odds ratio.

Media outreach and public attention to early detection of melanoma (as opposed to sun protection) is relatively recent compared with what the public has learned about smoking and breast cancer. Lessons from public health efforts for tobacco control are instructive for skin cancer advocates. Immediately after the Surgeon General's landmark 1964 report on tobacco, most educated women immediately reduced their smoking in contrast to the least educated, who actually increased their smoking rates.¹⁹ Education and awareness of good health behaviors may have important interactive effects²⁰; smoking behavior among more educated individuals was altered more in response to knowledge than in those with less education. We observed a similar combination of decreased perceived

risk and decreased knowledge about melanoma among the less educated in our study.

In a population-based, case-control study in Queensland, Aitken et al observed that higher education was associated with increased whole-body SSE.²¹ We observed a modest association between lower SES and less frequent SSE. HS-educated patients were less likely to frequently examine their skin or to use a picture aid to assist with SSE.^{9,22-24} The importance of SSE in preventing more advanced melanoma remains unclear, and further assessment of the role of SSE as a possible link between lower SES and more advanced disease is warranted.

Youl et al reported that higher education was associated significantly ($P < .001$) with increased rates of

clinical skin examination in the Queensland study.⁸ We confirmed that association, observing that HS-educated patients were approximately half as likely to receive a PSE in the year before diagnosis compared with college-educated patients, and HS-education patients were even less likely to receive a whole-body skin examination. Our data demonstrate a link between lower SES and the decreased likelihood of receiving a PSE, which is associated with thinner tumors in men aged >60 years.⁶ This suggests the importance of PSE as a possible link between lower SES and more advanced melanoma.

Effective physician-patient communication includes shared decision making, comprehension of medical information, mutual comfort, and patient disclosure.²⁵ A systematic review indicated that higher SES is associated repeatedly with increased overall physician-patient communication and provision of information.^{26,27-29} Independent of patient behavior, differences in physicians' engagement with patients have been related directly to patients' levels of education.³⁰

We observed that physicians were much less likely to warn less educated patients about melanoma risk factors or to discuss issues regarding melanoma screening and detection with them. Because less educated patients also were much less likely to perceive melanoma as serious or to have basic knowledge regarding melanoma, this lack of communication by physicians is particularly concerning. Patients of lower SES also were less likely ever to have told a physician that a mole had changed, suggesting that suboptimal physician-patient communication was bidirectional.

Little work has been done examining SES-specific barriers to skin cancer screening, although socioeconomic disparities in screening for other cancers (fecal occult blood testing, mammography, and prostate-specific antigen screening) are well documented. Less educated patients are less likely to be aware of the need for screening or to discuss screening with physicians, and physicians may be less likely to perceive these patients as willing to participate in screening or to recommend screening to them.³¹⁻³⁴ We did not observe that less educated individuals perceived greater potential barriers to accessing screening than more educated individuals. Once patients had discovered an unusual/concerning mole, however, less educated patients were far more likely to report that competing health concerns may have been a reason for not consulting a physician regarding the skin lesion. These results suggest a lack of awareness of the seriousness of a melanoma diagnosis and strengthen our findings described above that individuals of lower SES may be

significantly less likely to conceive of skin lesions and melanoma as entities with serious potential health impact.

Our behavioral data were self-reported, raising possible concerns about potential recall accuracy and bias. Given the severity of a melanoma diagnosis, the risk of recall bias may be higher in our study population. Our data are cross-sectional; thus, we were unable to prospectively assess the impact of SES on melanoma risk factors and outcomes. Future prospective studies are needed to further delineate the associations we describe here. It is possible that patient factors particular to this study (ie, proximity to an academic center) may have favored all respondents, regardless of educational status. SES was assessed only through education level, and, unfortunately, other important facets of SES (eg, occupational status, income) were unavailable. Subgroup analysis by age and sex was not possible with these data given the nature and number of our variables. In addition, it is reasonable to speculate that individuals with college degrees had stronger communication patterns because of a greater likelihood of having a regular dermatologist, although this information was not assessed. However, college-educated patients were no more likely to have had their melanoma diagnosed by a dermatologist than other patients.

Given the disproportionate burden of advanced melanoma at diagnosis and higher case fatality among individuals of lower SES, new public and professional education strategies are required. Our findings suggest the need for new public education campaigns to raise awareness of melanoma risk and to increase basic knowledge about melanoma screening and detection among individuals of lower SES. In addition, professional educational efforts are needed to improve physician communication to lower SES individuals about melanoma risk factors, prevention strategies, and early detection and to increase physician skin screening in this group.

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CONFLICT OF INTEREST DISCLOSURES

The authors made no disclosures.

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