Multiple Skin Cancer Risk Behaviors in the U.S. Population

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Background: The incidence of all types of skin cancer has increased over the past 3 decades in the United States. Increased skin cancer risk is associated with exposure to ultraviolet radiation. This study examined the age-stratified prevalence and correlates of multiple skin cancer risk behaviors (infrequent use of sun-protective clothing, staying in the sun when outside on a sunny day, infrequent use of sunscreen, indoor tanning, and receiving a sunburn) among U.S. adults.

Methods: 28,235 adults participating in the 2005 National Health Interview Survey (NHIS) answered questions regarding sun-protection behaviors, indoor tanning in the past year, and sunburns in the past year. Examined correlates included geographic location, demographics, healthcare access, BMI, physical activity, smoking, alcohol use, melanoma family history, perceived cancer risk, skin sensitivity to the sun, and receipt of a total skin exam.

Results: The most commonly reported skin cancer risk behaviors were infrequent use of sun-protective clothing and infrequent use of sunscreen. The majority of individuals reported multiple skin cancer risk behaviors. Although significant correlates varied according to age, individuals reporting more risk behaviors were more likely younger, residing in the Midwest, male, non-Hispanic white, less-educated, smokers, risky drinkers, and had skin that was less sun-sensitive.

Conclusions: The majority of the U.S. population engage in multiple skin cancer risk behaviors. A comprehensive approach to skin cancer prevention requires attention to multiple skin cancer risk behaviors that are common in the U.S. population.
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Skin cancer is the most common type of cancer in the United States.[1] Approximately 1.1 million individuals were diagnosed with cutaneous malignant melanoma (CMM) or nonmelanoma skin cancers (NMSC, basal or squamous cell) in 2007.[1] The incidence of all types of skin cancer has increased over the past 3 decades; for example, the incidence of melanoma, the most deadly type of skin cancer, has increased 4% each year for the past 30 years.[2–4]

Ultraviolet (UV) radiation exposure is the most important modifiable risk factor for all types of skin cancer, including melanoma.[5] Thus, wearing protective clothing like a hat with a wide brim, avoiding exposure in the middle of the day, seeking shade, avoiding indoor tanning, and using sunscreen, have been recommended by various agencies.[6,7] However, the results of several large studies suggest that the vast majority of the U.S. adult population do not practice regular sun protection and experience high rates of UV exposure and sunburns.[8–11] In addition, skin cancer risk behaviors are more prevalent among younger as opposed to older adults.[9, 11–14]

Results of several studies suggest that skin cancer risk behaviors may co-occur,[10,11,13,15] but a comprehensive analysis of the prevalence and correlates of multiple skin cancer risk behaviors across multiple age groups is lacking. The current study addresses this research gap by examining the age-stratified prevalence and correlates of occurrence of multiple behavioral risks for skin cancer using the 2005 National Health Interview Survey (NHIS). The present study examined five separate behavioral indicators of UV exposure: infrequent use of sun-protective clothing, staying in the sun when outside on a sunny day, infrequent use of sunscreen, use of an indoor tanning device, and sunburns. Correlates of the prevalence of multiple skin cancer risk behaviors examined in this study include geographic location, demographics, healthcare access, behavioral risk factors, family history of melanoma, perceived cancer risk, skin sensitivity to the sun, and receipt of a total skin exam.

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Providing descriptive information regarding the prevalence of multiple skin cancer risk behaviors along with correlates of these behaviors may assist in the development of targeted interventions for specific high-risk groups.

Methods

Procedure

The data for this study were drawn from the 2005 NHIS, which is an annual representative U.S. health survey conducted using a multistage, clustered, cross-sectional design, with state-level stratification and oversampling of black and Hispanic populations. The response rate for the data used in this study was 69.0%.[16] Additional details regarding the 2005 NHIS are available elsewhere.[16] The data were collected in 2005 and analyzed in 2007.

See related Commentary by Weinstock in this issue.

Participants

Participants were drawn from the 31,428 individuals selected as sample adults for the 2005 NHIS. Individuals were excluded from the current study if they reported a personal history of CMM or NMSC, were unaware of the type of skin cancer they had, or reported not knowing if they had ever had skin cancer or were missing data on the skin cancer history variables (n=767). An additional 2426 individuals were excluded from the analyses due to missing data on one or more of the variables that made up the multiple skin cancer risk behavior measure that was used as the primary outcome for this study (for details, see below). The resulting sample consisted of 28,235 individuals.

Measures

The exact wording of all measures listed below is available elsewhere.[17]

Demographics. Participants indicated their gender, age, race/ethnicity, education level, and marital status.

Healthcare access. Participants indicated whether they had visited a doctor in the previous year and whether they had any public or private healthcare insurance coverage.

Health behavioral risk factors (BMI, physical inactivity, smoking, risky alcohol intake). Each participant's BMI was calculated based on their self-reported height and weight.[18] Individuals with a BMI of ≥25 but <30 were denoted as overweight and those with a BMI of ≥30 were denoted as obese.[18] Participants answered questions about the weekly frequency and average duration of varying intensity physical activities. Responses were combined (using the formula: 4.5 × weekly minutes of moderate activity + 7.0 × weekly minutes of vigorous activity) to calculate weekly metabolic equivalent expenditure. Individuals were denoted as engaging in no physical activity (metabolic equivalents [METS]=0), some physical activity (0<METS< 675), or meeting physical activity recommendations (METS≥675).[19] Respondents who reported smoking cigarettes every day or some days were denoted as current smokers; individuals who were not currently smoking but reported smoking at least 100 cigarettes in their lifetime were denoted as former smokers.[20] Men who reported consuming an average of ≥15 drinks per week and women who reported an average intake of ≥8 drinks per week were denoted as being risky drinkers.[21,22]

Perceived cancer risk. Participants completed a single item asking about their likelihood of developing cancer compared to other individuals their same age and gender.

Family history of melanoma. Individuals reporting that any first-degree relative had been diagnosed with melanoma were denoted as having a melanoma family history.

Skin reaction to sun exposure. One item asked participants to report how much they would burn or tan if they went out in the sun for an hour with no sun protection. A second item asked participants what would happen if they were to go out in the sun every day for 2 weeks without sun protection.

Receipt of a total skin exam. Participants indicated whether they had ever had a total skin exam performed by a dermatologist or other doctor.

Skin cancer risk behaviors. Participants answered questions about five skin cancer risk behaviors: infrequent use of sun-protective clothing, staying in the sun when outside on a sunny day, infrequent use of sunscreen with a sun protection factor (SPF) of ≥15, use of indoor tanning devices, and a history of sunburns. With regard to the use of sun-protective clothing, participants reported the frequency with which they wear a wide-brimmed hat, wear a long-sleeved shirt, and wear long pants, when out in the sun. Each item used a 5-point Likert-type response scale (1=always, 2=most of the time, 3=sometimes, 4=rarely, 5=never). Responses to the three items were averaged (alphas from 0.69 to 0.79 for the five age groups examined in this study) and individuals were denoted as having infrequent use of sun-protective clothing if their average score was >3. One item asked individuals to report the frequency with which they stay in the shade when outside on a sunny day. This item used the same 5-point response scale as for the sun-protective clothing items. Individuals who indicated that they rarely or never stay in the shade were denoted as having the skin cancer risk behavior of staying in the sun when outside on a sunny day. Again using the same 5-point response scale, participants reported how often they use sunscreen when outside on a sunny day. Participants also indicated the SPF of the sunscreen they use most often. Individuals who reported using sunscreen rarely or never and those who reported using a sunscreen with an SPF of <15 (regardless of their reported frequency of using sunscreen) were denoted as having infrequent use of sunscreen with an SPF of ≥15. Individuals who reported using an indoor tanning device in the past year were coded as having that risk factor. Similarly, participants who reported having a sunburn in the previous year were denoted as having that risk factor. Individuals who reported never having had a total skin exam were coded as having that risk factor. Responses were aggregated across the five skin cancer risk behaviors to create a multiple skin cancer risk behavior score (with values from 0 to 5).

Data Weighting and Statistical Analyses

All statistical analyses were conducted using SUDAAN, version 9.0.1, and were weighted based on design, ratio, and nonresponse adjustments, with poststratification adjustments for 2000 U.S. Census-based estimates of age, gender, and race/ethnicity. All percentages reported in the Results section are weighted and all sample sizes are unweighted.

Given the multiple associations examined and the large sample size, a cutoff of $p<0.001$ was used to determine statistical significance for all analyses. A series of chi-square tests examined whether individuals who were excluded from analyses due to missing data for the multiple skin cancer risk behavior variable differed on demographic factors compared to individuals who were not missing data for that variable. Next, the demographic characteristics for the full sample were examined, followed by the age-stratified prevalence of each of the five skin cancer risk behaviors, and the percentage of individuals within each age group who reported having each number (from 0 to 5) of the skin cancer risk behaviors. A series of age-stratified ordinal logistic regression analyses using SUDAAN's PROC MULTILOG procedure were conducted to examine the association between each potential correlate and the multiple skin cancer risk behavior score. In each analysis, the covariate was included as a single independent variable with the skin cancer risk behavior score as the ordinal dependent variable.

Results

Missing Data Analyses and Sample Demographic Characteristics

Individuals missing data for the multiple skin cancer risk behavior variable were less likely to be non-Hispanic white individuals (65.8%) than those who were not missing data for that variable (71.1%) ($\chi^2=19.39$; $p=0.0003$). There were no differences in missing data for the multiple skin cancer risk behavior variable according to gender, age, education, or marital status ($\chi^2\leq13.54$; $p\geq0.004$). The demographic characteristics of the sample are shown in Table 1.

Table 1. Demographic characteristics of sample (N=28,235), 2005 National Health Interview Survey

	Sample (%)
Gender	
Male	48.0
Female	52.0
Missing (*n*)	0
Age (years)	
18–29	22.3
30–39	18.9
40–49	20.7
50–64	22.8
≥ 65	15.3
Missing (*n*)	0
Race/ethnicity	
Non-Hispanic white	71.1
Non-Hispanic black	11.4
Non-Hispanic other	4.6
Hispanic	12.9
Missing (*n*)	0
Education level	
College graduate	25.7
Some college	28.5
High school graduate	29.4
Some high school or less	16.4
Missing (*n*)	219
Marital status	
Married/partnered	63.2
Not married/partnered	36.8
Missing (*n*)	88

Note: All percentages are weighted. Data source: National Center for Health Statistics, 2005.[23]

Age-Stratified Prevalence of Single and Multiple Skin Cancer Risk Behaviors

The age-stratified prevalence of each of the four skin cancer risk behaviors is shown in Table 2. Infrequent use of sun-protective clothing was high across all age groups. Around half of the participants in each group did not regularly use a sunscreen with an SPF of ≥15. Fewer individuals reported having had a sunburn in the past year, and the sunburn rate was particularly low (11.2%) among older adults (aged ≥65 years). Across all age groups, there was a low prevalence of having used an indoor tanning device in the past year, although the rate was highest (20.2%) among those aged 18–29 years.

As shown in Table 3, across each age group, around one third of individuals had two of the five skin cancer risk behaviors. Additionally, in all except the oldest age group (those aged ≥65 years), the proportion of participants having three or more of the five skin cancer risk behaviors varied from just over a quarter (among those aged 50–64 years) to just under a half (among 18–29 year olds). Among those aged ≥65 years, around one quarter (24.4%) had none of the skin cancer risk behaviors and a further one quarter (28.0%) had one risk behavior. The mean number of skin cancer risk behaviors was highest among individuals aged 18–29 years (M=2.43) and was lowest among those aged ≥65 years (M=1.43).

Age-Stratified Correlates of Multiple Skin Cancer Risk Behavior Prevalence

The results of a series of ordinal logistic regression analyses examining correlates of multiple skin cancer risk behaviors are shown in Table 4. The results are summarized here. With regard to demographic factors, more skin cancer risk behaviors were found among individuals in the Midwest (except among those aged 65 years and over); men (except among individuals aged 18–29 years); non-Hispanic white individuals (aged 18–49 years); and individuals with lower levels of education (except among those aged ≥65 years). There was little evidence that individuals' number of skin cancer risk behaviors varied according to whether

Table 2. Age-stratified prevalence of skin cancer risk behaviors, 2005 National Health Interview Survey

	Sample % ± 95% CI				
	Age 18–29 (*n*=5370)	**Age 30–39 (*n*=5473)**	**Age 40–49 (*n*=5589)**	**Age 50–64 (*n*=6583)**	**Age 65+ (*n*=5220)**
Infrequent use of sun-protective clothing[a]	84.7 ± 1.2	81.5 ± 1.2	76.7 ± 1.3	67.8 ± 1.4	49.2 ± 1.7
Stay in the sun when outside on a sunny day	35.4 ± 1.8	31.8 ± 1.6	30.2 ± 1.4	24.4 ± 1.4	19.8 ± 1.3
Infrequent use of SPF 15+ sunscreen	56.7 ± 1.7	49.6 ± 1.7	48.0 ± 1.5	51.3 ± 1.4	55.3 ± 1.7
Indoor tanning device use in the past year	20.2 ± 1.3	16.7 ± 1.2	13.6 ± 1.1	9.9 ± 0.9	7.6 ± 0.9
Sunburn in the past year	45.6 ± 1.7	43.6 ± 1.7	40.0 ± 1.6	26.6 ± 1.3	11.2 ± 1.0

Note: All percentages are weighted. Data source: National Center for Health Statistics, 2005.[23]
[a]Composite measure based on a low reported frequency of doing the following when out in the sun: wearing a wide-brimmed hat, wearing a long-sleeved shirt, and wearing long pants (or other clothing reaching the ankles).
SPF, sun protection factor.

they visited a physician in the last year and the type of healthcare coverage they had. Among several age groups, more skin cancer risk behaviors were found among individuals who were overweight or obese, physically active individuals, and risky drinkers. Across all age groups, current smokers had more skin cancer risk behaviors than nonsmokers. Individuals aged 18–39 years who perceived themselves as being at higher risk for cancer had more skin cancer risk behaviors. Individuals who reported having skin that was less sensitive to the sun had more skin cancer risk behaviors. Among individuals aged 40–64 years, those who reported never having had a total skin exam had more skin cancer risk behaviors.

Discussion

This study represents the most comprehensive examination to date of the prevalence and correlates of multiple skin cancer risk behaviors among U.S. adults. The majority of individuals reported multiple skin cancer risk behaviors. This was particularly the case among young adults aged 18–29 years, more than 80% of whom reported at least two risk behaviors. The finding of more risk behaviors among young adults is consistent with previous research on single skin cancer risk behaviors.[9,11–15] Across all age groups, about half or more of the participants reported infrequent use of sun-protective clothing and infrequent use of sunscreen with an SPF of ≥15. Although many individuals reported limiting their UV exposure by staying out of the sun when outside on a sunny day, additional use of sun-protective clothing and sunscreen would further limit UV exposure. The low use of sun-protective clothing and sunscreen among individuals over 40 is particularly important to note because there is a disproportionate mortality burden of melanoma among middle-aged and older white men.[24] Rates of indoor tanning were highest among young adults aged 18–29 years, with one in five individuals reporting indoor tanning in the past year. If this younger age cohort continues to engage in indoor tanning as they age, the overall prevalence of indoor tanning will increase over time. Future studies should evaluate cohorts longitudinally to determine if indoor tanning present at a younger age continues into middle age. There have been no prior studies that have comprehensively evaluated the prevalence of multiple skin cancer risk behaviors to provide comparisons for the identification of trends over time, but the current results provide the foundation for the future examination of such trends.

There were several correlates significantly associated with a higher prevalence of multiple skin cancer risk behaviors across three or more of the age cohorts in the

Table 3. Age-stratified prevalence of multiple skin cancer risk behaviors, 2005 National Health Interview Survey

	Sample % ± 95% CI				
Number of skin cancer risk behaviors[a]	**Age 18–29 M=2.43 (*n*=5370)**	**Age 30–39 M=2.23 (*n*=5473)**	**Age 40–49 M=2.09 (*n*=5589)**	**Age 50–64 M=1.80 (*n*=6583)**	**Age 65+ M=1.43 (*n*=5220)**
0	4.2 ± 0.7	6.1 ± 0.8	8.6 ± 0.8	12.7 ± 1.0	24.4 ± 1.4
1	14.3 ± 1.3	17.5 ± 1.2	21.1 ± 1.2	26.9 ± 1.3	28.0 ± 1.4
2	35.2 ± 1.7	37.4 ± 1.4	35.0 ± 1.4	35.2 ± 1.3	30.4 ± 1.5
3	30.0 ± 1.6	27.2 ± 1.3	25.0 ± 1.3	19.1 ± 1.1	14.9 ± 1.2
4	13.5 ± 1.2	9.7 ± 0.9	8.9 ± 0.9	5.4 ± 0.6	2.2 ± 0.5
5	2.8 ± 0.6	2.1 ± 0.4	1.4 ± 0.4	0.7 ± 0.3	0.2 ± 0.1

Note: All percentages are weighted. Data source: National Center for Health Statistics, 2005.[23]
[a]Skin cancer risk behaviors: infrequent use of sun-protective clothing; stay in the sun when outside on a sunny day; infrequent use of SPF 15+ sunscreen; indoor tanning device use in the past year; sunburn in the past year.

Table 4. Age-stratified ordinal logistic regression analyses examining correlates of multiple skin cancer risk behaviors,[a] 2005 National Health Interview Survey

	Age 18–29		Age 30–39		Age 40–49		Age 50–64		Age 65+	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Region										
Northeast	Ref[b]		Ref[b]		Ref[b]		Ref[b]		Ref[b]	
Midwest	1.55	1.25–1.93	1.39	1.13–1.71	1.42	1.23–1.64	1.19	1.02–1.39	1.04	0.85–1.28
South	0.91	0.74–1.11	0.87	0.72–1.05	0.87	0.76–0.99	0.76	0.65–0.90	0.76	0.63–0.91
West	0.68	0.54–0.85	0.68	0.56–0.83	0.77	0.66–0.89	0.65	0.54–0.77	0.71	0.58–0.87
Gender										
Male	Ref		Ref[b]		Ref[b]		Ref[b]		Ref[b]	
Female	0.83	0.73–0.94	0.71	0.64–0.79	0.59	0.53–0.67	0.58	0.53–0.64	0.52	0.47–0.59
Race/ethnicity										
Non-Hispanic white	Ref[b]		Ref[b]		Ref[b]		Ref		Ref	
Non-Hispanic black	0.39	0.33–0.46	0.56	0.47–0.65	0.54	0.47–0.62	0.86	0.74–1.00	1.13	0.95–1.33
Non-Hispanic other	0.28	0.22–0.36	0.47	0.36–0.60	0.60	0.44–0.82	0.80	0.62–1.03	0.76	0.59–0.99
Hispanic	0.46	0.40–0.52	0.54	0.47–0.62	0.64	0.54–0.75	0.78	0.66–0.92	0.89	0.70–1.15
Education level										
College graduate	Ref[b]		Ref[b]		Ref[b]		Ref[b]		Ref	
Some college	1.46	1.23–1.74	1.37	1.19–1.59	1.23	1.07–1.41	1.31	1.16–1.48	1.04	0.87–1.24
High school graduate	1.21	1.02–1.43	1.34	1.15–1.56	1.61	1.40–1.86	1.43	1.26–1.63	1.02	0.87–1.21
Some high school or less	1.26	1.02–1.54	1.10	0.93–1.29	1.20	1.00–1.44	1.28	1.10–1.49	1.09	0.92–1.29
Marital status										
Married/partnered	Ref		Ref		Ref		Ref		Ref[b]	
Not married/partnered	0.95	0.84–1.08	0.89	0.79–0.99	0.96	0.86–1.08	0.92	0.83–1.02	0.68	0.61–0.75
Visited a physician in the last year										
Yes	Ref		Ref		Ref		Ref		Ref	
No	0.93	0.81–1.06	1.01	0.90–1.15	1.21	1.05–1.40	1.21	1.05–1.40	1.43	1.13–1.80
Healthcare coverage										
Private	Ref		Ref		Ref		Ref[b]		Ref	
Public	0.77	0.64–0.93	0.78	0.65–0.94	0.86	0.70–1.04	0.71	0.61–0.83	0.94	0.83–1.06
None	0.90	0.79–1.04	0.93	0.82–1.06	1.09	0.95–1.25	0.96	0.82–1.11	0.96	0.42–2.18
Body mass index										
Normal	Ref		Ref		Ref[b]		Ref		Ref[b]	
Overweight	1.12	0.96–1.30	1.22	1.07–1.38	1.30	1.15–1.46	1.19	1.05–1.34	1.24	1.11–1.40
Obese	0.96	0.81–1.13	1.03	0.90–1.17	1.18	1.03–1.35	1.11	0.97–1.27	1.49	1.27–1.74
Physical activity										
None	Ref[b]		Ref		Ref		Ref		Ref[b]	
Some	1.15	0.97–1.37	1.19	1.01–1.40	1.13	0.98–1.31	1.04	0.91–1.20	1.14	1.00–1.30
Meet recommendations	1.38	1.20–1.59	1.25	1.10–1.41	1.18	1.04–1.34	1.12	1.00–1.26	1.40	1.23–1.60
Smoking status										
Current smoker	Ref[b]		Ref[b]		Ref[b]		Ref[b]		Ref[b]	
Former smoker	0.74	0.58–0.93	0.75	0.63–0.90	0.74	0.63–0.86	0.77	0.66–0.89	0.83	0.69–1.00
Never smoker	0.51	0.44–0.59	0.54	0.48–0.62	0.55	0.49–0.63	0.63	0.54–0.72	0.57	0.47–0.69
Alcohol use										
Risky drinker	Ref[b]		Ref[b]		Ref[b]		Ref		Ref	
Not risky drinker	0.44	0.34–0.56	0.55	0.40–0.76	0.60	0.46–0.77	0.77	0.61–0.97	0.63	0.46–0.87
Perceived cancer risk compared to others										
Less likely	Ref[b]		Ref[b]		Ref		Ref		Ref	
As likely	1.26	1.09–1.46	1.21	1.05–1.38	0.96	0.85–1.09	1.04	0.94–1.16	0.89	0.79–1.01
More likely	2.06	1.67–2.54	1.61	1.33–1.94	1.09	0.91–1.31	1.07	0.91–1.26	0.77	0.64–0.93
Don't know	0.90	0.66–1.23	0.96	0.70–1.31	0.68	0.51–0.92	0.98	0.77–1.26	0.88	0.72–1.08
Family history of melanoma										
Yes	Ref		Ref		Ref		Ref		Ref	
No	1.14	0.78–1.64	1.04	0.61–1.78	1.08	0.74–1.58	1.50	1.16–1.95	1.20	0.80–1.81
Skin reaction after 1 hour in the sun										
Moderate/severe sunburn	Ref[b]		Ref[b]		Ref[b]		Ref[b]		Ref[b]	
Mild sunburn	1.38	1.15–1.65	1.30	1.11–1.53	1.31	1.12–1.53	1.35	1.18–1.55	1.31	1.09–1.57
No sunburn	0.85	0.73–0.98	0.95	0.83–1.08	1.17	1.01–1.34	1.57	1.39–1.77	2.16	1.85–2.52
Do not go out in the sun	0.05	0.03–0.07	0.04	0.03–0.07	0.06	0.04–0.09	0.10	0.08–0.13	0.15	0.12–0.19

(*continued on next page*)

Table 4. Age-stratified ordinal logistic regression analyses examining correlates of multiple skin cancer risk behaviors,[a] 2005 National Health Interview Survey (*continued*)

	Age 18–29		Age 30–39		Age 40–49		Age 50–64		Age 65+	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Skin reaction after 2 weeks in the sun										
Sunburn repeatedly/ freckle	Ref[b]		Ref[b]		Ref[b]		Ref[b]		Ref[b]	
Mild tan	1.22	1.01–1.47	1.32	1.12–1.54	1.50	1.26–1.80	1.67	1.44–1.94	2.11	1.77–2.50
Moderate tan	1.42	1.19–1.70	1.82	1.55–2.13	1.85	1.57–2.19	2.29	1.96–2.68	2.66	2.26–3.14
Very dark tan	1.75	1.40–2.17	1.60	1.34–1.90	2.08	1.71–2.54	2.90	2.37–3.55	2.72	2.14–3.45
Do not go out in the sun	0.13	0.09–0.20	0.11	0.08–0.17	0.14	0.10–0.19	0.18	0.14–0.23	0.24	0.20–0.30
Ever had a total skin exam										
Yes	Ref		Ref		Ref[b]		Ref[b]		Ref	
No	1.05	0.85–1.31	1.14	0.99–1.32	1.31	1.12–1.54	1.37	1.19–1.56	1.09	0.95–1.25

Note: Data source: National Center for Health Statistics, 2005.[23]
[a]Skin cancer risk behaviors: infrequent use of sun-protective clothing; stay in the sun when outside on a sunny day; infrequent use of SPF 15+ sunscreen; indoor tanning device use in the past year; sunburn in the past year.
[b]Denotes a significant association ($p<0.001$) between the variable and having multiple skin cancer risk behaviors.

ordinal regression analyses. These include residing in the Midwest, being male, non-Hispanic white, less educated, smoking, being a risky drinker, and having less sun-sensitive skin. These results are largely consistent with prior studies of correlates of single skin cancer risk behaviors.[9,10,13,14] Exceptions include prior findings that women and individuals with a higher level of education engage in indoor tanning at higher rates than men and those with less education[11] and a higher prevalence of sunburn among individuals with more sun-sensitive skin.[13] Non-Hispanic white individuals may be more likely to tan outdoors and therefore engage in less sun protection and experience more sunburns.[25] The finding in the current study of more skin cancer risk behaviors among less-educated individuals, smokers, and risky drinkers, is consistent with national trends regarding socioeconomic differences in health risk behaviors.[26] An additional finding of note is the higher prevalence of skin cancer risk behaviors among middle-aged individuals (aged 40–64 years) who reported never having had a total skin exam. Coupled with the rising incidence of melanoma,[2] this finding is consistent with a recent call to consider the development and implementation of a national targeted melanoma screening program.[27]

Study Limitations

There are several limitations to the current study. The study design was cross-sectional, which limits conclusions made regarding age differences (e.g., differences may represent cohort effects) as well as the causal associations between perceived risk and risk behaviors. Skin cancer risk behaviors were assessed by self-report, which may not correspond with actual engagement in these behaviors. Skin cancer risk is cumulative, and some of the risk measures (sunburn, indoor tanning) evaluated only past-year behaviors. Finally, the NHIS database contains very few psychological variables that are known correlates of sun protection behaviors (e.g., appearance motivations), and did not assess skin self-examination.

Implications and Conclusion

The majority of the U.S. population reported engaging in more than one skin cancer risk behavior, with infrequent use of sun-protective clothing and infrequent use of sunscreen being the most common risk behaviors. Groups at highest risk for having more skin cancer risk behaviors include individuals under the age of 40, those residing in the Midwest, men, non-Hispanic whites, those with a lower education level, smokers, risky drinkers, and individuals with less skin sensitivity to the sun. Knowledge of these groups can be used to guide the need for, and content of, skin cancer risk behavior screening and intervention efforts. Identification of high-risk groups is particularly relevant to the primary care setting, where limited time is available for preventive counseling[28] and rates of assessment and counseling for skin cancer risk behaviors are low.[29,30] Further, the current results suggest that individuals reporting one skin cancer risk behavior should be assessed for other skin cancer risks. A comprehensive approach to skin cancer risk prevention requires attention to multiple skin cancer risk behaviors that are common in the U.S. population.

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