Skin Cancer Awareness and Sun Protection Behaviors in White Hispanic and White Non-Hispanic High School Students in Miami, Florida

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Objective: To examine skin cancer awareness and behavior in white Hispanic (WH) and white non-Hispanic (WNH) high school students because increasing incidence and delayed diagnosis of skin cancer in the growing Hispanic population in the United States represent an emerging health issue.

Design: Pilot survey study.

Setting: A high school in Miami, Florida.

Participants: A total of 369 high school students (221 WHs and 148 WNHs) were surveyed in the study.

Main Outcome Measures: Survey data were collected regarding skin cancer knowledge, perceived risk, and sun protection behaviors. Differences between the 2 groups were compared with $\chi^2$ tests.

Results: White Hispanic students were more likely to tan deeply ($P=.04$) but less likely to have heard of ($P<.01$) or been told how to perform ($P<.01$) skin self-examination. White Hispanics were less likely to wear sun-protective clothing or to use sunscreen with a sun protection factor of 15 or higher and reported a greater use of tanning beds. White Hispanic students also thought their chance of developing skin cancer was less than that of WNH students ($P<.01$), which remained significant after adjustment for age, sex, family history, and skin sensitivity to sun. After adjustment, WHs were 2.5 times more likely than WNHs to have used a tanning bed in the past year. White Hispanics were also 60% less likely to have heard of skin self-examination ($P<.01$) and 70% less likely than WNHs to have ever been told to perform the examination ($P=.03$). White Hispanics are about 1.8 and 2 times more likely to never or rarely wear protective clothing ($P<.01$) and to use sunscreen ($P=.01$), respectively.

Conclusion: There are disparities in knowledge, perceived risk of skin cancer, and sun-protective behaviors among WH and WNH high school students.

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Skin cancer is the most common cancer in the United States, with the incidence of both melanoma and nonmelanoma skin cancers increasing at an alarming rate. Excessive exposure to UV radiation in the form of sunlight is a major risk factor for melanoma and nonmelanoma skin cancers. Children and adolescents receive the majority of their lifetime UV exposure before the age of 18 years. Childhood sun exposure is particularly important in melanoma development. For example, more than 1 severe sunburn in childhood is associated with a 2-fold increase in melanoma risk.

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Most studies that have evaluated the association of skin cancer with sun exposure patterns have focused on light-skinned whites, as their lighter constitutive pigmentation confers higher risk for skin cancer than other racial or ethnic groups. While Hispanics do have lower age-adjusted incidence rates for melanoma (4.3 compared with 20.8 per 100,000 among whites), the importance of Hispanics in the epidemiology of skin cancer remains, as they are the fastest growing minority group in the United States. The US Census Bureau reported 41 million Hispanics living in the United States in 2004, surpassing blacks as the second largest population. Both primary and secondary prevention efforts of melanoma may be needed in Hispanic populations. For example, the incidence of melanoma in Hispanics increased annually by 2.9% in the last 15 years. White Hispanics (WHs) with melanoma are more likely than white non-Hispanics (WNHs) to present with regional or distant-stage disease. The latter data suggest that there are differences in knowledge and behavior related to the
prevention of skin cancer in WH and WNH populations; therefore, we hypothesize that these differences may exist in students and may be related to early acquisition of knowledge.

While there are substantial data for sun protection practice in white populations, data on awareness and perception of risk of skin cancer in WH are sparse. One study in suburban employees in Illinois reported less awareness of melanoma and nonmelanoma skin cancer and perception of risk among Hispanics than among non-Hispanics. Only 1 study examined sunscreen use in Hispanic high school students, and it found that Hispanics used sunscreen less frequently. The high annual amount of UV radiation and the large Hispanic population in south Florida make this location ideal to conduct a pilot study related to skin cancer prevention in Hispanics. In this study of a population of south Florida high school students, we compared knowledge and behavior related to skin cancer prevention in WH and WNHs, while accounting for differences in certain skin cancer risk factors, such as family history and skin type. A better understanding would be valuable in designing interventions targeting Hispanics.

### METHODS

In this pilot study, we used 1 of the 33 public high schools located in the Miami–Dade County area of Florida. The school is racially and ethnically diverse and representative of Miami–Dade County; therefore, we selected it to study sun protection behavior among high school students. Of the enrolled students, 33.2% are WH, 21.2% are black, and 42.6% are WNH; the remainder are Asian or considered multiracial. A random sample of 369 students (approximately 1.5 times the number of students needed based on our power analysis) who identified themselves as WHs or WNHs were chosen to participate in the survey.

After appropriate institutional and school board approval, students were invited through their home rooms to complete a self-administered, anonymous survey, which was derived from a tool that had been completed by more than 10,000 children and adolescents throughout the United States. Consent was obtained for students older than 18 years, and parental consent and youth assent were obtained for those younger than 18 years. The questionnaire included (1) demographic questions (age, sex, school grade, ethnicity, and place of birth), (2) questions related to skin cancer risk factors and use of protective measures against sun exposure, and (3) questions regarding self-perceived risk of skin cancer. The students were also asked about skin type, with questions related to burning and tanning after sun exposure.

We used chi-square tests to compare the distributions of skin cancer awareness and perception of skin cancer risk between WH and WNH students based on survey responses. If an expected number in any cell was less than 5, we used the Fisher exact test instead. We then performed multivariate logistic regression analysis to compare awareness, perception, and sun-protective behaviors between the 2 ethnic student groups; age, sex, family history of skin cancer, and skin type were included in the multivariate logistic regression model. We used questions related to sensitivity to sun to classify students into 2 skin-type groups: sun sensitive and sun insensitive. The significance level was set at $P \leq .05$. All statistical analyses were performed with SAS software version 8 (SAS Institute Inc, Cary, North Carolina).

Based on the only other published study (to our knowledge) comparing awareness and perception of skin cancer risk and self skin-examination in WHs and WNHs, a total sample size of 216 (108 in each group) was needed to detect a 2-sided, $P \leq .05$ level of significance, with a study power of 80%.

### RESULTS

A total of 369 students participated in the survey. Of the 369 students, 221, or 60%, were WH and 148, or 40%, were WNH. These numbers represent 15% and 13% of the school’s WH and WNH students, respectively. The basic demographics and skin sensitivity to sunlight of these 2 groups are presented in Table 1. The WH students were slightly older than the WNH students (17.2 vs 16.5 years; $P < .01$). Approximately 49% of WHs were male compared with 45% of WNHs ($P = .42$). As expected, WHs were more likely than WNHs to have been born outside the United States (43% vs 10%; $P < .01$). When exposed to strong sun in summer without protection, WNHs reported proportions of “some redness” and “deep red painful burn” that were similar to those of WHs (these responders were categorized as sun-sensitive skin type, while the other responders were categorized as sun-insensitive skin type). However, WHs were significantly more likely than WNHs (31%) to tan deeply (44%) ($P = .04$).

Table 2 summarizes the awareness and perceived risk of skin cancer in WH and WNH students. Overall, time spent in the sun on weekdays or weekends was similar among WHs and WNHs. There was a trend toward sta-
The proportion of students who considered exposure to sun to be the most important factor causing skin cancer was comparable among WHs and WNHs, with about three-quarters of both groups agreeing with this statement. More WNHs than WHs had heard of (37% vs 19%; \( P < .01 \)) and been told how to perform skin self-examinations (11% vs 3%; \( P < .01 \)). This difference remained significant after age, sex, sun sensitivity, and family history of skin cancer were adjusted for, with WH students less likely both to have had heard of (\( P < .01 \)) and to have been told how to perform (\( P = .03 \)) skin self-examinations. The WNH students also reported a significantly higher proportion of having a close relative with a history of skin cancer than WH students (26% vs 11%; \( P < .01 \)). When asked about the chances of developing skin cancer in the future, 19% and 4% of WHs considered their chances to be about average or higher than average, respectively, compared with 26% and 14% of WNHs (\( P < .01 \)). After age, sex, sun sensitivity, and family history of skin cancer were adjusted for, WHs still believed their chances of developing skin cancer to be low compared with WNHs (\( P = .02 \)).

The use of protective measures for skin cancer was also compared between WH and WNH students (Table 3). The 2 groups sought shade equally. However, WNHs were more likely than WHs to wear sun-protective clothing as well as sunscreen with a sun protection factor of 15 or higher: 18% of WNHs wore sun-protective clothing most of the time and 6% always wore sun-protective clothing compared with 9% and 3% of WHs, respectively.
Among White Hispanic and White Non-Hispanic High School Students in Miami, Florida

<table>
<thead>
<tr>
<th></th>
<th>White Hispanics (n=221)</th>
<th>White Non-Hispanics (n=148)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeks shade</td>
<td></td>
<td></td>
<td>.32</td>
</tr>
<tr>
<td>Never</td>
<td>15 (6.9)</td>
<td>11 (7.4)</td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td>51 (23.3)</td>
<td>33 (22.3)</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>101 (46.1)</td>
<td>64 (43.2)</td>
<td></td>
</tr>
<tr>
<td>Most of the times</td>
<td>40 (18.3)</td>
<td>37 (25.0)</td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>12 (5.5)</td>
<td>3 (2.0)</td>
<td></td>
</tr>
<tr>
<td>Wears sun-protective clothing</td>
<td></td>
<td></td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Never</td>
<td>55 (24.9)</td>
<td>19 (12.9)</td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td>71 (32.1)</td>
<td>42 (28.6)</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>69 (31.2)</td>
<td>50 (34.0)</td>
<td></td>
</tr>
<tr>
<td>Most of the times</td>
<td>20 (9.1)</td>
<td>27 (18.4)</td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>6 (2.7)</td>
<td>9 (6.1)</td>
<td></td>
</tr>
<tr>
<td>Wears sunscreen with SPF ≥ 15</td>
<td></td>
<td></td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Never</td>
<td>72 (32.6)</td>
<td>21 (14.2)</td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td>89 (39.8)</td>
<td>59 (39.2)</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>40 (18.1)</td>
<td>42 (28.4)</td>
<td></td>
</tr>
<tr>
<td>Most of the times</td>
<td>17 (7.7)</td>
<td>15 (10.1)</td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>4 (1.8)</td>
<td>12 (8.1)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: SPF, sun protection factor.

In 2002, the Centers for Disease Control and Prevention set forth policy guidelines for skin cancer prevention in schools.17 The fast-growing Hispanic population includes school-aged children6; therefore, closer examination of the epidemiology of skin cancer in this population is warranted. We investigated skin cancer awareness among WH and WNH students in a Miami–Dade County high school and found disparities in the perceived risk of skin cancer and sun-protective behaviors. The WH students were less aware of skin self-examination, and they perceived themselves to be at lower risk for skin cancer. They were also less likely to wear sun-protective clothing and sunscreen. These differences between WH and WNH students remained significant after age, sex, sun sensitivity, and family history of skin cancer were controlled for (Table 4).

A few limitations of the study should be noted. This survey was completed at a Miami–Dade County high school because of the school’s racial and ethnic diversity. The school is located in a middle-class neighborhood. The use of a single school in this pilot study and the limited sample size suggest that these findings should be generalized with caution. We used the term Hispanic, which is considered an ethnicity by the US Census Bureau, to identify persons who indicate that their origin is from a Spanish-speaking country. Hispanic refers to persons whose origin is Mexican, Puerto Rican, Cuban, South or Central American, or other Hispanic/Latino, regardless of race. As Hispanic persons can be further described by race, it is critical to stratify risk based on skin type and analyze the results after controlling for skin type, as in the present study.18 Similar to US Census data gathering on race/ethnicity information, our survey lacked a standardized definition of WHs; however, to our knowledge, self-report of Hispanic ethnicity in school-aged children has not been previously studied. The self-reported information on sun exposure and sun protection is likely reliable, as a previous study that examined the solar protection reported by adolescents and by parents or guardians suggested that adolescents’ self-reporting of solar protection was relatively valid.19 Finally, while most of the questions asked were from a validated questionnaire, we attempted to minimize bias in the rest of the survey by asking questions with objective and clear answer choices.

In our study, we controlled for differences in skin sensitivity to sun in 2 groups with variably constitutive pigmentation and response to sun exposure and found that WH and WNH students reported little differences in sun burning when exposed to the strong sun in summer but

(P < .01); 28% of WNHs wore sunscreen sometimes, 10% most of the time, and 8% always compared with 18%, 8%, and 2% of WHs, respectively (P < .01). The lower likelihood of WH students using sunscreen and wearing sun-protective clothing compared with their WNH peers remained significant after age, sex, sun sensitivity, and family history of skin cancer were controlled for (Table 4).
did report differences in tanning. While there was no difference in time spent in the sun between the 2 groups, we did control for sun sensitivity in logistic regression analysis, and among the significant findings, we found that WH students were 2.5 times more likely than WNH students to have used a tanning bed.

Consistent with findings from a previous survey in Hispanic adults, we found that WHs perceived themselves to be at lower risk for skin cancer, knew less, and were less likely to have been taught about skin self-examination than their WNH peers. This difference remained significant after differences in age, sex, skin sensitivity, and family history of skin cancers were controlled for, which suggests that even among WH and WNH students of similar skin type and family history (and presumably similar risk profile for skin cancer), WH students were less knowledgeable about skin cancer. Although there is no formal recommendation or guidelines on performing self-skin-examination in adolescents, knowledge about skin self-examination was included in the survey as an additional parameter to measure adolescents’ awareness about skin cancer prevention. Skin self-examination in adolescents may be valuable as an additional step in secondary prevention in high-risk young individuals. Data show that the rate of increase in melanoma incidence in children and young adults (age, <20 years) was 2.8% per year from 1981 to 2001, which is comparable to the rate of increase in adults. According to Robinson et al., people gain most of their skin cancer information through multimedia sources in the United States, with messages defining high-risk populations as those with fair skin, those who burn easily, and those who participate in outdoor or recreational sun exposure. One possible explanation for the difference in skin cancer knowledge is that WNH students may have received more skin cancer–related information, including skin self-examination, through family members, as they reported having a significantly higher number of close relatives with a history of skin cancer (26% of WH students vs 11% of WH students). Studies have shown that teenagers who practice skin cancer prevention tend to be those with a family or friend with skin cancer; however, even those teenagers tend to use sunscreen infrequently, inconsistently, and incorrectly. However, in our study, the difference in skin cancer knowledge between WHs and WNHs remained significant after adjustment for family history of skin cancer. Therefore, it is possible that an overall lack of public education on skin cancer risk in minority populations may be contributing to the differences observed between WHs and WNHs.

We found that 10% of WH and 18% of WNH high school students frequently (most of the time or always) used sunscreen with a sun protection factor of 15 or higher. Although these rates are similar to those previously reported among Hispanic (11%) and white (17%) high school students in the United States, they are relatively low compared with those reported for young persons (age, >12 years) in Canada (68%) and Australia (73% of females and 54% of males). Considering the warm weather and year-round sun exposure in southern Florida, we would have expected a higher rate of sunscreen use. Experts recommend the use of sunscreen, as well as other sun-protective measures (eg, wearing protective clothing, wearing wide-brimmed hats, and avoiding the sun), to protect persons from sun exposure. Sunscreen use has been shown to be effective in preventing sunburn. Recent epidemiological studies also suggest that sunscreen use can prevent squamous cell carcinoma and reduce the number of acquired nevi that are associated with sun exposure as a risk marker for melanoma.

Our survey indicated that a significantly lower proportion of WHs than WNHs wore sun-protective clothing or used sunscreen with a sun protection factor of 15 or higher, regardless of skin sensitivity to sun. Such gaps indicate that there is a need to include WH students in skin cancer prevention programs targeting young persons. While WHs generally have a lower incidence of melanoma than WNHs, we recently reported that increased UV radiation exposure is associated with increasing melanoma incidence in persons with darker constitutive pigmentation (including Hispanics). This finding, combined with the increasing number of Hispanics in the United States, supports the rationale for recommending primary melanoma prevention (ie, sun protection) in darker-skinned populations. Further studies are needed to determine whether WH and WNH students improve to a similar degree after formal education regarding skin cancer, and such studies are currently under way. Finally, our findings of significant differences in skin self-examination are important given recent reports of later-stage melanoma diagnosis in WNHs compared with WNHs. This suggests a need for further research and possible intervention.

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**Author Contributions:** Study concept and design: Kirsner. Acquisition of data: Ma and Collado-Mesa. Analysis and interpretation of data: Ma, Hu, and Kirsner. Drafting of the manuscript: Ma and Collado-Mesa. Critical revision of the manuscript for important intellectual content: Hu and Kirsner. Statistical analysis: Ma. Obtained funding: Kirsner. Administrative, technical, and material support: Hu. Study supervision: Kirsner.

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**REFERENCES**