Sunbathing Habits and Sunscreen Use among White Adults: Results of a National Survey

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Introduction

Much of the worldwide increase in skin cancer incidence, including cutaneous melanoma, is attributed to increased exposure to sunlight over time.1-3 Primary prevention of melanoma and skin cancer involves minimizing sun exposure, seeking shade, routinely using sunscreen (with a solar protection factor of 15 or greater), and wearing protective clothing.4-6

Nationally representative data on current sun protection behaviors are lacking. Hence, we analyzed the sunbathing habits and prevalence of sunscreen use in a nationally representative sample.

Methods

In July through September 1991, we conducted a telephone survey of 3042 households (with persons 16 years of age or older) in the continental United States to assess recreational aquatic activities and risk factors associated with drowning. The sample size provided 90% power to detect differences of 4% or more. Methods have been described in greater detail in an earlier study.7 A subset of questions assessed respondents’ sunbathing and sunscreen habits. To partially control for lack of information on skin type (pigmentation and ability to tan on sun exposure), we restricted analyses to 2459 Whites.

Data Collection

This telephone survey sample, identified by random-digit dialing via a two-stage Waksberg procedure, was proportionate to the number of working residential telephone numbers in the continental United States. Within each household, one adult 16 years old or older was randomly selected to be interviewed. To represent the national population of adults 16 years of age and older, the interview was weighted by the reciprocal of the number of eligible persons within the household.

The response rates were 71% for English-speaking households and 70% for all households. Reasons for nonparticipation included refusal to be interviewed, illness, unavailability, and no answer after as many as 10 phone calls. Because the sample was contacted through a random-digit dialing procedure, we have no direct information from households that refused.

In comparison with data from the 1990 US Census, survey respondents were better educated (only 15% had less than a high school degree, as compared with the national average of 25%). To estimate the impact of this potential bias in responses, we directly standardized certain key responses (e.g., proportion of those surveyed reporting an aquatic activity during the previous year) to the 1990 Census education distribution. Since this made little or no difference in the response proportions, further standardization was not performed.

Data Analysis

Sunbathing. Respondents were asked about any recreational activities in, on, or near water (including pools, oceans, lakes, and rivers) during the previous 12 months. Respondents were also asked the number...
of days they had sunbathed or sat by the water (but had not gone in the water) during the past year. Respondents were then categorized into three groups: nonsunbathers, infrequent sunbathers (1 to 10 days), and frequent sunbathers (11 or more days).

Sunscreen use. Persons who reported any activity in, on, or near the water during the month prior to the interview were asked whether they had sunbathed on the last (full) day of activity; if so, they were asked about their general use of sunblock. While scientists recognize differences between sunblock and sunscreen, the general public uses these terms interchangeably, as we do in this analysis. Respondents were classified as "routine" users if they always or often used sunscreen and as "sporadic" users if they used it sometimes, rarely, or never.

Those reporting any sunscreen use were asked the solar protection factor (SPF) of the sunscreen they usually employed. Two groups were compared: those using a sunscreen with a solar protection factor of less than 15 and those using a sunscreen with a solar protection factor of 15 or higher.

Statistical Methodology

Demographic characteristics (age, gender, education level) were examined to evaluate associations with (1) frequency of sunbathing in the past year, (2) use of sunscreen when sunbathing, and (3) solar protection factor of sunscreen commonly used. Age groups were categorized as 16 through 25 years, 26 through 40 years, 41 through 60 years, and 61 years and above. Educational status was categorized as lower (grade school or less, some high school, high school diploma), middle (vocational school, 2-year college degree, some college), or higher (4-year college degree and graduate school). An exploratory analysis found no interactions with age and sex.

Analyses were performed on weighted numbers; standard errors were not taken into account in the logistic regression. Chi-squared tests for categorical data were performed, and logistic and linear regression models were constructed to describe sets of demographic predictors of sunbathing habits and routine sunscreen use. Dummy variables were used for categorical and ordinal data in the models. Crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were calculated. Women, the youngest age group, and the least educated group were the reference categories in each analysis. The SAS software program was used in conducting analyses.

Results

The mean age of the White respondents was 42 years; 55% were women, and 28% were college graduates.

Frequency of Sunbathing

Most respondents (59%; n = 1440) reported sunbathing at least once during the previous year (Table 1), with women, those in the youngest age group, and those in the highest education group most likely to sunbathe at least once.

A quarter of respondents were frequent sunbathers (11 or more days during the year) (Table 1). Women, younger respondents, and those at middle and higher education levels were most likely to frequently sunbathe. Multivariate analysis confirmed that women and younger respondents sunbathed most frequently.

Sunscreen Use

Two thirds (n = 1614) of the respondents reported an activity on or near the water during the month prior to the interview; of these individuals, 33% (n = 530) reported sunbathing on the last day of activity on or near the water (Table 2).

Among these 530 sunbathers, 248 (47%) reported using sunscreens routinely (always/often). Only 36% of men used sunscreen routinely, as compared with 53% of women (OR = 2.1, 95% CI = 1.5, 3.1) (Table 2). Multivariate analysis confirmed that women were more likely to report routine sunscreen use than men (adjusted OR = 2.2, 95% CI = 1.5, 3.2).

Education level was also related to sunscreen use (Table 2). Respondents in the lowest education group used sunscreen least frequently (38% vs 53% and 55% in the middle and highest education groups, respectively). In the multivariate analysis, sunscreen use was more common in individuals in the higher education group (adjusted OR = 2.0, 95% CI = 1.2, 3.1). Associations remained constant when routine sunscreen use was redefined to include "sometimes" users. Respondents in the youngest age group (16 to 25 years of age) were less likely than those in the other age groups to use sunscreen routinely. After we controlled for age, sex, and education, income was not associated with the likelihood of sunbathing or sunscreen use.

Solar Protection Factor Level

Routine users were more likely than sporadic users to use sunscreen with a solar protection factor of 15 or higher (P < .01). Among the 530 sunbathers, 390 responded to the question concerning the solar protection factor of sunscreen usually used (the remainder included persons who never used sunscreen). Of the 248 routine users, 240 (97%) responded to this question; of these individuals, 45% did not use sunscreen with a solar protection factor of 15 or higher. Among the sporadic sunscreen users

| TABLE 1—Sunbathing in Past Year among White US Adults (n = 2459), 1991 |
|------------------------|------------------------|------------------------|
|                        | None (n = 1019), % (95% CI) | Infrequent (n = 818), % (95% CI) | Frequent (n = 622), % (95% CI) |
| Sex                    |                        |                        |                        |
| Women (reference)      | 40 (36, 43)            | 33 (30, 36)            | 27 (25, 30)            |
|                        | (95% CI)                | (95% CI)                | (95% CI)                |
| Men                    | 43 (40, 47)            | 34 (31, 37)            | 23 (20, 25)**          |
| Age, y                 |                        |                        |                        |
| 16–25 (reference)      | 25 (20, 30)            | 41 (35, 47)            | 34 (29, 39)            |
| 26–40                  | 34 (30, 38)            | 32 (28, 36)**          | 34 (30, 38)            |
| 41–60                  | 43 (39, 48)            | 36 (32, 41)**          | 20 (17, 23)**          |
| >60                    | 69 (61, 77)            | 22 (18, 27)**          | 9 (6, 11)**            |
| Education level        |                        |                        |                        |
| Lower (reference)      | 48 (43, 52)            | 30 (27, 33)            | 22 (19, 25)            |
| Middle                 | 41 (36, 46)            | 32 (27, 37)            | 27 (23, 31)*           |
| Higher                 | 37 (32, 41)            | 38 (33, 43)**          | 25 (22, 29)**          |

Note. Chi-squared tests assessed differences in proportions relative to the reference category. CI = confidence interval.

*1–10 days.
**p11 days.
***.01 < P < .05; **.001 < P < .01; ***P < .001.
TABLE 2—Sunscreen Use among White US Sunbathers (n = 530), 1991

<table>
<thead>
<tr>
<th></th>
<th>Sporadic Users (n = 282)</th>
<th>Routine Users (n = 248)</th>
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<tbody>
<tr>
<td></td>
<td>% (95% CI)</td>
<td>% (95% CI)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women (reference)</td>
<td>47 (41, 53)</td>
<td>53 (47, 59)</td>
</tr>
<tr>
<td>Men</td>
<td>64 (57, 71)</td>
<td>36 (31, 41)***</td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
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</tr>
<tr>
<td>16–25 (reference)</td>
<td>62 (55, 69)</td>
<td>38 (33, 43)</td>
</tr>
<tr>
<td>26–40</td>
<td>48 (42, 54)</td>
<td>52 (46, 58)*</td>
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<tr>
<td>41–60</td>
<td>53 (47, 59)</td>
<td>47 (41, 53)</td>
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<tr>
<td>&gt;60</td>
<td>57 (51, 63)</td>
<td>43 (37, 49)</td>
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<tr>
<td>Education level</td>
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</tr>
</tbody>
</table>

Note. Chi-squared tests assessed differences in proportions relative to the reference category.
CI = confidence interval.
*01 < P < .05; **.001 < P < .01; ***P < .001.

responding to this question (n = 150), 60% did not use sunscreen with the recommended solar protection factor of 15 or higher. Those in the youngest age group were less likely than those in the other age groups to use sunscreen with a protection factor of 15 or higher (P < .01).

In summary, only 47% of the 530 respondents reported routine sunscreen use, and of these individuals only 55% used sunscreen with a solar protection factor of 15 or higher. Thus, overall, only 25% of sunbathers routinely used a sunscreen with the recommended solar protection factor of 15 or higher.

**Discussion**

With the goal of preventing melanoma and skin cancer, current public health recommendations endorse safe sun behaviors, including use of sunscreens with a solar protection factor of 15 or higher. However, there are few national data to determine whether such recommendations are being followed. Our national telephone study indicated that while most (59%) White American adults sunbathe and a quarter do so frequently, less than half routinely use sunscreen. Of routine users in this study, only half used sunscreen with the recommended solar protection factor of 15 or higher. Hence, only about a quarter of respondents overall used sunscreens with recommended levels of protection during maximal recreational sun exposure.

Our study also revealed that men, those in the lowest education group, and those in the youngest age group were less frequent users. These results generally conform with findings of other, smaller studies that did not use national sampling. Investigations also documenting that men and the least educated are less likely to use sunscreens include a survey of 251 Connecticut participants at a skin cancer screening program,10 a Hawaiian study,11 and a survey of beachgoers.12 In Australia,13 70% of adults contacted through employment sources reported sunscreen use; women, in comparison with men, had more positive attitudes, beliefs, and intentions about future usage. In contrast, Robinson found that women previously diagnosed with nonmelanoma skin cancer were less compliant with sun protection guidelines than men, suggesting that female patients did not consider skin cancer enough of a problem to give up a tan.14 Another study of nearly 300 outpatients in dermatology and internal medicine clinics in Pennsylvania also found that about half of the participants reported using sunscreen or a suntan lotion product, with no gender differences in usage.15

There is little literature on solar protection factor levels of sunscreens used. The Hawaiian investigation mentioned earlier, which noted that 25% of those who spent time in the sun used sunscreen with a solar protection factor of at least 8,11 was conducted before use of higher solar protection factor levels became popular. A more current study found that women and college-educated persons were most likely to identify the solar protection factor level they used and to define it appropriately.10

In the present study, respondents in the youngest age group (16 to 25 years of age) sunbathed frequently and were least likely to use the recommended sunscreen. Because most lifetime sun exposure occurs in childhood and adolescence16,17 and excessive amounts can raise melanoma and skin cancer risk,18-21 reducing unhealthy sun exposure in children and adolescents could substantially reduce future skin cancer rates.2,6

To our knowledge, this study represents the first nationally representative population survey on sunscreen use. Asking people for information on their last sunbathing day also tends to minimize recall bias but may overemphasize recent behavior. Ascertaining bias should be minimal; the few sun-related questions were incorporated within an hour-long survey on drinking in aquatic settings.

However, there are limitations to this study. The term “sunbathing,” generally viewed as purposeful exposure to the sun, may have had different meanings for different respondents. Also, frequency of sunscreen use and solar protection factor level were self-reported. In addition, we could not assess sunscreen use in the context of other sun protection practices (e.g., use of shade, hats, and clothing). Thus, we cannot describe the full range of sun protection practices of this sample.

We also lack information on skin type (e.g., pigmented and constitutional characteristics). It is possible that a high degree of sunbathing with suboptimal sunscreen use was more common in those with lower skin cancer risk (e.g., those who tan easily and rarely burn in the sun). Finally, in comparison with the overall US population, our respondents were somewhat better educated.

Nevertheless, our 1991 survey provides a preliminary national estimate that only a quarter of Americans use recommended sunscreen measures when sunbathing. Further studies must confirm and update our results. In addition, qualitative research must address the reasons for low use of sunscreen by young men and those with low education levels; recent data indicate more advanced-stage melanomas and higher mortality in these subgroups.22-24 Studies must also address how sunscreen costs affect compliance, although income was not associated with the likelihood of sunbathing or sunscreen use in our analysis. In addition, better age-specific educational messages may be needed for younger persons to offset the
desire for a suntan. Healthy People 2000 has set forth sun protection goals for the nation. Further efforts that improve sun protection behaviors should reduce melanoma and skin cancer rates in future generations.

Acknowledgments
This research was supported in part by the Dr Donald Gauthier Melanoma Research Fund, the Judge Bernard Cohen Cancer Control Research Fund, and the Centers for Disease Control and Prevention (cooperative agreement U50-CCU511453-03).

References