

Sun Protection Practices for Children

Knowledge, Attitudes, and Parent Behaviors

Kyle Johnson, MPH; Leigh Davy, BS; Tim Boyett, MPH; Laura Weathers, MD; Richard G. Roetzheim, MD, MSPH

Objective: To examine the frequency with which sun protection is used by parents for their children.

Design and Setting: Descriptive survey conducted at a university medical clinic in Florida.

Participants: Parents of children aged 1 to 16 years were approached in the waiting area, and 77 of 100 were successfully interviewed.

Main Outcome Measures: Parents' self-reported use of sun protection measures for their children and their attitudes and beliefs about sun protection.

Results: Fewer than half of respondents (43%) reported regularly using sun protection for their child. Regular use of sun protection was reported more frequently

by female caretakers and those with more favorable attitudes regarding sun protection use. Sunscreen was the most frequently used measure, and preventing sunburn was the primary reason for using sun protection. Respondents held several unfavorable sun protection attitudes, including the belief that sun exposure was healthy, that children looked better with a tan, and that it was okay to stay out in the sun longer if the child wore sunscreen.

Conclusions: Regular use of sun protection for children is infrequent and consists primarily of applying sunscreen rather than methods that reduce sun exposure. Parents primarily use sunscreen to prevent sunburn and may increase their children's overall sun exposure as a result.

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SKIN CANCER is a growing public health problem. More than 1.3 million persons will be diagnosed with some form of skin cancer in the year 2000.¹ Malignant melanoma, the most fatal form of skin cancer, is also occurring more frequently. During the period from 1973 to 1989, the incidence of malignant melanoma increased 85%, more than any other major cancer.^{2,3} Approximately 47 700 people are expected to be diagnosed with melanoma in 2000, with an estimated 7700 deaths owing to this malignancy.¹ The lifetime risk of acquiring melanoma is now estimated to be about 1 in 87.⁴

See also page 874

Excessive sun exposure has been associated with the subsequent development of most types of skin cancers.^{5,6} Moreover, as much as 80% of total lifetime sun exposure occurs during childhood.^{7,8} Stern et al⁹ have calculated that routine sunscreen use by children could reduce subsequent skin cancer development by 78%.

The US Preventive Services Task Force concurred, concluding that "avoiding sun exposure or using protective clothing is likely to decrease the risk of malignant melanoma and nonmelanoma skin cancers."¹⁰ Thus, sun protection use for children, including avoiding excessive sun exposure, covering exposed skin, and using appropriate sunscreen, is one of the most important means to prevent the development of skin cancer.

One of the objectives of Healthy People 2010 is to decrease the incidence of skin cancer by the following methods (from objectives 3-9 and 3-9a):

Increase the proportion of adolescents in grades 9 through 12 who follow protective measures that may reduce the risk of skin cancer: avoid the sun between 10:00 AM and 4:00 PM, wear sun protective clothing when exposed to sunlight, use sunscreen with a sun protective factor (SPF) of 15 or higher, and avoid artificial sources of ultraviolet light.¹¹

Numerous health authorities, including the Centers for Disease Control and Prevention, the American Academy of Dermatology, the American Cancer Society, the Na-

From the Departments of Family Medicine (Mr Johnson and Dr Roetzheim), Pediatrics (Dr Weathers), and Family Medicine (Ms Davy and Mr Boyett), University of South Florida, and the Division of Cancer Control, H. Lee Moffitt Cancer Center & Research Institute (Dr Roetzheim), Tampa.

SUBJECTS, MATERIALS, AND METHODS

We systematically sampled 100 parents whose children were being seen in the University of South Florida medical clinics during 4 arbitrarily chosen clinic sessions in August 1999. A sample size of 100 was chosen to enable us to estimate all proportions with maximum error of $\pm 10\%$. Parents were approached in the waiting area by a research assistant and asked to participate. It was explained to the parents that the survey was part of a research study examining sun protection of children and that their answers would be confidential and not shared with their physician. It was also explained that the survey was purely voluntary. Parents having a child between the ages of newborn to 16 years were eligible for inclusion in the study. Nonparents who were otherwise a primary caregiver to the child (grandparent, legal guardian, etc) were also eligible. Eligible subjects were asked to complete a 2-page self-administered questionnaire.

The self-administered questionnaire consisted of 43 items that were pretested for clarity and required approximately 15 minutes to complete. The questionnaire elicited basic sociodemographic information about the respondent and the child being seen, recorded their current methods of sun protection for their children, and their attitudes and knowledge about sun protection. Parents who could not complete the survey in the waiting room were offered a self-addressed, stamped envelope to complete the survey at home. Seventy-seven persons responded. The most common reasons for nonresponse included being non-English speaking or having no time to complete the survey before the child's office visit.

The main outcome of our study was self-reported use of sun protection on a regular basis. Caretakers who reported the frequency of use of sun protection for their child as "usually" or "always" were assigned this outcome. In bivariate analysis we examined whether sociodemographic and clinical factors were associated with the regular use of sun protection using the χ^2 test for categorical variables, the Mantel-Haenszel χ^2 test for trend for ordinal measures, and the *t* test for continuous measures.

To examine whether sun protection knowledge and attitudes of caretakers was predictive of regular sun protection use, we developed a mixed sun protection knowledge and attitude scale based on 10 survey questions that assessed these factors. Four items that correlated poorly (correlation coefficient, < 0.3) with the summative scale were dropped. The final scale consisted of the 6 remaining items and had a maximum potential score of 6, indicating very favorable attitudes and beliefs regarding sun protection use. The 6 items included knowing how quickly sunscreen becomes effective, believing that it is not okay to stay out in the sun longer because sunscreen was applied or if the child is in the water, that it is still necessary to apply sunscreen on cloudy days, strongly disagreeing with the statement, "There is not much you can do to prevent skin cancer," and believing that the sun causes most damage during childhood.

The internal consistency of this scale was confirmed using Cronbach coefficient α ($\alpha = .63$). We also tested the construct validity of this scale by comparing knowledge/attitude scores for 3 subgroups of parents; (1) those who indicated that they were very knowledgeable about sun protection (mean score, 4.8); (2) those who indicated they were somewhat knowledgeable (mean score, 2.8); and (3) those who indicated they were not knowledgeable about sun protection (mean score, 2.0) (Kruskal-Wallis test for differences in mean scores, 21.7; $P < .001$).

To determine if more favorable parental knowledge and attitudes was associated with sun protection use, we compared the mean scores for the sun protection knowledge/attitude scale among caretakers who reported regular use of sun protection and those who did not using the *t* test. We also performed multivariate analysis on the outcome of regular sun protection use using multiple logistic regression and a stepwise variable selection algorithm. All variables were eligible for selection into the logistic model, with specified levels for initial entry into the model and remaining in the final model both set at 0.01. Logistic models determined which characteristics were independently associated with the odds of regular sun protection use. The statistical significance of predictors was assessed using the χ^2 likelihood ratio test.³⁴

tional Cancer Institute of Canada, and the National Health and Medical Research Council of Australia, recommend comprehensive sun safety for children.¹²

The types of sun protection methods used for children and the frequency of use have not been thoroughly studied. Most studies in the United States have addressed adults.¹³ In addition, most surveys have asked only about one sun protective behavior, sunscreen use, and the published survey results are primarily descriptive.^{14,15} Few studies have framed survey questions in behavioral theory, so there is a need to better understand the factors influencing children to practice sun protection habits.¹⁶ This knowledge may lead to improved designs for sun protection interventions with the goal of reducing the lifetime risk of malignant and nonmalignant skin cancers.

One behavioral theory that may be relevant to sun protection use for children is the social cognitive

theory. Social cognitive theory asserts that a person's surrounding social and physical environment influences his or her behavior. Although this has served as an explanation for one's own decision-making patterns reflecting, in particular, health behaviors, it is plausible to extend this theory to support the claims that parents are responsible for the sun protective behaviors of their children because of their beliefs on the subject and their subsequent norms and practices.¹⁷ Parents are, in most cases, the primary agents for socialization with respect to child development.¹⁸ Therefore, they are in the right position to influence their children's sun protection habits.

Most studies that have examined knowledge and attitudes as determinants of sun protection habits have focused on children's sun protection knowledge and attitudes and not the parents'.¹⁹⁻²³ Interventions that have targeted children themselves have generally shown fa-

Table 1. Demographic Characteristics of 77 Caretakers and Their Children*

Characteristic	No. (%)
Caretaker	
Age, mean (SD), y	34.6 (11)
Sex	
Male	14 (18)
Female	63 (82)
Race/ethnicity	
White	42 (55)
African American	20 (26)
Hispanic	11 (15)
Other	3 (4)
Education	
≤High school education	32 (42)
>High school education	44 (58)
Area of residence	
Urban	50 (65)
Nonurban	27 (35)
Child	
Age, mean (SD), y	5.8 (5)
Sex	
Male	44 (60)
Female	30 (41)

*Numbers may not sum to total sample size as a result of missing data.

avorable effects on their knowledge and attitudes, but not their sun protection behaviors.¹² Few studies have examined parents' sun protection knowledge and attitudes as a determinant of their child's sun protection behaviors.

Several studies that have included a parental interview did not examine parental knowledge and attitudes as a predictor of their child's sun protection behavior.²⁴⁻²⁸ Other studies did not attempt to systematically examine parental knowledge and attitudes and have often examined only a single attitude ("my child looks healthier with a tan").^{15,29-32} Finally, studies that have attempted to systematically examine parent's sun protection knowledge and attitudes were limited to selected populations. Buller et al,³³ for example, studied the parents of children in grades 1 through 3 who were attending a summer recreational program in Hawaii.

For these reasons, it is not yet clear how parental knowledge and attitudes affect the sun protection behavior of children. Understanding the parental characteristics that influence children's sun protection use is an important area of inquiry as interventions directed at parents have generally been more successful than interventions targeted at children themselves.¹²

This study, approved by our institutional review board, was performed to examine the frequency with which sun protection is used by parents for their children. We also sought to assess the relationship between parents' knowledge, attitudes, and behaviors concerning sun protection and the subsequent use of sun protection practices to benefit their children. We hypothesized that parents having more favorable knowledge and attitudes regarding sun protection use would report greater sun protection use for their children.

Table 2. Sun Protection Behaviors Reported for 77 Children*

Survey Item	No. (%)
Sun protection methods used for child	
Sunscreen	51 (67)
Hat	26 (34)
Stay in shade	31 (41)
Long-sleeved shirt	5 (7)
Short-sleeved shirt	16 (21)
Staying indoors during peak hours	39 (51)
Sunglasses	26 (34)
Other	5 (7)
Usually or always uses sun protection for child	
Yes	33 (43)
No	44 (57)
Applies sunscreen to child when at beach	
Yes	65 (84)
No	12 (16)
Applies sunscreen to child daily	
Yes	18 (23)
No	59 (77)
Always or usually reapplies sunscreen to child when used	
Yes	34 (44)
No	43 (56)
Parent always or usually use sun protection	
Yes	43 (56)
No	34 (44)
Parent teaches child about sun protection	
Yes	51 (72)
No	20 (28)
Parent believes it is okay for child to stay in sun longer if sunscreen used	
Yes	35 (49)
No	36 (51)
Parent believes sun exposure is healthy for child	
Yes	31 (41)
No	44 (59)
Parent thinks child looks better with a tan	
Yes	31 (44)
No	39 (56)

*Numbers may not sum to total sample size as a result of missing data.

RESULTS

Table 1 gives the demographic characteristics of the caretakers and their children. Most respondents were women, had received more than a high school education, and were ethnically and racially diverse. The average age of the children was 5.8 years, and boys outnumbered girls.

The forms of sun protection that parents used to protect their children are reported in **Table 2**. Sunscreen was the most frequently reported form of sun protection used. Staying indoors during peak sun hours or staying in the shade and using hats and/or sunglasses were other frequently reported sun protection methods. Thirty-three respondents (42.9%) reported using some form of sun protection for their children either usually or always. Among respondents who indicated that they used some form of sun protection for their child, the most common reasons cited for doing so included preventing sunburn (n=55), skin cancer (n=41), or premature aging of skin (n=22); because of information from the media (n=12); because their doctor recom-

Table 3. Predictors of Sun Protection Measures Being Used Usually or Always

Predictor Variables	No. (%) of Those Using Measures Usually or Always	P (χ^2 Analysis)
Parent's sex		.55
Male (n = 14)	5 (36)	
Female (n = 63)	28 (44)	
Parent's race		.001
White (n = 42)	25 (60)	
Nonwhite (n = 35)	8 (23)	
Parent's education level		.14
≤High school diploma (n = 33)	11 (33)	
>Postsecondary education (n = 44)	22 (50)	
Parent's knowledge of sun protection		.001
Knowledgeable (n = 33)	21 (64)	
Not knowledgeable (n = 44)	12 (27)	
Parent believes skin cancer is preventable		.09
Yes (n = 38)	20 (53)	
No (n = 39)	13 (33)	
Child has history of sunburn in past year		.46
Yes (n = 49)	20 (41)	
No (n = 24)	12 (50)	
Use of sunscreen by parent		.001
Usually or always (n = 43)	26 (61)	
Rarely or never (n = 34)	7 (21)	
History of skin cancer in family		.21
Yes (n = 59)	23 (39)	
No (n = 18)	10 (56)	
Urban residence		.03
Yes (n = 50)	17 (34)	
No (n = 27)	16 (59)	
Child's sex		.35
Male (n = 30)	11 (37)	
Female (n = 44)	21 (48)	
Parent teaches child about sun protection		.001
Yes (n = 51)	29 (57)	
No (n = 20)	2 (10)	
How sensitive is child's skin to sun		.60
Very (n = 23)	11 (48)	
Normal (n = 31)	13 (42)	
Not very (n = 20)	8 (40)	

mended it (n=11); and because of information from the child's school (n=1).

Not surprisingly, the amount of time that children were reported to be outside was substantial. Among the 77 respondents, 29 indicated that their child was outside between 1 to 2 hours each day, 15 indicated their child was outside 3 to 4 hours each day, and 5 indicated their child was outside 5 or more hours each day. In addition, 24 respondents indicated that their child had developed sunburn at some time during the past year.

Respondents held several unfavorable attitudes or beliefs regarding sun protection use. Fewer than half of respondents indicated sun exposure was healthy and that children looked better with a tan. Almost half of respondents indicated it was okay to stay out in the sun longer if the child wore sunscreen. When asked at what age does the sun cause the most damage, only 27 respondents (35%) indicated in childhood.

Table 3 gives characteristics associated with the regular use of sun protection for the respondent's child. Parents were more likely to report use of sun protection if they were white, lived in an urban area, reported being knowledgeable about sun protection, used sun protection regularly themselves, and reported teaching their children about sun protection. Parents who regularly used sun protection for their children tended to be older than those who did not (mean age, 38.1 vs 32.0 years; *t* test, 2.4; *P* = .02). The average age of children who regularly received sun protection did not differ from those who did not use sun protection regularly (mean age, 5.7 vs 5.9 years, respectively; *t* test, 0.12; *P* = .90). Parents who reported using sun protection regularly for their child had higher scores on the knowledge/attitude scale than those who did not (mean score, 4.4 vs 3.0; *t* test, 3.2; *P* = .002).

In multivariate analysis, 2 factors were statistically significant predictors of regular sun protection use. Female caretakers had almost 10 times greater odds of reporting regular use of sun protection for their children compared with male caretakers (adjusted odds ratio [OR], 9.8; 95% confidence interval [CI], 1.1-89.6; *P* = .04). The odds of regularly using sun protection also increased 63% with each unit increase in the knowledge and attitudes scale (adjusted OR, 1.63; 95% CI, 1.1-2.5; *P* = .02). There were nonstatistically significant trends for greater use of sun protection among parents who used sun protection themselves (adjusted OR, 3.8; 95% CI, 0.9-15.3; *P* = .06) and with increasing caretaker age (adjusted OR, 1.06; 95% CI, 1.0-1.1; *P* = .07).

COMMENT

Even in a state with a high intensity of sun exposure and a high incidence of skin cancer, regular use of sun protection for children was infrequently reported by parents. Fewer than half of parents reported regularly using sun protection for their children. Among parents who did use sun protection for their children, sunscreen was the most frequently used method. Avoiding the sun (by staying indoors or in the shade) or using hats or protective clothing were less frequently used methods of sun protection.

Our results are similar to those of previous studies reporting infrequent use of sun protection for children.^{16,20,22,28,31,35} These studies similarly reported that sunscreen was the most common method of sun protection used by parents. Sun avoidance or the use of protective hats and/or clothing were not commonly reported.

The most common reason that parents gave for using sun protection was to prevent sunburn, and almost half of respondents indicated that it was okay for children to stay in the sun longer if they used sunscreen. Previous studies have similarly found that the primary reason parents use sunscreen is to prevent sunburn.^{15,24,32} Unfortunately, the use of sunscreen, although preventing sunburn, may lead to increased overall sun exposure for children. Studies by Autier et al^{36,37} have found that the use of sunscreen by children was associated with overall greater sun exposure and the subsequent development of a greater number of

nevi. Wearing protective clothing on the other hand was associated with a reduced number of subsequent nevi. Educational campaigns may be placing too much emphasis on the use of sunscreen rather than on measures that would better protect the skin from damage, such as avoiding the sun, using shade, or wearing protective clothing.

Predictors of regular sun protection use in bivariate analysis included subjects who were white, parents using sun protection themselves, increasing caretaker age, more favorable attitudes and beliefs for sun protection use, and residing in a nonurban area. In multivariate analysis female caretakers and caretakers having more favorable knowledge and attitudes remained independent predictors of regular sun protection use. These findings are similar to previous studies showing that children's use of sun protection correlated with their parent's use^{15,16,19,21,29,33,38,39} and with more favorable parental attitudes.^{15,16}

These findings have implications for sun protection interventions and education campaigns that are targeted at children. One method of increasing sun protection use of children may be to target the sun protection behaviors of the parents themselves. Campaigns that target both the parent's and child's sun protection use may have additive effects. In addition, health education campaigns should not emphasize solely sunscreen as a method of sun protection, but should include other sun avoidance behaviors such as staying indoors or in the shade and wearing hats and other protective clothing. Finally, it should be stressed to parents that sunscreens are important not only for preventing sunburn but also to protect their child's skin from the damaging effects of the sun. Relying solely on sunscreen to prevent sunburns may paradoxically increase children's overall sun exposure and subsequent risk of melanoma and non-melanoma skin cancers.

This study has some important limitations. First our study population consisted primarily of younger children (average age, roughly 6 years) who have generally been found to have higher rates of sun protection use.²⁸ Rates for use of sun protection for older children are probably lower than what we found. In addition we relied solely on patient self-reports of sun protection use; there was no attempt to independently verify their responses. As preventive health behaviors are generally overreported in surveys, one might expect actual rates of sun protection use to be lower than what we have found. For multivariate findings, our limited sample size produced CIs that were quite wide and limited our ability to exclude chance as an explanation for these findings. Our sampling method was primarily one of convenience and the resultant sample may not be representative of all children who are seen in the university medical clinics. Finally, our study was conducted among parents attending a medical clinic in Florida, and findings may be different in other settings or in other states.

In conclusion, parents of young children often hold unfavorable beliefs and attitudes about sun protection, and these factors were associated with less frequent use of sun protection for their children. Regular use of sun

What This Study Adds

Few studies have examined parents' sun protection knowledge and attitudes as a determinant of their child's sun protection behaviors. Determining parental characteristics that influence children's sun protection use is an important area of inquiry as interventions directed at parents have generally been more successful than interventions targeted toward children themselves. In our study, the regular use of sun protection for children was infrequent and consisted primarily of applying sunscreen rather than methods that reduce sun exposure (staying indoors or in the shade, wearing hats and/or protective clothing). Parents of young children often held unfavorable beliefs and attitudes about sun protection, and these factors were associated with less frequent sun protection use for their children.

protection for children was infrequent in our sample and consisted primarily of applying sunscreen rather than methods that reduce sun exposure (staying indoors or in the shade, wearing hats and/or protective clothing). Parents primarily use sunscreen to prevent sunburn and may increase their children's overall sun exposure as a result. These findings have relevance for those preparing interventions or educational campaigns that promote the use of sun protection for children.

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Reprints: Richard Roetzheim, MD, MSPH, Department of Family Medicine, University of South Florida, 12901 Bruce B. Downs Blvd, MDC 13, Tampa, FL 33612 (e-mail: rroetzhe@hsc.usf.edu).

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