SUN PROTECTION BEHAVIORS AND STAGES OF CHANGE FOR THE PRIMARY PREVENTION OF SKIN CANCERS AMONG BEACHGOERS IN SOUTHEASTERN NEW ENGLAND[1,2,3,4]

Martin A. Weinstock
Rhode Island Hospital and Brown University

Joseph S. Rossi, Colleen A. Redding, Jason E. Maddock, and Sara D. Cottrill
University of Rhode Island

ABSTRACT

Sun exposure is the most important avoidable cause of skin cancers. We report characteristics of a representative sample (N = 2,324) of beachgoers in Southeastern New England during the summer of 1995. This sample was not employing adequate sun protection behaviors (83% did not often avoid the sun during midday and only 45% often used sunscreen). Important demographic and skin cancer risk factor differences in sun protective behaviors and stages of change for sun protection were found, especially differences based on age, gender, and degree of sun sensitivity. Consistent with previous research, increased age, female gender, and greater sun sensitivity were each independently associated with more sun protective behaviors. These findings underscore the need for interventions targeting high-risk populations, such as those receiving high-intensity sun exposures at the beach.

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INTRODUCTION

Skin cancers are a major and growing public health problem. Together, they account for approximately 1,000,000 cancers per year in the United States, roughly equivalent to all other cancer sites combined (1). Furthermore, while the incidence of cancer at most major sites is declining, there is no evidence of a decline in incidence rates of any of the three common types of skin cancer: basal cell carcinoma, squamous cell carcinoma, or melanoma. Melanoma is increasing in incidence faster than any other major cancer site, despite the enormous potential for primary prevention (2). Melanoma is of particular concern because it is responsible for the majority of skin cancer deaths (3).

Sun exposure is the most important avoidable cause of each of the three most common types of skin cancer (melanoma, squamous cell carcinoma, and basal cell carcinoma) and accounts for most of each of these cancers (4). Intense, intermittent sun exposure has been most closely linked with melanoma (5). Sun protection is therefore the key to primary prevention, and it is particularly important to target people in high-risk environments, such as the beach.

Our approach to the development of measures and interventions for skin cancer prevention is based on the transtheoretical model (TTM) of behavior change. The TTM has received a great deal of empirical support over the last 15 years, especially for smoking cessation and other addictive behaviors (6,7). In recent years, this model has been adapted to a wide range of health behaviors including sun exposure and sunscreen use (8–12). This research has consistently shown that, in attempting to change a problem behavior, most people progress through a series of stages of change. In moving from one stage to the next, a common set of at least 10 processes of change are utilized (10,13). The model also incorporates the two constructs: decisional balance (the pros and cons of changing a behavior) and self-efficacy (confidence in the ability to change).

We sought to evaluate primary prevention of skin cancer among southeastern New England beachgoers. Prior studies of beachgoers have been reported from Australia, South Africa, Puerto Rico, New Jersey, and California (14–18). We extend previously published work (8,9,19) by recruiting a larger and more representative sample at the beach and by using assessments of both sun protection behaviors and sun protection stages of change based on the TTM (8,10). This sample also participated in a subsequent randomized trial designed to foster primary skin cancer prevention practices (11,20,21).

Our primary focus is descriptive (i.e. to estimate the prevalence of sun protection among beachgoers) both in terms of self-reported behavior and in terms of stages of readiness for behavior change. Our secondary purpose is to identify the key predictors of these patterns, in particular with respect to demographic and sun-related characteristics of our population, in order to inform subsequent interventions.

METHODS

The beach is not a common site for recruitment for scientific studies, so we describe our work in this environment in detail.

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[2] Some aspects of this paper have been presented at the Fourth International Congress of Behavioral Medicine in Washington, DC, the Fourth World Congress on Melanoma sponsored by the World Health Organization in Sydney, Australia, and the Second International Meeting on Epidemiology and Prevention of Skin Diseases: The European Dermato-Epidemiology Network Congress in Bamberg, Germany.

[3] We thank all the participants and beach interviewers who made this work possible and Margaret Boyle, Dorie Lawson, and Heidi Recksiek for assistance in conducting this study.

[4] Jason E. Maddock, Ph.D., is now at the Cancer Research Center of Hawaii at the University of Hawaii.

Reprint Address: M. A. Weinstock, M.D., Ph.D., Dermatoepidemiology Unit, VA Medical Center—111D, 830 Chalkstone Avenue, Providence, RI 02908-4799.

Study Populations

Data were collected at initial contact from a representative sample of 2,324 beachgoers who were proactively recruited (see below) during the summer (6/6–8/11) of 1995 for a randomized trial as part of the Rhode Island Sun Smart Project.

Beach Sampling Procedures

There are approximately 40 public coastal salt water town and state beaches in southern Rhode Island. Many of the largest and most popular beaches tend to be frequented by different segments of the population and may be characterized as "teen" beaches, "family" beaches, and "local/community" beaches. We rotated among 7 of the largest beaches that appealed to each group. Permission for beach access was obtained from the Rhode Island Department of Environmental Management. Beach staff at all sites were very supportive, often asking to participate in the study and volunteering to reorganize available space to accommodate the project.

Between 10 a.m. and 4 p.m., between one and five teams arrived at various designated beaches to conduct the study. Teams of four interviewers and one camera person conducted the interviews, which lasted between 15–25 minutes. The beach was divided into sections using local landmarks (e.g. lifeguard stations) and each team surveyed their assigned section. Teams surveyed every other individual or group within a section. Within each team, each interviewer would approach a different individual or group of beachgoers. The interviewers would introduce themselves, their affiliation, and the study. When a group of individuals was approached, the interviewer would select the person from the group whose next birthday was closest to that day to participate in the study. Upon receiving verbal consent to participate, the interviewer would review the consent form and have the participant sign it. Then the interviewer would ask the baseline survey questions and randomize the participant to treatment or control conditions. When the participant was in the treatment group, the interviewer would conduct the intervention and conclude by verifying contact information. When the participant was in the control group, the interviewer would simply verify the contact information. After completing the protocol, the interviewer would rejoin other members of the team and wait until all were done before starting again. The team would repeat this procedure throughout their shift, approaching every other individual/group in the designated section. Teams would take breaks and restock supplies as necessary.

Beach Interviewers

Fifty-five undergraduate and graduate students from the University of Rhode Island and Brown University, representing a variety of disciplines, were hired to be field interviewers for this study. Interviewer selection was based on prior interviewing experience, oral communication skills, maturity, confidence of presentation, and voice quality. Interviewers were required to attend both: (a) training sessions on the principles and practices of standardized interviewing and (b) two practice days on the beach in which they performed all protocols from conducting interviews to surveying a beach.

Ongoing monitoring and training of interviewers maintained quality control of the interviewing process. Monitoring was conducted using daily, weekly, monthly, and cumulative tallies of completion rates, refusal rates, completion per hour, and other survey dispositions for all interviewers. While working, beach interviewers were required to wear sunscreen, hats, and sunglasses, in addition to bright yellow "Sun Smart" project T-shirts.

Measures

The baseline survey included assessments of attitudes, behaviors, and skin cancer risk factors as well as other items. Sun protective behaviors were assessed using the Sun Protection Behavior Scale (SPBS) (20,22). The SPBS included questions assessing the frequency of sun protective behaviors (e.g. frequency of wearing hats, using sunscreens, time spent in the shade). Responses were completed on a 5-point Likert scale (*never, rarely, sometimes, often,* and *always*), such that higher scores reflected greater frequency of use of sun protective behaviors. Two algorithms were used to measure stage of change. The algorithms consisted of a short series of questions designed to assess intentions and behaviors for reducing sun exposure. The purpose of the staging algorithm was to classify respondents into one of the five stages of change: precontemplation, contemplation, preparation, action, or maintenance. The first general sun protection algorithm classified subjects by stage based on a combination of their intentions and behaviors to protect themselves from the sun consistently by: (a) avoiding sun exposure, (b) covering up with clothing/hats, and (c) using Sun Protection Factor (SPF) 15 sunscreens. The second sunscreen staging algorithm classified subjects by stage based on their behaviors and intentions to protect themselves from sun exposure by using SPF 15 sunscreens alone. The development of the staging algorithms is described in more detail elsewhere (10,20,23). For both algorithms, Precontemplation stage included participants who were not consistently protecting themselves from the sun and were not intending to start doing so within the next 12 months. Contemplation stage included participants who were not protecting themselves consistently from sun exposure but were thinking about starting to do so within the next 12 months. Preparation stage individuals were not currently protecting themselves and were planning to begin protecting themselves within the next 30 days. Action stage individuals had been protecting themselves consistently from sun exposure for less than 12 months. Finally, Maintenance stage individuals had been protecting themselves consistently from sun exposure for 12 months or more.

Demographic variables included age, sex, income, marital status, educational level, and race/ethnicity. Brief health histories focusing on skin cancer risk factors were also obtained including the variables sun sensitivity (24), sun exposure, sunburn history, presence of large moles, use of tanning/sun lamps, and personal/familial history of skin cancer. These factors were chosen because of the greater importance of sun protection among those at highest risk for skin cancer and the importance of these factors for future interventions. Other health-related items assessed smoking and exercise habits because of our interest in the possible links among health-related behaviors and in future interventions aimed at multiple risk behaviors.

RESULTS

Subjects

Participants (N = 2,324) between eligible ages of 16–65 years completed a survey on the beach with a trained interviewer. Eighty-three percent of those approached agreed to participate (80% of men, 84% of women), $\chi^2(1) = 7.47$, $p = .006$. Participation rates were particularly high (93%) in the youngest group (16–24 years of age), but decreased with increasing age (ages 25–39, 84%; ages 40–65, 75%), $\chi^2(2) = 115.4$, $p < .001$.

TABLE 1
Demographic and Behavioral Characteristics of Beach Sample (N = 2,324)

Gender	
Female	1,406 (60%)
Male	918 (40%)
Race/Ethnicity	
White (not Hispanic)	2,184 (94%)
Black (not Hispanic)	15 (<1%)
Hispanic	42 (2%)
American Indian	16 (<1%)
Asian	17 (<1%)
Other	50 (2%)
Age	M = 32.7 (SD = 12.3)
16–24 years	821 (35%)
25–39 years	822 (35%)
40–65 years	678 (29%)
Highest Grade Completed	
Less than high school	275 (12%)
High school graduate	617 (27%)
Some college	737 (32%)
Bachelors degree	440 (19%)
Postgraduate education	252 (11%)
Annual Household Income	
Less than $15,000	186 (9%)
$15,001–$25,000	225 (10%)
$25,001–$45,000	558 (26%)
$45,001–$65,000	611 (28%)
More than $65,000	589 (27%)
Marital Status	
Single	1,183 (51%)
Married	926 (40%)
Divorced/separated	187 (8%)
Widowed	20 (<1%)
Other	6 (<1%)
Would you say your health in general is:	
Excellent	898 (39%)
Very good	903 (39%)
Good	447 (19%)
Fair	70 (3%)
Poor	6 (<1%)
Smoking Status:	
Never smokers	1,184 (51%)
Former smoker	560 (24%)
Current smoker	580 (25%)
Do you exercise three times per week for at least 20 minutes each time?	
No	830 (36%)
Yes	1,494 (64%)
Sun Sensitivity[1]:	M = 4.5 (SD = 2.4)
Good natural protection	615 (26%)
Moderate sensitivity	1,271 (55%)
Very vulnerable	438 (19%)
How many times in your life have you had a severe sunburn that blistered?	
0	880 (38%)
1	502 (22%)
2	356 (15%)
3–5	319 (14%)
More than 5	267 (11%)
How many times in the past year have you had a severe sunburn that blistered?	
0	2,070 (89%)
1 or more	245 (11%)
Have you ever used a tanning booth or sun lamp?	
No	1,286 (55%)
Yes	1,038 (45%)
Have you used a tanning booth or sun lamp in the past year?	
No	1,995 (86%)
Yes	327 (14%)
Have you ever had a melanoma or any other type of skin cancer?	
No	2,266 (98%)
Yes	56 (2%)
Has anyone in your immediate family ever had a melanoma or any other type of skin cancer?	
No	1,879 (81%)
Yes	443 (19%)
Outside of your immediate family, do you know anyone who has had skin cancer?	
No	1,234 (53%)
Yes	1,088 (47%)
Do you have any moles on your body that are larger than a pencil eraser?	
No	1,995 (86%)
Yes	327 (14%)
In general, during summer WEEKDAYS, about how many hours a day are you outside between 10 a.m. and 4 p.m.?	
Less than 1	681 (29%)
1 to 2 hours	412 (18%)
2 to 3 hours	391 (17%)
3 to 4 hours	311 (13%)
4 to 5 hours	194 (8%)
5 to 6 hours	333 (14%)
In general, during summer HOLIDAYS AND WEEKENDS, about how many hours a day are you outside between 10 a.m. and 4 p.m.?	
Less than 1	97 (4%)
1 to 2 hours	214 (9%)
2 to 3 hours	391 (17%)
3 to 4 hours	505 (22%)
4 to 5 hours	424 (18%)
5 to 6 hours	693 (30%)
Stages of Change for General Sun Protection[2]	
Precontemplation	1,040 (45%)
Contemplation	68 (3%)
Preparation	333 (14%)
Action	93 (4%)
Maintenance	779 (34%)
Stages of Change for Sunscreen Use[2]	
Precontemplation	1,295 (56%)
Contemplation	67 (3%)
Preparation	242 (10%)
Action	105 (5%)
Maintenance	605 (26%)

Notes: 1–Sun Sensitivity was assessed with a short series of questions about natural hair color, untanned skin color, and tendency to burn when in the sun; for details, see (24). Sun Sensitivity scores were calculated from these items and ranged between 0.0 and 10.0 with higher scores indicating greater sensitivity.

2–The correlation between Stages of Change for General Sun Protection and for Sunscreen Use was r = .54.

The sample was largely White (94%) and had at least a high school education (88%). The median annual household income was $50,000. Half (51%) of the participants were single and 60% were female. The average age was 32.7 years (SD = 12.3); 35% were between 16–24 years, 35% were between 25–39 years, and 29% were between 40–65 years. One-quarter of the sample (25%) reported being current smokers. Most of the sample (64%) reported exercising regularly at least 20 minutes a day, three times a week, and reported very good to excellent health (78%). Further demographic details are provided in Table 1.

Sun-Related Health History

Table 1 also provides details on sun-related health history. Most of the sample (62%) reported having had at least one severe sunburn that had blistered in their lifetime. Of these people, 18% had had more than five severe lifetime sunburns. Only 11% of the sample reported severe sunburns in the last year. Almost half (45%) of the sample had ever used a tanning booth or sun lamp, and 14% had used one in the past year. Few had ever had any skin cancer (2%), but almost one-fifth (19%) reported a family member who had had some type of skin cancer, and about half (47%) knew someone who had had skin cancer.

Participants spent an average of 1.9 hours in the sun on weekdays between 10 a.m. and 4 p.m. During weekends and holidays, participants reported being in the sun 3.3 hours per day between 10 a.m. and 4 p.m. Subjects were classified by stage of change based on their readiness to consistently engage in protective behaviors and by stage of change to use sunscreens with SPF 15 or greater (see above). The distributions for these two staging algorithms shown in Table 1 reveal that the largest group of participants was in the Precontemplation stage for both general sun protection (45%) and for sunscreen use (56%). Smaller proportions were staged into Contemplation (3%), Preparation (11%–14%), and Action (4%–5%). Maintenance was the second largest stage group, including 34% of participants for general sun protection and 26% for sunscreen use. As expected, general sun protection stage of change was moderately correlated with sunscreen stage of change (r = .54).

Participants were also asked how often they engaged in a variety of sun protective behaviors when out in the summer sun for more than 15 minutes. The SPBS mean score can vary between 1 (*never engage in any of the listed sun protection practices*) and 5 (*always use all of them*); the SPBS mean ± SD in this sample was 2.696 ± 0.886. Cronbach internal consistency coefficient of the seven SPBS items was very good (α = .825). The frequency of use of specific sun protection practices varied considerably (see Table 2).

Descriptive Differences in Stage of Change and Sun Protective Behaviors

Table 3 displays the proportion of the sample in Action or Maintenance for both general sun protection and sunscreen use by descriptive categories. For both general sun protection and sunscreen use, men, younger adults, those of lower socioeconomic status and lower sun sensitivity and without a family history of melanoma or a personal knowledge of someone with skin cancer, those rating their general health as less than "excellent," and tanning booth users were all more likely to be in earlier stages of change and therefore not protecting themselves adequately from sun exposure. The variables tested that were not significantly associated with stages of change for general sun protection or sunscreen use were the presence of large moles, personal history of skin cancer, smoking status, and exercise status.

TABLE 2
Percent Using Sun Protection Behavior Scale (SPBS) Items Often or Always

Item	% Reporting Often or Always
Wear sunglasses	61.5
Use a sunscreen*	45.4
Wear shirt*	41.4
Use a sunscreen w/ SPF 15+ on face*	38.3
Wear a hat	24.6
Use a sunscreen w/ SPF 15+ on all sun-exposed areas*	23.6
Limit exposure to the sun during midday*	19.3
Avoid the sun during the midday*	17.3
Wear a hat with a wide brim	14.4
Stay in the shade*	13.3
Wear protective clothing	4.9

Note: * indicates this item is included in the 7-item SPBS.

Table 3 also reports the univariate relationships between these descriptive categories and the SPBS. These analyses revealed significant effects for gender, age group, education, income, sun sensitivity group, experience of severe sunburns, tanning booth use, family history of skin cancer, knowledge of anyone with skin cancers, and general health status. Having large moles was not significantly associated with the SPBS. These relationships are consistent with those found for stages of change.

The independent relations of these variables with sun protection stage of change were assessed by logistic regression. A model including all predictor variables associated with the Action or Maintenance stage (except for education and income, as described below) was assessed and variables with $p > .1$ were eliminated. The resulting models included the variables listed in Table 4. We evaluated all other variables individually to determine whether they were associated with stage after controlling for the variables in the model and found none met our criterion of $p < .1$ either for general sun protection or for sunscreen use. These nonsignificant variables included: experience of blistering sunburns, having family member(s) with skin cancer, and having large mole(s) for both general and sunscreen stage of change. In addition, age group was not a significant predictor of sunscreen stage of change. In the 16–24 year old group, education and income are primarily a function of age and have different meaning than in older age groups. Hence, models to evaluate the effect of education and income were run for participants greater than 24 years of age, and neither income nor education added to the prediction. Hence, the six independent predictors of Action or Maintenance stage for general sun protection in our sample were older age, female gender, greater sun sensitivity, less tanning booth use, personal knowledge of someone with skin cancer or melanoma, and excellent perceived general health. All of these except age group were also independent predictors of stage of change (Action/Maintenance) for sunscreen use. One key melanoma risk factor, which was not associated with either general sun protection or sunscreen stage, was the presence of large moles.

We also assessed the predictors of sun protective behavior, as measured by the SPBS. Age, gender, income, education, personal history of skin cancer or melanoma, family history of skin cancer or melanoma, knowing anyone with skin cancer, presence of large moles, lifetime number of severe burns, tanning booth use, and general health status were entered into regression models. Presence of large moles, income, education, and general health status were

TABLE 3

Descriptive Variables by General Sun Protection and Sunscreen Use Stages of Change and Sun Protection Behavior Scale (SPBS)

Variable	Category	General %A/M	χ^2	p	Sunscreen %A/M	χ^2	p	SPBS Mean (*SD*)	F(df)	p	η^2
Gender			10.1	.001					42.2 (1, 2316)	.001	.020
	Female	40%			34%	22.4	.001	2.79 (.90)			
	Male	34%			25%			2.55 (.84)			
Age (years)			109.5	.001		68.4	.001		135.8 (2, 2313)	.001	.105
	16–24	25%			21%			2.33 (.79)[a]			
	25–39	39%			32%			2.78 (.85)[b]			
	40–65	51%			41%			3.03 (.89)[c]			
Education			28.6	.001		6.8	.034		40.0 (2, 2313)	.001	.033
	Less than high school	24%			25%			2.33 (.76)[a]			
	High school/GED	36%			29%			2.60 (.94)[b]			
Income			16.7	.001		12.6	.002		10.2 (2, 2313)	.001	.009
	<$25,000	29%			28%			2.54 (.86)[a]			
	$25,000–54,999	38%			28%			2.67 (.88)[b]			
	$55,000+	41%			35%			2.78 (.90)[c]			
Sun Sensitivity			103.8	.001		57.9	.001		104.3 (2, 2316)	.001	.083
	Low	25%			22%			2.37 (.82)[a]			
	Moderate	38%			30%			2.70 (.87)[b]			
	High	56%			44%			3.14 (.83)[c]			
Sunburns that blistered?			37.6	.001		39.3	.001		50.2 (2, 2307)	.001	.042
	None	31%			24%			2.49 (.84)[a]			
	Yes ever, but not in past year	44%			36%			2.87 (.89)[b]			
	Yes, in past year	33%			27%			2.56 (.84)[a]			
Used Tanning Booths?			80.4	.001		66.9	.001		123.8 (2, 2296)	.001	.097
	No	41%			34%			2.83 (.88)[a]			
	Yes ever, but not in past year	46%			36%			2.88 (.83)[a]			
	Yes, in past year	22%			17%			2.20 (.75)[b]			
Any family member had skin cancer or melanoma?			8.7	.004		9.0	.003		19.8 (1, 2314)	.001	.008
	No	36%			29%			2.65 (.87)			
	Yes	44%			37%			2.86 (.91)			
Know anyone who had skin cancer or melanoma?			41.3	.001		34.2	.001		44.8 (1, 2314)	.001	.025
	No	32%			25%			2.56 (.85)			
	Yes	45%			37%			2.84 (.90)			
Moles bigger than a pencil eraser?			1.56	.211		.52	.470		3.4 (1, 2314)	.064	.001
	No	37%			30%			2.68 (.88)			
	Yes	41%			32%			2.78 (.90)			
General Health			9.9	.007		10.3	.006		5.3 (2, 2313)	.005	.005
	Excellent	42%			34%			2.76 (.90)[a]			
	Very Good	36%			30%			2.68 (.85)[a]			
	Good/Fair	34%			26%			2.61 (.91)[b]			

Note: SPBS is an average of 7 items assessing sun protective behaviors when exposed to the sun. Groups not sharing superscripts are different based on Tukey HSD follow-up tests ($p < .05$).

not found to be significant predictors of SPBS in this multivariate model ($p > .10$). The final model was significant, $F(5, 2291) = 167.5$, $R^2 = .268$, and is presented in Table 5.

As before, one additional regression model restricted to participants over the age of 24 was conducted to evaluate the relation of education and income to behavior; neither of these variables was found to be associated ($p > .10$). Finally, each nonsignificant variable from earlier steps was again added separately and sequentially to assess if it was now a significant predictor. None of these variables were associated with SPBS ($p > .10$).

DISCUSSION

This paper has presented estimates of sun protection practices and stage of change for a representative sample of beachgoers. Study participants were at high risk for skin cancer since they spent midday hours in the sun and had a high rate of severe sunburns. Relatively few individuals were making full use of easily available and effective sun protection strategies: only 45% reported using sunscreen very often or always and only about half of these (24%) used a sunscreen with an SPF of 15 or more on all of their sun-exposed areas. Sunglasses were the most commonly worn type of protective clothing and these protect only the eyes and are

TABLE 4

Final Logistic Regression Model Predicting % in Action or Maintenance Stages for General Sun Protection and Sunscreen Use

Variable	Odds Ratio General Sun Protection	95% Confidence Interval		p	Odds Ratio Sunscreen Use	95% Confidence Interval		p
		Low	High			Low	High	
Women (vs. Men)	1.35	1.11	1.65	.0026	1.74	1.42	2.13	<.0001
Age Group (16–24 vs. 40–65)	0.45	0.36	0.58	<.0001	n.s.			
Age Group (25–39 vs. 40–65)	0.66	0.53	0.82	.0002	n.s.			
Sun Sensitivity	5.76	3.88	8.56	<.0001	4.67	3.11	6.99	<.0001
Tan Booth Use (1)	2.22	1.71	2.87	<.0001	3.11	2.38	4.08	<.0001
Tan Booth Use (2)	2.23	1.66	2.99	<.0001	2.69	1.99	3.63	<.0001
Know anyone with skin cancer or melanoma	0.68	0.56	0.81	.0001	0.66	0.55	0.80	.0001
General Health	0.86	0.76	0.97	.0146	0.82	0.73	0.93	.0019

Note: Sun Sensitivity scores ranged between 0.0 and 10.0 with higher scores indicating greater sensitivity; for details, see (24). Tanning Booth Use is coded such that (1) reflects the contrast between: Never and Yes ever, but not in the past year, and (2) reflects the contrast between Never and Yes in the past year.

TABLE 5

Multiple Regression Predicting Sun Protection Behavior Scale (SPBS)

Variable	β	*B*	95% Confidence Interval on *B*		*p*
			Low	High	
Women (vs. Men)	.178	.323	.330	.316	.001
Sun Sensitivity	.272	.101	.100	.102	.001
Age Group	.235	.260	.256	.264	.001
Tanning Booth Use	−.255	−.272	−.276	−.268	.001
Know anyone with skin cancer or melanoma	.091	.162	.154	.168	.001

Note: $R^2 = .268$; SPBS is an average of 7 items assessing frequency of sun protective behaviors when exposed to the sun. Sun Sensitivity scores were divided by 10, ranging between 0.0 and 1.0 with higher scores indicating greater sensitivity. Gender and Know Anyone with Skin Cancer are coded on a 0 to 1 scale. Age Group was coded: 1 = 16–24 years, 2 = 25–39 years, 3 = 40–65 years; Tanning Booth Use was coded: 0 = Never, 1 = Yes ever, but not in the past year, and 2 = Yes in the past year.

usually worn for reasons other than sun protection. In general, sun protective behaviors of beachgoers remain inadequate despite public health campaigns on the dangers of sun exposure. About half of our sample was in the Precontemplation stage of change with respect to sun protection generally and sunscreen use specifically.

Across analyses, the six independent factors which predisposed beachgoers to engage in more sun protective behaviors were: age (older more likely); gender (female more likely); sun sensitivity (more sensitive more likely); use of tanning booths (less use more likely); know someone with skin cancer or melanoma (know more likely); and general health (healthier more likely). Also, several other variables that could have added to predictive power (e.g. income, education, large moles, personal history of skin cancer, smoking status) were assessed but did not improve prediction.

Across analyses, age showed strong associations with sun protective behaviors. The strongest correlations were for sun avoidance measures, although this could have been due to the large percentage of working people who cannot spend as much time in the sun as adolescents. Older individuals were significantly more advanced in their stages of change for both general sun protection and for sunscreen use. This finding is consistent with previous research in other samples (25–28). We found significant variability by age on both sun protective behaviors and stages of change for almost all descriptive categories. This finding underscores the importance of targeting younger individuals for sun protective behavioral interventions, consistent with intervention priorities set forth by the American Cancer Society, National Cancer Institute, Centers for Disease Control and Prevention, and American Academy of Dermatology, among others. Of course, interventions to increase the motivation and protective behaviors of adolescents at all stages of change would be particularly useful (8,10,29).

Women were also generally more advanced in the stages of change than men and reported doing more to protect themselves from the sun. Women were much more likely to use sunscreens with SPF of 15 or more than men. However, females tend to frequent the beach more than males do, perhaps offsetting their protective advantage.

Across analyses, sun sensitivity (24) emerged as strongly associated with increased sun protective behaviors. This is also consistent with other findings (28) and makes intuitive sense since more sun sensitive individuals experience immediate negative consequences, particularly painful sunburn, from unprotected sun exposure. The strength of this relationship in these data suggests that increased tailoring of feedback to levels of sun sensitivity may be a useful intervention strategy in the future. Another advantage of this strategy is its potential utility in addressing ethnic variations in skin tone and sun sensitivity within the context of a population-based sun protection intervention.

Limited data on sun protection are available from nationwide surveys conducted in 1986, 1991, 1992, and 1996. Variation in the questions asked precludes direct comparison of the prevalence of specific sun protection behaviors among these efforts. The relation of age and gender to sun protection does tend to be similar across surveys when these relations are examined. These prior efforts, however, were limited in the items that were addressed, and while

some self-reported behaviors were assessed, stage of change was not (26–28).

This sample is receiving the intense sun exposures that will generate later skin cancers. In spite of their risk, however, the largest proportion of this sample was not even considering protecting themselves from the sun (Precontemplation stage). Smaller proportions of individuals were found to be considering (Contemplation) or getting ready to start (Preparation) protecting themselves. Only 4%–5% of the sample had recently begun taking protective measures (Action). About one-third (26%–34%) of the sample reported that they were taking adequate precautions against too much sun exposure and had been for more than a year (Maintenance stage). The variability apparent in Table 2, however, reveals that this sample still has a long way to go before their protective behaviors could be considered adequate, given their levels of exposure. The lack of adequate sun protection in this sample underscores the need for further research and intervention trials targeting this at-risk group. Furthermore, the range of stages of change supports stage-matched and stage-tailored approaches to increasing sun protective behaviors (10,29).

Several limitations of this study should be noted. All of the data were collected through self-report, which could be biased by overestimation or underestimation of protection and social desirability. However, the face-to-face data collection methods used should have reduced response bias, since the interviewers could observe the use of protective clothes and shade and sometimes could observe the bottle of sunscreen used on the beach. Beachgoers are in a high ultraviolet radiation flux environment and, hence, at potentially high risk for future skin cancers, but, of course, many people who receive intense exposure do not visit the beach. We also did not visit every beach in Southern Rhode Island; so it is possible that our sample of beaches may not have been completely representative of the entire area.

We included sunscreen use in our assessments, including the SPBS and a separate staging algorithm for their use, despite the controversy that has surrounded recommendations of sunscreen use for cancer prevention. Sunscreens are recommended by major organizations involved in skin cancer prevention, including the American Cancer Society, American Academy of Dermatology, and the Centers for Disease Control and Prevention. They are widely used for this purpose, and we find that the scientific evidence clearly justifies that use (30).

Despite publicity about the association between unprotected sun exposure and skin cancers, beachgoers were still not protecting themselves adequately from the sun. These data strongly support future research within a beach environment, as well as primary prevention interventions to increase rates of protective behaviors. Additional research examining generalizability of these findings across samples and in different environments would be useful. These results are all based on self-report data and would be nicely complemented by future observational studies where feasible. Studies which examine additional potential predictors of protective behaviors, especially longitudinally, would also be particularly useful. We were able to achieve high recruitment rates for this beach-based study. Hence, studies targeting individuals at the beach appear to be both feasible and important for primary prevention of skin cancers. As we enter the 21st century, integration of public health and clinical approaches to skin health and cancer prevention become more vital.

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