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Lifeguards' Sun Protection Habits and Sunburns:

Association With Sun-Safe Environments and Skin Cancer Prevention Program Participation

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Abstract

Objective—To examine associations among outdoor pool environments, social norms, pool policies, and participation in a sun safety program with lifeguards' sun protection habits and sunburn.

Design—Cross-sectional survey.

Setting—Outdoor swimming pools across the United States.

Participants—Lifeguards and aquatic instructors at pools participating in the Pool Cool skin cancer prevention program in 2001 (N=699) and 2002 (N=987).

Main Outcome Measures—Sun protection habits and number of sunburns.

Results—Social norms supporting sun safety were associated with more sun protection habits (95% confidence intervals [CIs], 0.18–0.28 in 2001 and 0.17–0.26 in 2002), as were pool policies supporting sun safety (95% CI, 0.02–0.07 in 2001 and 0.002–0.04 in 2002). There was a trend toward fewer sunburns as social norms, pool policies, and participation in the Pool Cool program increased, but results differed across the 2 years. In 2001, lower social norms scores and pool policy scores were associated with more reported sunburns. In 2002, teaching Pool Cool sun safety lessons was associated with fewer sunburns.

Conclusion—The pool environment is related to sun safety behaviors of outdoor pool staff, with social norms showing the strongest association.

Skin cancer accounts for almost half of all cancers diagnosed in the United States, and there is both direct and indirect evidence that sun exposure can cause skin cancer.[1,2] Lifeguards and aquatic instructors working at outdoor pools are at high risk for overexposure to the sun because they are young adults and also outdoor workers. Young adults in high school or college tend to have poor sun protection habits[3–6] and a high prevalence of sunburn.[7] Lifeguards at outdoor pools are particularly vulnerable to skin cancer owing to high sun exposure on the job.[8] Results from a randomized trial of the Pool Cool program found that

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Study concept and design: Hall and Glanz. *Acquisition of data:* Elliot, and Glanz. *Analysis and interpretation of data:* Hall, McCarty, and Glanz. *Drafting of the manuscript:* Hall. *Critical revision of the manuscript for important intellectual content:* Hall, McCarty, Elliot, and Glanz. *Statistical analysis:* Hall and McCarty. *Obtained funding:* Glanz. *Administrative, technical, and material support:* Elliot. *Study supervision:* Elliot and Glanz.

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about 50% of aquatic staff had a history of severe sunburn and almost 80% had experienced sunburn the previous summer.[9]

Interventions in the workplace may be effective for reducing sun exposure and improving sun protective behaviors of outdoor workers, but there are few published reports of sun protection interventions in occupational settings and inconsistent findings across those reports.[8,10] Further research is needed to guide the development of effective strategies for improving sun safety among lifeguards. The environments at outdoor swimming pools and staff perceptions of these environments may influence the sun safety habits of employees, and better understanding of these factors can provide insight into potentially effective prevention strategies. The goal of this study was to examine the associations among the pool environment, perceived social norms, pool policies regarding sun safety and participation in a skin cancer prevention program, and lifeguard and aquatic staff sun protection habits and sunburn. It was hypothesized that social norms and pool policies supporting sun safety, as well as having taught sun safety lessons, would be associated with more sun protection habits and fewer sunburns.

METHODS

STUDY POPULATION AND DESIGN

The study included lifeguards and aquatic instructors working at outdoor swimming pools participating in the Pool Cool skin cancer prevention program during the summers of 2001 and 2002. Pool Cool is a multicomponent educational and environmental intervention that provides sun protection education directed at children aged 5 to 10 years enrolled in swim lessons, their parents, and the lifeguards and aquatic staff at outdoor swimming pools.[9,11] The program strategies are directed mainly at the children, with the expectation that helping to conduct the Pool Cool lessons should reinforce lifeguards' sun protection practices.

After being evaluated and found to be effective in a cluster randomized trial in 2 states,[9,11] the Pool Cool program was first disseminated across the United States in 2001 and 2002, and later studied in a randomized diffusion trial.[12] This is the first report based on data collected from lifeguards in 2001 and 2002.

At the beginning of each summer, Pool Cool program materials were shipped to participating pools. The materials included Leaders' Guides, sun safety lessons, visual materials to go with the lessons, a Decision Maker's Guide, a Resource Guide, sun safety signs and posters, and a zip disk for reproducing additional materials. Program materials also contained instructions for training lifeguards to teach Pool Cool sun safety lessons to children, and pools were provided with training assistance on request. (Further information regarding Pool Cool program materials may be found at the following websites: www.poolcool.org and http://rtips.cancer.gov/rtips/rtips_details.do?programid=84&topicid=3&co=N&cg=.) Throughout the summer, lifeguards taught the sun safety lessons to children as part of swimming lessons. Near the end of the summer, surveys were mailed to pool managers, who distributed the surveys to the lifeguards. Passive consent was obtained from the participants, and participation was voluntary. Procedures were approved by the human subjects committee at the University of Hawaii. Owing to the data collection methodology, it was not possible to identify individual lifeguards by name or identify participants who completed surveys in both years.

MEASURES

The survey asked about demographic characteristics, skin cancer risk, knowledge about skin cancer and sun protection guidelines, attitudes regarding sun safety, perceived sun protection

norms among the staff, sun protection habits, participation in Pool Cool program activities, and pool policies regarding sun safety. The measures used in the survey were adapted and/or selected from previous surveys on skin cancer and sun protection published in the literature[9,11,13–15] and used in the Pool Cool efficacy trial.[11]

Characteristics of Respondents—Age, sex, and race/ethnicity were included as questions on the survey and used as covariates in the data analyses. Participant skin cancer risk was measured by 4 questions that were used to calculate a skin cancer risk score. Skin cancer risk measures were based on work by Weinstock[13] and adapted from the Brief Skin Cancer Risk Assessment Tool (BRAT).[14] The score included whether a physician had told the participant that he or she had skin cancer, the participant's sunburn experience as a child, untanned skin color, and tendency to burn after being in direct sunlight for more than 30 minutes. Risk was classified as low to average, medium, or high based on scores derived from tertiles established in earlier research.14 These indicators have acceptable to good reproducibility.13,14 The geographic location of each pool was coded according to latitudinal position with pools north of latitude 37°N coded as north and pools south of latitude 37°N coded as south (see the Figure for a map of pool locations).

Predictor Variables—Primary predictor variables in this study include pool policies for sun safety, social norms among pool staff regarding sun safety, and whether the participant had taught Pool Cool lessons. Table 1 gives the survey items used to create social norms and pool policy scales and the Cronbach α reliability coefficient for each scale. A single question asking how many times the respondent taught sun safety lessons to children was used to measure involvement in the Pool Cool program. The response options for this question were as follows: 1 to 4 times, 5 to 8 times, more than 8 times, I do not teach swimming lessons, I did not teach Pool Cool lessons because of the age group I teach, and I was not able to teach Pool Cool lessons. The last 3 response options were all coded as not teaching Pool Cool lessons.

Dependent Variables—The sun protection habits (SPH) index was created from 5 questions asking about sun protection behaviors when outdoors in the sun (Table 1). The second dependent variable was the number of sunburns participants reported experiencing that summer. Responses were coded into 3 categories: 0, 1, or 2 or more sunburns.

STATISTICAL ANALYSIS

The data from 2001 and 2002 were analyzed separately using parallel statistical methods and treated as replicate studies. During analysis, outliers were excluded, and only respondents aged 15 to 60 years were included. Analyses were performed to describe the characteristics of the study sample, and *t* tests were conducted to examine differences in SPH scores among subgroups by age, sex, ethnicity, skin cancer risk score, and geographic location in each sample. Pearson product-moment correlations were calculated to determine the association of pool policies and sun safety norms with SPH scores. Pearson correlations were also used to measure the association between each individual norms question (use of sunscreen and hats, and covering up) and the corresponding SPH question. One-way analyses of variance were conducted to examine differences in SPH scores between groups based on participant response to the question "How many times, total, did you teach the Pool Cool sun safety lessons to children?"

Because there were multiple respondents from swimming pools, observations were considered to be clustered. To further study the relationship of pool policies, social norms, and having taught Pool Cool lessons to sun protection behaviors, mixed regression models accounting for clustering by pool were created for the 2001 and 2002 data sets. Independent

variables included in the models were pool policies, social norms, and having taught Pool Cool sun safety lessons. Covariates included in the models were age, sex, race/ethnicity, skin cancer risk level, and geographic location of the pool.

Ordinal regression models using the Logit Link function and accounting for clustering by pool were created to study the relationship of pool policies, social norms, and having taught Pool Cool lessons to sunburn. Independent variables included in the models were pool policies, social norms, and having taught Pool Cool sun safety lessons. Covariates were age, sex, race/ethnicity, skin cancer risk level, and geographic location of the pool. Pearson product-moment correlations and ordinal regression models using the Logit Link function and controlling for skin cancer risk were also used to examine the relationship of reported sun protection habits to sunburn.

RESULTS

A total of 699 participants from 2001 and 987 from 2002 were included in the analyses. Forty-six participants were excluded because they did not report an age of 15 to 60 years. A total of 191 pools participated in the program during 1 or both summers (79 pools participated both summers), with a range of 1 to 21 respondents from each pool and a median of 9 respondents per pool. Most respondents were white and female, and just over half were 15 to 19 years old. Skin cancer risk scores among participants were normally distributed, and the north and south regions of the United States were equally represented.

The most commonly reported SPH were wearing sunglasses (over 80% of respondents) and wearing sunscreen (over 60%). However, less than half the respondents reported usually or always wearing a shirt with sleeves, staying in the shade or under an umbrella, or wearing a hat when outside on a sunny day. Sunburn rates of 0, 1, and 2 or more sunburns for that summer were each reported by about one-third of the lifeguards. The mean score for social norms regarding sun safety was 3.61 in 2001 and 3.51 in 2002 (range, 1 [strongly disagree] to 5 [strongly agree]), and the mean score for pool policies regarding sun safety was 4.55 in 2001 and 4.50 in 2002 (0–7 “yes” responses). Just over 60% of respondents reported teaching the Pool Cool sun safety lessons each year.

There were significant differences in the mean SPH scores reported by the 2 age groups, with participants ages 15 to 19 reporting significantly fewer SPH than those aged 20 to 60 ($P < .001$). Those who reported teaching Pool Cool sun safety lessons had significantly higher mean SPH scores than those who reported not having taught Pool Cool sun safety lessons ($P < .001$ for both years). Among those who taught Pool Cool lessons, lifeguards who had taught the lessons more frequently tended to have higher SPH scores. Those who reported that they were “not able to teach Pool Cool lessons” tended to have the lowest SPH scores. There were no significant differences in the mean SPH scores by sex ($P=.73$ in 2001 and $P=.22$ in 2002) or geographic location ($P=.30$ in 2001 and $P=.54$ in 2002). However, in 2002 only, white individuals had significantly lower SPH scores than nonwhite lifeguards ($P < .01$), and those in the group at high risk for skin cancer had significantly higher SPH scores than those in the medium-risk group ($P=.03$).

There was a modest positive association between pool policy scores and SPH scores ($r=0.18–0.25$; $P < .001$) and a significant positive association between sun safety norms and SPH scores each year ($r=0.36–0.38$; $P < .001$). A significant positive association was also found between each individual norms question (regarding sunscreen use, hat use, and covering up while in the sun) and the corresponding sun safety habits question (aggregated by lifeguards’ behaviors at the pools) ($r=0.28–0.43$; $P < .001$). There was a moderate

positive correlation between norms scores and policy scores in both years (r=0.23–0.27; P < .001).

Table 2 gives the results of mixed-models regression analyses, including 5 covariates (age, sex, race/ethnicity, skin cancer risk, and geographic location), 3 independent variables (social norms, pool policies, and having taught Pool Cool sun safety lessons), and SPH score as the dependent variable. In both years, higher social norms were associated with higher SPH scores (P < .001), as were higher pool policies (P < .05). Having taught Pool Cool sun safety lessons was not significantly associated with SPH scores (P ≥ .34 for all analyses).

Ordinal regression models including the 5 covariates (age, sex, race/ethnicity, skin cancer risk, and geographic location), 3 independent variables (social norms, pool policies, and having taught Pool Cool sun safety lessons), and sunburn as the dependent variable were created for each year. Although the trends within the models were similar, the models differed with regard to significant results.

In the 2001 model, lower social norms scores (P < .01) and pool policy scores (P < .01) tended to be associated with a greater number of reported sunburns. The association between having taught Pool Cool sun safety lessons and the number of sunburns reported was not significant (P=.74). Odds of reporting 2 or more sunburns were 1.6 times greater for females than males (P < .01) and 2.2 times greater for white individuals than for individuals of other ethnicities (P < .01). Higher skin cancer risk scores were also associated with a higher number of sunburns (P < .001).

In 2002, the association between pool policies and social norms and the number of reported sunburns was not significant, although there was a nonsignificant trend toward fewer sunburns as pool policies (P=.16) and social norms (P=.24) supporting sun safety increased. The odds of reporting 2 or more sunburns were 1.5 times greater for individuals who reported not having taught Pool Cool sun safety lessons (P < .05). As in 2001, the odds of reporting 2 or more sunburns were 2 times higher for white individuals than for individuals of other ethnicities (P < .01), and higher skin cancer risk scores were associated with a greater number of reported sunburns (P < .001).

In 2001 and 2002, there was a negative correlation between SPH scores and number of sunburns (r=−0.12, P=.001 in 2001; r=−0.14, P < .001 in 2002). For both years, ordinal regression models including SPH scores as the independent variable, skin cancer risk level as a covariate, and sunburn as the dependent variable were significant, with higher SPH scores associated with fewer sunburns (P < .001).

COMMENT

The purpose of this study was to analyze the associations among the pool environment, social norms, and lifeguard/aquatic staff SPH and sunburn. Although over 60% of respondents reported wearing sunscreen, other key sun protection habits (eg, wearing a hat, covering up, and staying in the shade) were less common. Over half of the lifeguards reported experiencing at least 1 sunburn. Owing to the amount of time lifeguards working at outdoor pools typically spend in the sun, these data suggest a need to improve sun safety behaviors among this group.

Social norms and pool policies were both positively associated with SPH scores and may be key elements to include in interventions targeting lifeguards. Moderate associations between individual social norms questions and responses to the corresponding SPH items by lifeguards at the same pool indicate that lifeguards made fairly accurate assessments of the sun safety practices of their coworkers. However, these associations were not so strong that

they suggest redundancy between the social norms and SPH measures. The relationship between policies and SPH scores was not as strong as that seen between social norms and SPH scores but does demonstrate the importance of having sun safety policies in place at outdoor pools. Having taught Pool Cool sun safety lessons was not significantly associated with SPH scores ($P \geq .34$ for all analyses). Teaching sun safety lessons may not strongly affect one's own sun protection practices, or it is possible that most lifeguards taught the lessons, irrespective of their own sun safety habits.

The number of sunburns reflects the combined effects of sun exposure, SPH, and photosensitivity into 1 indicator. The results of the ordinal regression models differed slightly between the 2 years, with lower social norm scores and pool policy scores significantly associated with reporting a higher number of sunburns in 2001 (P=.004 and P=.01, respectively) and having taught Pool Cool sun safety lessons significantly associated with reporting fewer sunburns in 2002 (P=.02). However, the models reflect a similar pattern in which more sun safety supports around the pool environment (whether they be social norms, policies, or a sun safety program) tend to be associated with fewer sunburns among the pool staff. When controlling for skin cancer risk score, there was a significant relationship between SPH scores and number of sunburns ($P < .001$), suggesting that those with healthier sun protection behaviors tend to experience fewer sunburns.

Ethnicity and skin cancer risk score were significantly associated with the number of sunburns experienced in both the 2001 and 2002 ordinal regression models ($P < .01$). As one might expect, white subjects and those with higher skin cancer risk scores tended to report more sunburns. Individuals who are more photosensitive should be targeted for sun safety interventions owing to their increased risk of sunburn and skin cancer.

Consistent with social cognitive theory, this study suggests that the pool environment and individuals' perceptions of the social or peer environment influence sun safety behaviors.[16,17] The results support the concept of dynamic interactions between the environment, perceptions of the environment, and behavior. Healthy sun protection behaviors among one's peers will likely have a positive influence on an individual's sun safety habits. Furthermore, sun-safe pool policies also foster healthier sun safety behaviors among the staff while they are at work and create a work environment conducive to developing healthy sun protection habits.

Given the dynamic interaction between perceived social norms, pool policies, and individual sun protection behaviors, it is difficult to determine which area is more central to consider when planning future interventions. A multicomponent approach to sun safety interventions may ultimately be most successful among this high-risk group. Future interventions should focus on changes at the pool level and at the individual level. This includes implementing policies supportive of sun safety, promoting sun safety practices as the norm among pool staff, and also making sun safety relevant to individual lifeguards.

One strength of this study is that it used 2 years of data with large sample sizes to compare as replicate data sets, allowing for a more robust study of the relationships between the variables. The use of replicate analyses in skin cancer prevention and community health research is rare, making this study a valuable addition to the current literature. Second, previously published lifeguard data from the Pool Cool program have described the effects of the program on lifeguard sun safety but have not specifically explored the relationships between the pool environment, sun safety, and sunburn.[9] There are also limitations to the current study. First, the study relies on self-reported data, which can be limited owing to potential respondent misinterpretation of the questions, inaccurate recall, or misrepresentation of the truth. Second, results are based on relatively brief survey measures

that capture limited detail about key constructs. Third, the cross-sectional design does not permit conclusions about causal relationships. The generalizability of the study is limited to lifeguards and aquatic staff working at outdoor pools.

CONCLUSIONS

The results of this study suggest that organizational and social environments supportive of sun safety are key to sun safety behaviors of the staff and to reducing sunburns. Participation in a sun safety program in the aquatic setting may help to improve sun safety behaviors among the pool staff. Future research should explore the effectiveness of sun safety programs that directly target lifeguards and aquatic instructors and integrate multiple strategies for improving policies, social norms, and sun safety behaviors.

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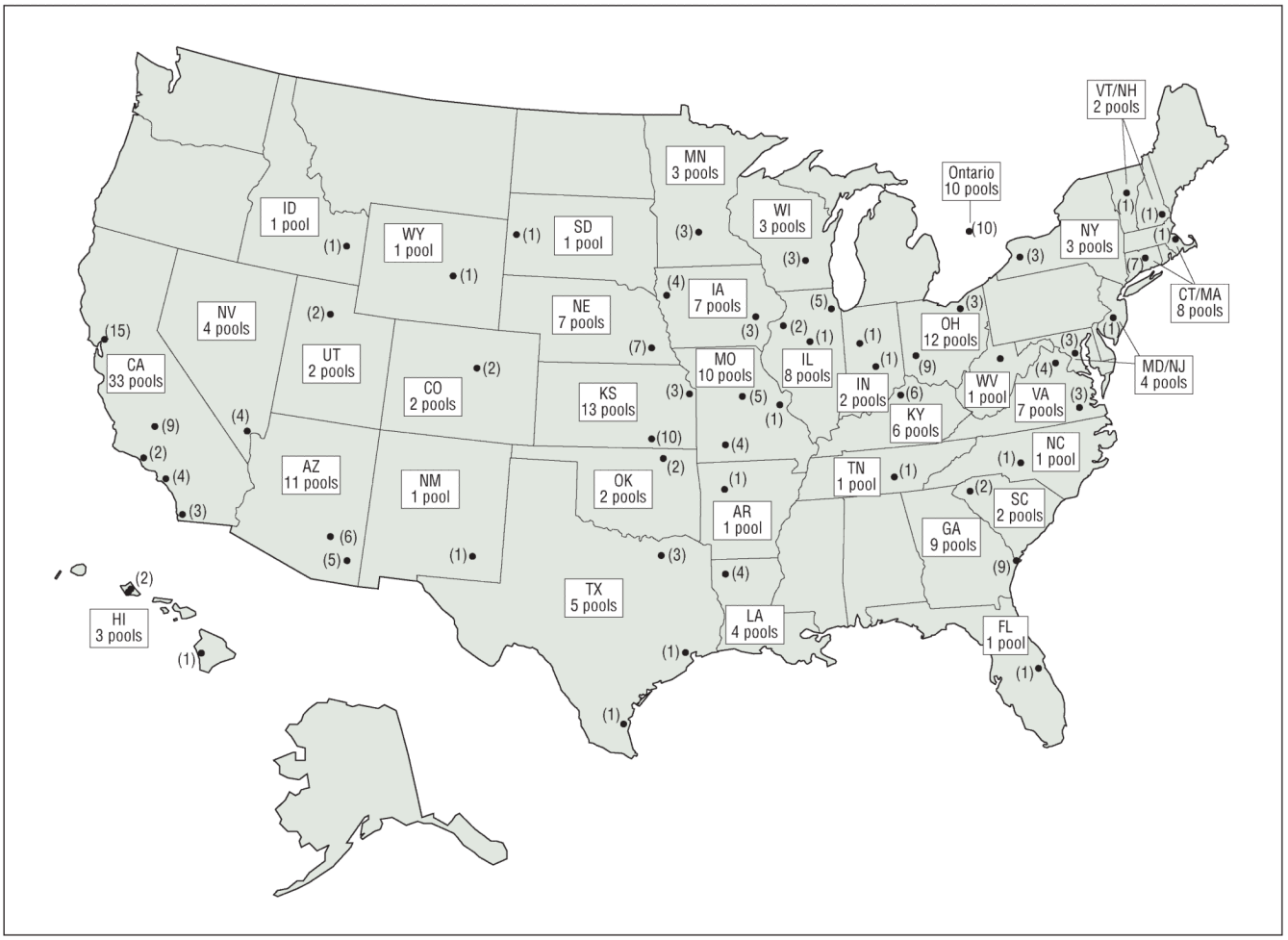

Figure 1.
Pools with lifeguards responding to surveys, 2001 and 2002. Unlabeled states had no pools that responded.

Table 1

Items, Response Ranges, and Cronbach Reliability Coefficients for Indices Regarding Sun Protection Habits, Social Norms, and Pool Policies

Index Name		Response Range	Cronbach Reliability Coefficient
Social norms (3 items)			
Most of the lifeguards here…		1 (strongly disagree) to 5 (strongly agree)	0.64
1	Use sunscreen as protection from the sun when they are outdoors		
2	Wear hats as protection from the sun when they are outdoors		
3	Cover up to protect themselves from the sun		
Pool policies (7 items)			
Does your pool…		0, No; 1 = Yes	0.73
1	Encourage swimmers to stay in the shade when not swimming		
2	Remind children to wear sunscreen		
3	Remind parents to send children with sunscreen		
4	Provide sunscreen to swimmers who forgot to put it on		
5	Display info about how to select and use sunscreen		
6	Teach about sun protection in swimming lessons		
7	Use a “big book” to teach health topics in swimming lessons[a]		
Sun protection habits (5 items)		1 (rarely/never) to 4 (always)	0.56
1	Wear a shirt with sleeves		
2	Wear sunglasses		
3	Stay in shade or under an umbrella		
4	Wear sunscreen		
5	Wear a hat		

[a] “Big book” refers to a flip chart of colorful illustrations designed to be used with the lessons.

Table 2

Mixed Regression Models of the Relationship of Covariates,[a] Social Norms, Pool Policies, and Having Taught Pool Cool Sun Safety Lessons for Sun Protection Habits in 2001 and 2002

	2001		2002	
Parameter	**Estimate (95% CI)**	**OR**	**Estimate (95% CI)**	**OR**
Intercept	1.399 (1.15 to 1.65)[b]	4.05	1.484 (1.26 to 1.71)[b]	4.41
Age	0.021 (−0.01 to 0.05)	1.02	−0.004 (−0.03 to 0.02)	1.00
Sex (0=male)	−0.019 (−0.10 to 0.06)	0.98	−0.045 (−0.11 to 0.03)	0.96
Ethnicity (0=white)	0.095 (−0.04 to 0.23)	1.10	0.083 (−0.02 to 0.19)	1.09
Skin cancer risk score[c]	0.035 (−0.02 to 0.09)	1.04	0.047 (0.001 to 0.09)[d]	1.05
Pool location (0=north)	0.016 (−0.06 to 0.10)	1.02	0.046 (−0.02 to 0.11)	1.05
Norm score[e]	0.231 (0.18 to 0.28)[b]	1.26	0.214 (0.17 to 0.26)[b]	1.24
Policy score[f]	0.042 (0.02 to 0.07)[b]	1.04	0.022 (0.002 to 0.04)[e]	1.02
Taught Pool Cool (0=no)	0.043 (−0.05 to 0.13)	1.04	0.011 (−0.06 to 0.09)	1.01

Abbreviations: CI, confidence interval; OR, odds ratio.

[a] Covariates included age, sex, race/ethnicity, skin cancer risk score, and pool location.

[b] Significant difference from zero ($P < .01$).

[c] Higher skin cancer risk scores indicate a higher risk of developing skin cancer.

[d] Significant difference from zero ($P < .05$).

[e] Higher social norms scores indicate higher levels of agreement with statements about whether the pool's staff usually wear hats, use sunscreen, and cover-up as means of sun protection.

[f] Higher pool policy scores indicate more sun safety policies at the pool, with a possible range of 0 to 7.