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Effectiveness of a Targeted, Peer-Driven Skin Cancer Prevention Program for Lifeguards

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Lifeguards working at outdoor pools typically receive high amounts of sun exposure, increasing their risk for developing skin cancer. This study evaluates the effectiveness of a targeted, peer-driven intervention for skin cancer prevention among lifeguards. Nine pools received the targeted intervention, Pool Cool Plus, and five received the standard Pool Cool prevention program. Lifeguards completed surveys at the beginning and end of the summer. Lifeguards in both the targeted intervention and standard program groups increased their sun safety practices and reported more sun-safe pool policies and environments. Sunburn rates decreased among lifeguards participating in Pool Cool Plus. Future research should test the feasibility and effectiveness of disseminating the Pool Cool Plus program.

More than one million cases of basal and squamous cell cancers are reported annually, and 62,480 people are expected to be diagnosed with melanoma in 2008 (American Cancer Society, 2008). Behavioral recommendations for primary prevention of skin cancer include wearing protective clothing, wearing sunglasses, and using sunscreen with a sun protection factor (SPF) of 15 or higher when outdoors in the sun. Staying in the shade and limiting sun exposure during the midday hours (10 a.m. to 4 p.m.) are also recommended (American Cancer Society, 2008). Although awareness about skin cancer is growing, preventive behaviors remain relatively low in the United States (Saraiya, Hall, & Uhler, 2002).

Outdoor pools provide an environment of constant sun exposure, and pool staff members are exposed to large amounts of ultraviolet radiation (UVR) daily, increasing their risk of developing skin cancer later in life. In addition, most lifeguards are young adults in high school or college, an age group that typically has poor sun safety habits. National surveys administered in the United States in 1999, 2001, and 2003 found that only about 10% of students in grades 9–12 reported using sunscreen most of the time when outside for more than one hour on a sunny day (Jones & Saraiya, 2006). In addition, annual sunburn prevalence among 18–29 year-olds is high (57.5%; Saraiya, Hall, & Uhler, 2002), and the majority of adolescent sunburn occurs during water activities (Davis, Cokkinides, Weinstock, O'Connell, & Wingo, 2002).

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Data from the *Pool Cool* sun safety program indicate poor sun safety practices among lifeguards, with about 80% of pool staff experiencing at least one sunburn over the summer (Geller et al., 2001), and less than half usually or always practicing sun safety behaviors when outside on a sunny day (Hall, McCarty, Elliott, & Glanz, in press).

The need to improve lifeguard sun safety is clear, but there are no known effective strategies for outdoor aquatics workers (Glanz, Buller, & Saraiya, 2007). Among young adults, the use of motivational appeals to arouse interest and personalize the risk of skin cancer and sun damage has been successful (McMath & Prentice-Dunn, 2005), and peer-driven approaches have been found to be effective in other areas of youth health promotion (Borsari & Carey, 2001). These strategies have not been tested among lifeguards in outdoor pool settings. The aim of this study is to evaluate the effectiveness of a targeted, peer-driven intervention for skin cancer prevention among lifeguards at outdoor pools. If found effective, such an intervention could be disseminated to further improve sun safety among lifeguards.

Method

Context and Setting

The *Pool Cool* skin cancer prevention program is a multicomponent educational and environmental intervention that has theoretical foundations in Social Cognitive Theory. As part of the program, lifeguards and aquatic staff at each pool are trained to teach children aged 5–10 who are taking swimming lessons about sun safety. The program has been systematically developed, pilot tested, and evaluated through four successive phases of development, implementation, dissemination, and evaluation: (a) pilot study, (b) efficacy trial (Glanz, Geller, Shigaki, Maddock, & Isnec, 2002; Geller et al., 2001), (c) dissemination pilot study (Hall, McCarty, Elliott, & Glanz, in press), and (d) diffusion trial (2003–2006; Glanz, Steffen, Elliott, & O'Riordan, 2005). The current study builds on the diffusion trial and involves implementation strategies specifically targeted to lifeguards in the *Pool Cool* program.

Design

This study, conducted at outdoor pools in the summer of 2007, used a hybrid design with comparison groups clustered by region. Pools in two regions that previously participated in the *Pool Cool* program between 2003 and 2006 were randomized to receive either the standard *Pool Cool* program or *Pool Cool Plus*, a targeted, peer-driven program for lifeguards. Pools in a third region that had not participated in *Pool Cool* before were assigned to receive the *Pool Cool Plus* program. The standard *Pool Cool* program was conducted in Wichita, Kansas (5 pools), and the *Pool Cool Plus* program for lifeguards was conducted in Atlanta, Georgia (6 pools) and Henderson, Nevada (6 pools; see Figure 1). Outcome evaluation was based on self-administered surveys completed by aquatic staff at baseline and at follow-up. Process evaluation was completed by site visits and in-person and telephone interviews with pool liaisons.

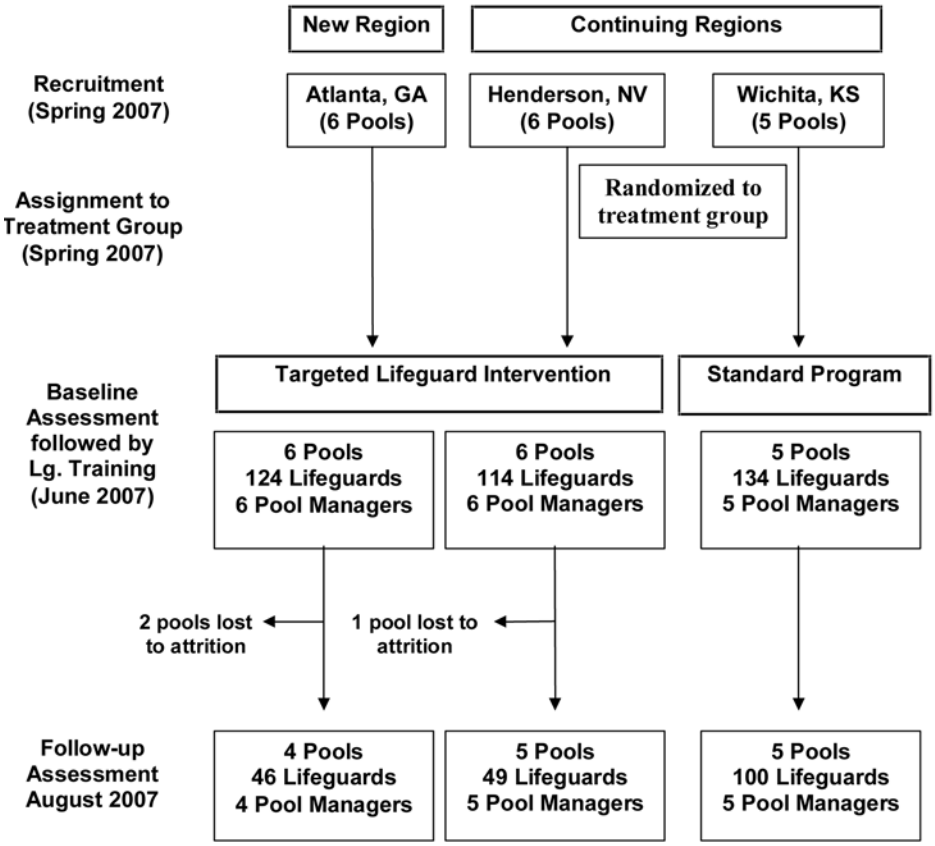

Figure 1 — Pool Cool 2007 study design.

Program Components and Materials

Lifeguards at pools participating in the standard *Pool Cool* program were trained or retrained on sun safety and the use of *Pool Cool* program materials at the start of the summer, according to the protocol used in previous studies (Glanz et al., 2005). Each pool received a *Pool Cool* Tool-kit containing educational materials, incentive items, and a gallon pump container of sunscreen. Pools in the new *Pool Cool Plus* program received the same materials plus additional program components involving strategies specifically targeting lifeguards: (a) motivational appeals, (b) a peer-driven approach, and (c) extra policy and environmental supports (Table 1).

For the *Pool Cool Plus* pools, motivational appeals were designed to personalize the potential risk of skin cancer to the lifeguards. These included images of skin cancer growth and damage presented at the trainings, vivid stories of youth who died of melanoma, and testimonials from young skin cancer survivors. An ultraviolet skin analyzer machine was used so each lifeguard could view sun

Table 1 Program Components Provided for Each Group

	Standard *Pool Cool*	*Pool Cool Plus*
Lifeguard Training		
Basic sun safety training	x	x
Overview of sun safety lessons	x	x
Educational Materials		
Leader's guide	x	x
Laminated sun safety lessons	x	x
DVD containing sun safety info	x	x
CD-ROM containing program materials	x	x
Motivational Appeals		
Video clips of actual skin cancer cases		x
Testimonials from skin cancer survivors		x
Skin analyzer machine demonstration		x
Policy and environmental supports		
Decision maker's guide	x	x
Resource guide	x	x
Sun safety posters and aluminum signs	x	x
Free gallon jug of sunscreen	x	x
Free shade structure		x
Option to request additional sun-safety supports		x
Peer-driven Approach		
Encouragement to form a Sun Safety Planning Team		x
Sun safety planning guide		x
Pool Cool staff visits to the pool		x
Pool Cool pages on internet networking sites		x
Awards for best work		x

damage that had already occurred on their faces (Olson et al., 2007). The peer-driven approach encouraged lifeguards to form a Sun Safety Planning Team at their pools to design their own strategies for improving sun safety among their coworkers. *Pool Cool* staff members provided technical assistance to the lifeguards during a visit to each "Plus" pool and also were available via e-mail and phone. Pool staff submitting and implementing the best sun-safety ideas were given extra incentives and recognition at the end of the summer. To further encourage lifeguard involvement in an age-appropriate manner, special *Pool Cool Plus* web pages were posted for the lifeguards on the social networking sites MySpace (www.myspace.com/poolcoolplus) and Facebook (www.faceboook.com). The extra policy and environmental support strategies included a free shade structure for each pool and the opportunity for lifeguards to request up to $200 worth of additional sun safety support items for their pool.

Data Collection

Data were collected from lifeguards and pool managers at each pool. All participants provided written informed consent, and the research protocol was approved by the Emory University Institutional Review Board (IRB# 156–2004; renewed January 2007). Participants received small incentive items (i.e., pens, lanyards, etc.) upon completion of a baseline survey before the Pool Cool training session at the start of the summer and a $10 gift certificate upon completion of a follow-up survey at the end of the summer.

Process evaluation site visits were conducted in late July at "Plus" pools only and involved observations of pool and staff characteristics. Process evaluation telephone interviews were conducted with a liaison from each pool at the end of the summer and included open and close-ended questions to assess receipt and use of program components, program implementation, and reactions to the program.

Measures

The measures used in this study were selected and/or adapted from earlier studies of skin cancer prevention in aquatic settings (Geller et al., 2001; Glanz et al., 2005; Glanz et al., 2002). Data from pool manager surveys were used to describe participating pools and the communities where they were located. Lifeguard surveys included questions about demographic characteristics, skin cancer risk factors, sun protection habits, sunburn history, and pool policies, as well as questions about sun safety knowledge, attitudes, and social norms.

Participants were categorized into low, moderate, or high skin cancer risk groups based on responses to risk factor questions including untanned skin color, hair color, eye color, sunburn history, tanning propensity, and history of skin cancer (Glanz et al., 2003; Weinstock, 1992).

Sun protection habits were assessed by measuring five behaviors (using sunscreen, wearing a shirt, wearing a hat, seeking shade, and wearing sunglasses) on a 4-point ordinal scale ranging from 1 (*rarely* or *never*) to 4 (*always*). The mean score for the five items was calculated to obtain a summary sun protection habits score ($\alpha = .45$). The same five items were also asked in reference to sun protection habits at work ($\alpha = .42$).

Sunburn was assessed by asking how many times (0, 1, 2, 3, 4, or 5 or more) participants got a sunburn last summer (baseline) and this summer (follow-up). Sun protection pool policies and environments were assessed with seven yes/no items (for example, Does your pool limit how often lifeguards are on the stand during peak sun hours?). Index scores were calculated by adding up the number of "yes" responses ($\alpha = .55$). Additional questions were asked about sun safety knowledge, benefits and barriers to sun safety, and social norms regarding sun safety among the lifeguards.

Statistical Analyses

Analyses were conducted using SPSS 15.0. Preliminary analyses included calculating descriptive statistics for all variables and scales and examining survey completion rates for baseline and follow-up surveys at each pool. Pools with participant completion rates below 20% at follow-up were excluded from further analyses.

T-tests and chi-squares were used to assess differences between respondents who completed both baseline and follow-up surveys and those who completed only a baseline survey, and to compare the two treatment groups at baseline. Intraclass Correlation Coefficients (ICCs) were calculated for each outcome variable to assess the effects of clustering within pools.

Linear regression analyses were conducted in which each outcome variable (sun protection habits, sun protection habits at work, pool policies, and sunburn) was regressed onto treatment group, controlling for previous participation in the program and for variables that differed between completers and noncompleters or between treatment groups at baseline. Study variables showing a statistically significant correlation with the outcome variable were included as covariates in the model. Multivariate analysis of covariance (MANCOVA) was used to assess changes in each outcome variable from baseline to follow-up by group, with previous participation included as a covariate. The model for sunburn was also stratified by skin cancer risk group (low, moderate, and high risk).

Results

Participation and Treatment Group Equivalence

Seventeen pools participated in the study. Three pools in the *Pool Cool Plus* group were dropped from further analyses due to attrition at follow-up (less than 20% of baseline respondents completed follow-up surveys; see Figure 1). Pool-level data from manager baseline surveys showed no significant differences between dropped and nondropped pools. The 14 remaining pools were located mainly in suburban communities (71.4%), and most participating pool staff were seasonal and had worked at the pool for three to five years (71.4%).

Baseline surveys were completed by 260 lifeguards (134 in the standard group and 126 in the "Plus" group), and 195 lifeguards completed follow-up surveys (100 in the standard group and 95 in the "Plus" group). Attrition analyses showed that completers were more likely to be female than male. Tests of treatment group equivalence at baseline showed no significant differences in demographic characteristics, but participants in the standard group had significantly higher policy scores than participants in the "Plus" group ($\bar{X} = 4.95$ vs. $\bar{X} = 4.34$, $p < .001$). As seen in Table 2, most lifeguards were female (57.9%), Caucasian (88.5%), and had not started college (76.2%), and the mean participant age was 17.0 (± 5.3) years. The effects of clustering by pool were stronger for pool policies

Table 2 Baseline Characteristics of Participants

Characteristic	Total (n = 260)		Basic (n = 134)		Intervention (n = 126)	
	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*
Age	17.02	5.32	16.49	4.06	17.58	6.36
	%		%		%	
Gender (female)	57.9		60.9		54.8	
Ethnicity (Caucasian)	88.5		88.1		88.9	
Skin cancer risk level						
Low risk	26.9		28.4		25.4	
Moderate risk	40.8		42.5		38.9	
High risk	32.3		29.1		35.7	
Education						
Haven't finished high school	53.9		56.5		51.2	
Completed high school	22.3		19.1		25.6	
Completed some college	23.8		24.4		23.2	
Marital status (Never married)	97.2		98.5		96.0	

Note. No significant differences in demographic characteristics were found between treatment groups at baseline.

(ICC = .18) than for sun protection habits (ICC = .003), sun protection habits at work (ICC = .03), or sunburn (ICC = .07).

Main Effects Analyses

Sun Protection Habits. The mean sun protection habits score was 2.33 (± = .43) at baseline and 2.46 (± = .51) at follow-up. Treatment group was not significant in linear regression models predicting sun protection habits while controlling for pool, previous participation, gender, and pool policies at baseline (∃ = .01, p = .91). A MANCOVA assessing change in sun protection habits over the summer by treatment group showed a statistically significant increase in sun protection habits from baseline to follow-up in both the standard, $F(1, 99) = 6.67$, $p = .01$ and "Plus" groups, $F(1, 86) = 4.38$, $p = .04$.

Sun Protection Habits at Work. The mean sun protection habits at work score was 2.27 (± = .48) at baseline and 2.41 (± = .55) at follow-up. Treatment group was not significant in linear regression models predicting sun protection habits at work while controlling for pool, previous participation, gender, and pool policies at baseline (∃ = .06, p = .52). A MANCOVA assessing change over the summer in sun protection habits at work by treatment group showed a statistically significant increase in sun protection habits at work from baseline to follow-up in the standard group only, $F(1, 99) = 5.44$, $p = .02$.

Sunburn. At baseline, 79.9% of participants reported experiencing sunburn the previous summer, and 72.8% reported experiencing sunburn "this summer" at follow-up. Treatment group was significant in linear regression models predicting number of sunburns while controlling for pool, previous participation, gender, and pool policies at baseline ($p = .04$; Table 3). A MANCOVA assessing change over the summer in sunburn by treatment group and by skin cancer risk group showed a statistically significant reduction in sunburn in the "Plus" group only, $F(1, 87) = 16.97$, $p < .001$. Among the three skin cancer risk groups, there was a significant decrease in sunburn for participants in the moderate, $F(1, 73) = 25.82$, $p < .001$ and high, $F(1, 61) = 4.04$, $p = .05$ risk groups.

Sun Protection Pool Policies. Although pool policies scores were significantly higher for participants in the standard group at baseline (see above), the mean pool policies score at follow-up was 7.37 (± = 2.15), with no significant difference between groups. Treatment group was not significant in linear regression models predicting pool policies while controlling for pool, previous participation, gender, and pool policies at baseline (∃ = -35, p = .73). A MANCOVA assessing change in pool policies over the summer by treatment group showed a significant increase in sun protection policies from baseline to follow-up for both the standard, $F(1, 96) = 18.47$, $p < .001$ and "Plus" groups, $F(1, 85) = 16.64$, $p < .001$.

Previous Participation. Previous participation was included as a covariate in the linear regression models for each of the four main outcome variables and also was controlled for in the MANCOVAs for each of these variables. Previous participation was not significant in any of the linear regression models or MANCOVAs.

Process Evaluation and Implementation. Of the pools that were observed ("Plus" pools only), all had shade in the pool area and free sunscreen available for

Table 3 Summary of Multiple Linear Regression Analysis for Variables Predicting Number of Sunburns Reported at Follow-up (*N* = 195)

Variable	*B*	*SE B*	β
Step 1			
Group (1 = Enhanced, 0 = Basic)	–.34	.25	–.13*
Pool	.003	.03	.01
Previous Participation	.36	.29	.11
Pool policies at baseline	–.01	.08	–.01
Gender (0 = Female, 1 = Male)	–.23	.20	–.08
Step 2			
Group (1 = Enhanced, 0 = Basic)	–.50	.24	–.18*
Pool	.004	.02	.01
Previous Participation	.24	.27	.07
Pool policies at baseline	–.05	.08	–.04
Gender (0 = Female, 1 = Male)	–.30	.19	–.11
Risk group (0 = Other, 1 = Medium)	.42	.23	.15
Risk group (0 = Other, 1 = High)	1.22	.24	.43**

Note. R^2 = .05 for Step 1; R^2 = .15 for Step 2; ΔR^2 = .13 (p = .0001)
*$p < .05$, **$p < .01$

staff, and 76.9% had sun safety signs displayed in the pool area. The majority of the pool staff (69.2%) observed were wearing hats, although fewer than half were seen applying sunscreen (30.8%), wearing a shirt with sleeves (30.8%), or wearing Pool Cool items (46.2%). According to telephone interviews with pool contacts, there was a high rate of program implementation, with 92.9% of pool contacts reporting the sun safety lessons were taught at their pool. Most contacts in the "Plus" group reported that the pool staff had a Sun Safety Planning Team (83.3.%), used the Sun Safety Planning Guide (66.7%), or requested additional sun safety supports through the Pool Cool program (100%).

Discussion

The aim of this study was to evaluate the effectiveness of a targeted, peer-driven intervention for skin cancer prevention among lifeguards at outdoor pools. Study results provide evidence that the targeted program was effective in decreasing sunburn and improving sun protection habits and pool policies. The standard *Pool Cool* program also had positive effects on sun safety at the individual and pool levels, but the reduction in sunburn was unique to lifeguards participating in *Pool Cool Plus*. Although the precise relationships of sun protection and sunburn as measured on the study surveys are unknown, the new program components (environmental supports, motivational appeals, and a peer-driven approach) appear to have added health benefits above and beyond the standard *Pool Cool* program.

Limitations

Limitations of this study include the use of brief, self-reported measures by a convenience rather than random sample, the relatively short intervention period (one summer), and the lack of a long-term follow-up with participants. Furthermore, because all three intervention components (motivational appeals, a peer-driven approach, and environmental supports) were combined in *Pool Cool Plus*, it is not possible to separate out the effects of different parts of the program. Further, there was no true control group in this evaluation. Three study pools were dropped from analyses due to survey completion rates below 20%. These pools returned a high number lifeguards surveys at baseline but were unable to collect many follow-up surveys before the closing for the summer; however, baseline data indicated that there were no systematic differences between these pools and those that completed the study.

Conclusion

The high prevalence of skin cancer in the United States, excessive sun exposure lifeguards typically experience on the job, and notoriously poor sun protection practices of adolescents and young adults all support the need for sun safety programs targeting lifeguards at outdoor pools. This study adds new information on strategies that may be effective for improving sun protection habits and reducing sunburn among lifeguards. Some of the strategies used in the targeted intervention may be useful for sun safety interventions among outdoor workers in nonpool settings as well. More intensive interventions may prove more effective at changing sun protection habits. Future research should examine the effectiveness of more intensive or longer-duration strategies with wider dissemination of the *Pool Cool Plus* program.

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