Published in final edited form as:

J Health Commun. 2009 June ; 14(4): 346–365. doi:10.1080/10810730902873117.

Testing a Theory-Based Health Communication Program: A Replication of *Go Sun Smart* in Outdoor Winter Recreation

PETER A. ANDERSEN,

San Diego State University, San Diego, California, USA

DAVID B. BULLER,

Klein Buendel, Inc., Golden, Colorado, USA

BARBARA J. WALKOSZ,

University of Colorado at Denver and Health Sciences Center, Denver, Colorado, USA

JULIE MALOY,

Klein Buendel, Inc., Golden, Colorado, USA

MICHAEL D. SCOTT,

California State University, Chico, California, USA

GARY R. CUTTER, and

University of Alabama, Birmingham, Birmingham, Alabama, USA

MARK B. DIGNAN

University of Kentucky, Lexington, Kentucky, USA

Abstract

The epidemic of preventable skin cancer in the United States creates an urgent need for health communication campaigns to improve sun protection. Go Sun Smart (GSS), a theory-driven multichannel health communication campaign showed positive effects on sun safety behaviors of employees and guests in a randomized trial at high-altitude ski areas. In this article we report findings from the North American GSS campaign for guests at ski areas that composed the original control-group resorts, replicating the results of the original guest intervention. Results showed that after GSS was deployed, guests at the original control group ski areas increased sun protection and reported greater recall of sun safety messages. Conversely, GSS had no effect on sunburning attitudes or self-efficacy beliefs. Like the original GSS guest intervention, the present study found that greater exposure to GSS messages was associated with greater use of sunscreen, sunscreen lip balm, and face covering, but not gloves or overall sun protection. There was no evidence that GSS decreased sunburning or attitudes and self-efficacy beliefs regarding sun safety.

Skin cancer prevention programs are an important national health priority. In the United States, skin cancer is both the most commonly occurring and the most preventable cancer (American Cancer Society, 2007). Several large health communication trials on sun safety have been effective with outdoor workers (Andersen et al., 2006; Buller et al., 2005; Glanz, Buller, & Saraiya, 2007; Mayer et al., 2007), children (Dietrich et al., 1998; Olson et al., 2007; Walkosz, Voeks et al., 2007), and people engaged in outdoor recreation (Glanz, Geller, Shigaki, Maddock, & Isnec, 2002; Glanz, Lew, Song, & Murakami-Akatsuka, 2000;

Glanz, Maddock, Lew, & Murakami-Akatsuka, 2001; Mayer et al., 2001; Walkosz, Buller et al., 2007; Winett et al., 1997). One trial, the Go Sun Smart (GSS) program, has evaluated a theory-driven intervention targeted at the quarter million outdoor workers and more than 30 million recreational guests in the North American ski and snowboard industry. GSS demonstrated positive effects at ski areas by reducing sunburning and increasing sun safety behaviors of outdoor workers (Andersen et al., 2006; Buller et al., 2005), guests (Walkosz, Buller et al., 2007), and children at ski school (Walkosz, Voeks et al., 2007).

Sun Safety at High Altitude

Health communication campaigns to prevent skin cancer are imperative because the effects of excess ultraviolet radiation (UVR) are nontrivial. Over 1 million cases of basal and squamous cell carcinomas—nonmelanoma skin cancers (NMSC)—are diagnosed annually in the United States (American Cancer Society, 2007). Alarming, the most common skin cancer, basal cell carcinoma, is associated with an increased risk of cancer at all sites (Kahn, Tatham, Patel, Thun, & Heath, Jr., 1998; Karagas et al., 1992; Rosenberg et al., 2004). Melanoma afflicted 59,940 people in 2007, with 8,110 deaths (American Cancer Society, 2007). Unprotected excessive exposure to UVR is the primary skin cancer risk factor that could be prevented if people were persuaded to limit UVR exposure (American Cancer Society, 2007).

Ski areas are high-elevation environments with substantial UVR that increases by 4%–6% for every 1000 ft above sea level. Limited cloud cover, low humidity, and reflection from snow also increase UVR exposure (Blumthaler & Ambach, 1988; Reiter, Munzert, & Sladovic, 1982). Over 38 million Americans participated in skiing and snowboarding annually (United States Department of Agriculture [USDA] Forest Service, 2001), and most adults fail to protect themselves from UVR at ski areas (Buller, Andersen, & Walkosz, 1998).

The GSS Guest Studies

Given its previous success, the present study provides an additional test of the effectiveness of GSS on guests at ski areas in North America. An initial group-randomized trial (Walkosz, Buller et al., 2007), where one set of 13 randomly selected pair-matched ski areas (Group A) received the GSS program and a matched set of 13 control group areas (Group B) did not, revealed that guest skiers and snow-boarders at GSS ski areas were significantly more likely to recall hearing or seeing a message about sun protection and were more likely to recall seeing the GSS logo while skiing or snowboarding. In turn, guests at intervention ski areas recalling a sun safety message were more likely to report using sunscreen and sunscreen lip balm, and report fewer sunburns while skiing or snowboarding, than guests at intervention ski areas not recalling a message and more than guests at control ski areas. Health communication experts, however, should not be satisfied with single experimental trials.

We posited a priori that the GSS program would produce positive effects and, as in most health studies, we planned to treat the control group with our intervention in Year 2. Planning to treat all the resorts in Year 2 also assisted in recruiting resorts since areas in the control group were promised the intervention in Year 2. This crossover design (Checkoway, Pearce, & Kriebel, 2007; Stone, 2006) provided a replication of the effects of GSS, which is important to improve confidence in research findings (Frey, Botan, Friedman, & Kreps, 1991; Lustig & Andersen, 1990; Neuliep, 1990).

The Go Sun Smart Studies

Go Sun Smart (GSS) is a theory-based intervention primarily based on Diffusion of Innovations Theory (DIT), which has been used successfully across diverse cultures to promote the behavioral objectives adoption of numerous preventive health practices (Rogers, 2003). Details of the theory base of GSS is available in prior studies (Andersen et al., 2006; Buller et al., 2005; Walkosz, Buller, et al., 2007). GSS employed brief messages with the behavioral objectives of improving perceptions that sun safety is easy to implement, personally advantageous, and compatible with activities in which employees and guests are engaged. We expected opinion leaders on health and safety, particularly ski patrollers, would be locally influential and convince employees to adopt sun safety (Rogers, 2003). Messages attempted to employ principles from Bem's (1972) Self-Perception Theory, which held that "Individuals come to know their own attitudes, emotions and internal states by inferring them from observations of their own behavior and circumstances in which they occur" (p. 2), which attempted to induce self-persuasion. Go Sun Smart (GSS) employed research on sensation seeking (Donohew, Lorch, & Palmgreen, 1998), including graphics-rich, high-sensation materials that work best for snowboarders and skiers, Agenda-Setting Theory (Dearing & Rogers, 1996; i.e., sun protection advice was placed in prominent resort locations), Social Cognitive Theory (Bandura, 1986; i.e., sun protection demonstrated by attractive models create positive outcome expectations and was portrayed as easy to implement in the environment as a means of increasing self-efficacy), and Extended Parallel Processing Theory (Witte, 1992; i.e., getting guests to process fear messages about skin damage will create an avoidable threat from UVR). While it was difficult to attribute increased sun safety to any one theory, integrated theoretical principles within GSS attempted to maximize its potential effectiveness.

Go Sun Smart Messages

GSS was a multimediated, multichanneled campaign targeted at guests, employees, and children at ski school. Visual media were primary and included signage on lift poles, in the lodge, at ski school, in rest rooms, and in ski lift boarding areas. Posters employed research and theory on sensation seeking, fear appeals, and message redundancy to optimize their effectiveness. Additionally table tents and brochures in guest facilities, brochures at ski and snowboard schools, and messages on electronic signs and grooming reports were displayed. Sun safety messages also were diffused to guests by employees who were trained to advise guests to take precautions. The GSS logo branded all materials and materials all contained the message, "Wear Sunscreen, Sunglasses and a Hat."

Hypotheses

Like the test of the original intervention (Walkosz, Buller, et al., 2007), we hypothesized that guests visiting former control-group ski areas (Group B) receiving GSS would show improved sun safety compared with the prior year in terms of increased sun protection (H1), decreased sunburning (H2), and more favorable attitudes and self-efficacy beliefs (H3). We further predicted that guests in Group B were more likely to recall seeing or hearing a message about protecting their skin and eyes from the sun than the prior year (H4) and, in turn, those who recall a message would engage in increased sun protection (H5a), experience fewer sunburns (H5b), and express more favorable attitudes and self-efficacy beliefs toward sun safety (H5c) than guests who do not recall a message.

Methods

Participants and Time Line

Across the 3 years of the study, adult guests ($n=8,295$) at 26 western U.S. and Canadian ski resorts were interviewed on chair lifts during the GSS program. In phase one, between January to April 2001, guests were pretested at all 26 GSS resorts ($n=2,991$; 99.3% completed; 0.7% refused [$n=23$]). In phase two, from January to March 2002, following the intervention at group A resorts, a second wave of interviews were conducted ($n=3,525$; 99.1% completed; 0.9% refused [$n=33$]). Finally, in the third phase from January to March 2003, after the control group had been exposed to the intervention, a third round of interviews was conducted ($n=1,779$; 99.6% completed; 0.4% refused [$n=7$]). Across all 3 years, 446 guests ($n=201$ in 2001; 181 in 2002; 64 in 2003) were ineligible because they were under 18 ($n=78$), ski area employees (221), previously interviewed (113), or could not speak English (34). The resorts, located in Alaska, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, and British Columbia, were National Ski Area Association (NSAA) members and had at least two aerial chairlifts (Buller et al., 2005). Recruitment procedures for ski areas have been described previously (Buller et al., 2005).

Go Sun Smart Program Messages

The GSS materials have been described previously (Andersen et al., 2006; Buller et al., 2005; Walkosz, Buller et al., 2007). Messages employed multiple media and channels (i.e., print, electronic, visual, and interpersonal) stressing the benefits, simplicity, compatibility, observability, and trialability of sun safety, accrued by wearing sunscreen, sunglasses, and a hat. Contact persons at ski areas, designated by the senior management, were supplied with GSS materials and trained and supported to implement GSS from late December to early March, following a protocol described elsewhere (Buller et al., 2005).

Experimental Design and Survey Procedures

GSS was tested using a pair-matched group-randomized pretest–posttest controlled quasiexperimental design (Murray, 1998), with independent samples of guests at baseline (2001) and follow-up (2002 and 2003) using ski areas as the unit of randomization. Ski areas were matched on size, location, ownership structure, and proportion of female employees (Buller et al., 2005). In the year following the initial test of the intervention (2002), GSS was implemented at the 13 control ski areas, and a second posttest was conducted in 2003 with a third independent sample of guests at all 26 ski areas. The use of independent samples avoided the threat of testing effects, and the randomization of multiple groups (i.e., ski areas) made this a high-quality design that avoids most threats to internal validity (Campbell & Stanley, 1966).

All guests were interviewed face-to-face on chair lifts and gondolas with a minimum run time of 4 minutes by trained interviewers during consecutive days (3 days for pretest and posttest 1; 2 days for posttest 2), composed of at least one weekend day and one weekday. Each matched pair of ski areas was visited the same week of the winter season for interviewing. Interviewers sat at the end of the chair and recruited guests seated immediately next to them; if seated in the middle, they recruited the person to the right. Interviewers read a consent statement approved by the Institutional Review Boards. If a guest refused or was ineligible, another guest on the chair was recruited; one interview was completed per lift ride to avoid clustering effects. A complimentary sunscreen lip balm was given to guests after the survey. Interviewers completed 12–20 surveys per day; 46 to 220 participants were interviewed per ski area determined by the number of guests on the mountain. Interviews were attempted on all eligible chair lifts; main lifts providing access to large areas were oversampled.

Outcome Measures

Several measures of guest sun safety behavior while on the mountain at the time of the interviews were included in the 4-minute survey each year: self-reported use of sunscreen (yes/no or don't know; and if yes, its sun protection factor [SPF], parts of the body on which it was applied, time it was first applied, and whether it was reapplied that day), self-reported use of sunscreen lip balm (yes/no or don't know; and if yes, its SPF), and observation by interviewers of head cover, neck cover, face cover, gloves, and sunglasses or goggles. Unweighted composite scores were created by summing (a) sunscreen with SPF 15+ and lip balm with SPF 15+ (range=0–2) and (b) sunscreen with SPF 15+, lip balm with SPF 15+, goggles, gloves, face cover, neck cover, and head cover (range=0–7). Guests self-reported whether they ever had been sunburned while skiing or snowboarding during the winter season. The definition of sunburns was based on prior recommendations (Lovato, Shoveller, Peters, & Rivers, 1998; Shoveller & Lovato, 2001); high test–retest reliability has been reported for a similar measure (Van de Mei, Blizzard, Ponsonby, & Dwyer, 2006); and a 3-month recall sunburn measure has been validated against a diary (Brandberg, Sjoden, & Rosdahl, 1997).

Attitudes and self-efficacy beliefs about sun safety were measured on Likert-type items (strongly agree [5]/strongly disagree [1]), including, “skin cancer is an important health concern for me”; “no matter what I do, I cannot avoid getting sunburned” (posttests only); “so many things need to be done in order to protect my skin from the sun that I cannot adequately protect it: (posttests only); and “I am confident I can practice sun safety.” Two potential moderators of reactions to GSS, sensation-seeking (I like new and exciting experiences even if I have to break the rules) and skepticism (I am often skeptical of new ideas) were similarly assessed.

Guests' exposure to sun safety messages used recall measures including seeing or hearing messages about protecting their skin, lips, or eyes from the sun while at the ski area (yes, no, or don't know; if yes, whether on a poster or sign, brochure, trail map, or website); being told by anyone at the area to protect their skin, lips, or eyes from the sun (yes, no, or don't know; if yes, whether by a lift operator, ski/snowboard instructor, ski patroller, or someone else). In the posttest surveys, guests were asked if they had seen the GSS logo (yes, no, or don't know; and if yes, where). In the pretest and first posttest survey, guests reported other ski areas they had visited that winter. Analyses showed no consistent evidence of contamination between conditions (Walkosz, Buller, et al., 2007), so this measure was deleted in the second posttest.

Demographics (age, race, Hispanic ethnicity, education, sex), skin sun sensitivity (always burn/unable to tan; usually burn/can tan if work at it; sometimes mildly burn/tan easily; rarely burn/tan easily; Weinstock, 1992), skiing/snowboarding expertise (beginner, intermediate, expert), number of days spent skiing/snowboarding during the winter, time started skiing/snowboarding that day, and home zip code were collected. Distance of the home from the ski area (those living farther than 200 miles were classified as “destination” guests who likely spent several days vacationing at the ski area rather than making a day trip to it) was obtained from the zip code. Interviewers recorded whether guests used skis or a snowboard (or other equipment), weather (i.e., cloud cover [sunny, partly cloudy, cloudy], wind [none, light, moderate/strong], precipitation [none, flurries/light snow, heavy snow, other], and temperature), name of the chair lift, and time and date.

Statistical Analysis

Hypotheses 1–3, which posited that guests visiting former control-group ski areas receiving GSS (Group B) would show improved sun safety compared with the prior year in terms of

increased sun protection (H1), decreased sunburning (H2), and more favorable attitudes and self-efficacy beliefs (H3) were tested by examining the interaction between experimental group (intervention, control) and time of interview (pretest [2001], posttest 1 [2002], posttest 2 [2003]) on the sun safety outcome measures at the individual level nested within ski areas. The crossover in the design occurred between posttest 1 and posttest 2. Following this analysis, the same two-way interaction was examined for recall of messages at ski areas advocating sun protection to test Hypothesis 4, which posited that guests in Group B were more likely to recall than the prior year seeing or hearing a message about protecting their skin and eyes from the sun. Next, the association of message recall and sun protection outcome measures were tested within both experimental conditions, by examining the three-way interaction between experimental group, time, and recall of messages (yes, no, don't know) to assess Hypothesis 5, which posited that those who recall a message would engage in increased sun protection (H5a), experience fewer sunburns (H5b), and express more favorable attitudes and self-efficacy beliefs toward sun safety (H5c) than guests who do not recall a message. Comparisons were conducted using a mixed-effects model (Laird & Ware, 1982; Murray, 1998), a variation of hierarchical linear modeling (Raudenbusch & Byrk, 2002). This model adjusted for the association between guests within ski areas measured by the intraclass correlation, which, when nonzero, increases the association among individuals beyond that estimated by traditional analysis methods and increases Type I error (Andersen et al., 2006). The analyses used the Statistical Analysis System (SAS) PROC MIXED program (SAS Institute, 2002). Because resorts were initially pair-matched prior to randomization, all analyses included pair in the models to account for the effect of matching. Eighteen potential covariates were analyzed (days since November 1, time started skiing, cloud cover, wind, precipitation, temperature, proportion of days skied this season, expertise, local/destination guest, equipment, skin sun sensitivity, race [White/all others], sensation-seeking, skepticism, age, education, and sex) using backward stepwise elimination ($p < .05$ criterion for retention). Covariates found to be significantly related to each outcome were included in the regression analysis for that particular outcome. Outcome data were not transformed prior to analysis. Models were conducted with casewise deletion of missing values on the outcome or covariates (due to item nonresponse). A two-tailed alpha criterion of 0.05 was used in all models. Adjusted proportions and means are reported.

Results

Similarities Among the Three Samples

The samples across the three surveys were similar demographically and on other characteristics (Table 1). Respondents were predominantly male, White, college educated, and young. Skiers outnumbered snowboarders 4 to 1; half of the respondents classified themselves as intermediate in ability; most lived within 200 miles of the ski area and thus qualified as local skiers; and half had visited a ski area five or fewer times during the winter. Interviews were conducted in all weather conditions. Small differences existed among the three samples across three years in terms of Hispanic ethnicity, education, age, expertise, destination v. local guests, location of the ski area, and weather that did not appear sizable enough to bias comparisons (Table 1).

Crossover Effect on Sun Safety: Hypotheses 1–3

The effect of GSS in the crossover design was evaluated by examining the interaction between treatment group (intervention, original control) and time (pretest, posttest 1, posttest 2), testing Hypotheses 1–3. Sun protection, sunburning, attitudes, and self-efficacy beliefs about sun safety were expected to improve among guests in the original control (Group B) who were exposed to the intervention between posttest 1 and posttest 2, but the pattern of improvement relative to the intervention group (Group A) in the crossover design

was uncertain. If no carryover effects of GSS from the initial test period occurred, sun protection by guests in the control group (Group B) should increase from posttest 1 to posttest 2, while guests in the intervention group (Group A) should show a corresponding decrease. If carryover effects existed, however, improvements in the control group from posttest 1 to posttest 2 should remain, but the sun protection in the intervention group should remain elevated from posttest 1 to posttest 2.

Results showed support for Hypothesis 1, which posited that following the GSS intervention, guests visiting former control ski areas receiving GSS (Group B) would report increased sun safety behaviors. Hypotheses 2 and 3, which posited that following the GSS intervention guests would manifest less sunburning and more positive attitudes regarding sun safety and greater self-efficacy, were not supported. Specifically, the treatment group-by-time period interaction was statistically significant for several sun protection behaviors but not for sunburns, attitudes, or self-efficacy beliefs. The adjusted proportions are shown in Table 2. They indicate that the composite sun protection measure decreased from posttest 2 to posttest 3 in both Group B ski areas (the original control group) and Group A ski areas (the original intervention group). The reduction was much larger in the original intervention group, however, with the original control group sun protection remaining elevated. Examination of the individual constituent sun protection behaviors showed an increase in use of head covering that covered the ears and face covering in the Group B at posttest 2 compared with Group A. Neck covering showed a decline from posttest 1 to posttest 2 in both groups, but again this reduction was far larger in the original intervention group than in the original control group.

Crossover Effect on Recall of Sun Protection Messages: Hypothesis 4

Hypothesis 4 predicted that more guests in Group B (the original control group) would recall a sun safety message once GSS was implemented in the second year compared with the previous year. This hypothesis was confirmed by the statistically significant interaction between experimental group (intervention, control) and time (pretest, posttest 1, posttest 2). The proportion of guests in Group B recalling a message at posttest 2 increased substantially over posttest 1 and was similar to the proportion of guests at the original intervention ski areas (Group A) who had recalled a message at posttest 1 when GSS was implemented at those areas (Table 2). A similar proportion of guests interviewed at Group A ski areas at posttest 2 recalled seeing or hearing such messages, however, which indicated that there was the potential for a carryover effect in Group A. As in the initial evaluation of GSS (Walkosz, Buller, et al., 2007) guests primarily recalled seeing a sun safety message on a poster or sign (Table 2). Just over one-third of guests in both groups recalled the GSS logo, and consistent with Hypothesis 4, there was a substantial increase in logo recall in Group B in posttest 2 over posttest 1 (Table 2).

A backward, stepwise linear regression model regressing message recall on guest and ski area characteristics was performed, and age, gender, and expertise emerged as statistically significant predictors of exposure to GSS. Message recall was higher among older than younger guests (0.35 18–25; 0.37 26–35, 0.41 36–45; 0.47 46–55; 0.45 56 or older; $F=14.28$, $p<.001$), male than female guests (0.44 male, 0.39 female; $F=8.03$, $p=.005$), and experts than beginners (0.50 experts, 0.42 intermediates, 0.31 beginners).

Association of Message Exposure With Guest Sun Protection: Hypothesis 5

In Hypothesis 5, exposure to GSS measured by message recall during periods when GSS was implemented at the ski areas (i.e., at posttest 1 for intervention group; at posttest 2 for control group) was expected to be associated with improved sun safety (i.e., sun protection, sunburning, attitudes, and self-efficacy beliefs). Thus, the three-way interaction between

experimental group (intervention, control), time (pretest, posttest 1, posttest 2), and message recall (yes, no, don't know) was examined. Table 3 presents the adjusted proportions for statistically significant three-way interactions.

Moderate support for Hypothesis 5a for sun protection was obtained. Use of sunscreen with SPF 15+ and sunscreen lip balm combined displayed the expected pattern supporting an exposure effect. Guests recalling a message at intervention ski areas reported the greatest use of these two sun protection products at posttest 1, while guests at control results reported the greatest use at posttest 2. A similar pattern was evident for sunscreen alone, except that while guests at control areas recalling a message increased sunscreen use, the proportion using it was similar to the proportion of guests at control ski areas who did not recall a sun safety message. The use of face covering also showed a pattern that may support an exposure effect. The three-way interaction on gloves and on the overall composite of sun protection measures did not show the expected message exposure effect. There was no support for Hypotheses 5b or 5c; the three-way interaction was not evident on reported sunburns or attitudes and self-efficacy beliefs regarding sun safety.

Discussion

The purpose of the present study was to replicate the evaluation of the effect of the GSS health communication program on previously untreated control group ski areas (Group B) using a quasiexperimental crossover design. The change in sun safety outcomes in Group B ski areas was compared with sun safety outcomes in the original intervention group ski areas. Message recall among guests remained high in the original intervention ski areas, suggesting that GSS continued to be influential either because its health communication was memorable from the preceding year or managers at intervention ski areas continued to use GSS materials. This diminished the potential to see a clear crossover in GSS effects, yet there were several indications that in fact GSS had positive benefits for guests at control ski areas once it was deployed.

Salient Findings

The clearest finding indicating that GSS was effective in the original control group ski areas was the support for Hypothesis 4. The number of guests recalling a sun safety message more than doubled from below 29% prior to deploying GSS to 60% following implementation of GSS in Group B. Go Sun Smart (GSS) material was not recalled by 40% of the sample, but this was true in the initial test of GSS in the original intervention group. Additionally, GSS increased some sun safety protection behaviors of guests in the original control groups by the second posttest, including using sunscreen and lip balm (combined), supporting Hypothesis 1. Unfortunately, GSS failed to decrease sunburning and failed to produce more favorable attitudes and self-efficacy beliefs.

The Effects of Exposure

Across both replications (Walkosz, Buller et al., 2007) as well as in a recent study of a community-based skin cancer prevention campaign (Dobbinson et al., 2008), exposure to GSS messages was a critical variable in its success. As Walkosz, Buller, and colleagues (2007) pointed out, the important role of message exposure is not surprising; message exposure in prevention campaigns is an essential step for modifying health behaviors. Indeed, it is a central variable in DIT (Rogers, 2003), the primary theoretical basis of the GSS campaigns. Exposure to the GSS materials in the control group ski areas, as assessed by message recall, was associated with increases in several sun protections behaviors including increased use of sunscreen, lip balm, and face covering. Increased exposure,

however, was not associated with sunburning or attitudes and self-efficacy beliefs regarding sun safety.

That program success depended on message exposure also is not surprising when one considers that guests were a secondary target population. Both in the initial evaluation and the current one, managers were instructed to promote sun safety primarily to employees, although materials for distribution at ski and snowboard schools and at chair lifts were designed most with guests in mind. Guests also spent far less time at the ski area than employees, so they had fewer opportunities to encounter GSS materials. It is understandable, then, why exposure to GSS varied considerably among guests, why 40% did not recall a message, and why GSS was effective only when messages were encountered. Improved understanding of the process of message exposure will help move the field of health communication forward (Slater, 2004).

Across both studies, signage was most influential, probably because posters, magnetic lift pole signs, and base stake signs were more observable to guests during repeated trips up the chair lift than other more employee specific program materials such as brochures, newsletters, the website, and staff training. Oral communication was least prevalent (Buller et al., 2005), undermining both the diffusion effects and the self-perception effects of the study. In addition, data from both intervention periods showed that we successfully “branded” the materials with the GSS logo, which was memorable for about one-third of guests.

Effects on Sunburning

The results of the GSS intervention for employees at ski areas (Andersen et al., 2006; Buller et al., 2005) showed significant effects of the GSS campaign on reducing sunburning. Neither the initial analysis of GSS in the original intervention group (Walkosz, Buller et al., 2007) nor the present evaluation of GSS with the original control group, however, revealed any effect on this important risk behavior. What explains this difference?

The likely reason is that guests visit ski areas for brief time periods, from half a day to a week most typically. Employees, on the other hand, work at ski areas for most of the ski season and for some employees all year around. This produces two differences between employees and guests. (1) The employees are repeatedly exposed to GSS materials during their daily routines. Our prior studies show that virtually all employees at intervention ski areas recall seeing GSS messages. In both analyses, only 60% of guests recalled GSS messages, and even guests who recalled a message did not have the redundant exposure that employees experienced. Reminders are a staple of all campaigns, including public health and political campaigns and commercial advertising. Our analyses of guests may provide support for the value of message redundancy in improving health risk behaviors. (2) Employees have much greater access to sun safety materials such as head gear and sunscreen than guests. Some guests may not bring hats or sunscreen with them to ski areas, and few guests may be willing to stop skiing or snowboarding to buy them during their intermittent visits to ski areas, even after encountering a GSS message. Employees in their work environment repeatedly see GSS messages and have opportunities over many days to obtain sun protection products to improve their sun safety behaviors. Thus, sun safety interventions in recreation environments may have the biggest potential to improve employees' sun safety. Their potential to influence guests may be highest when sun safety promotions in other community channels help prepare guests to take precautions (i.e., increase their likelihood of having hats, sunscreen, and sunglasses with them), during their infrequent visits to outdoor recreation venues.

Limitations to the Study

As noted elsewhere, there were several limitations to the evaluations of GSS (Walkosz, Buller et al., 2007). Implementation varied across ski areas, due to differences in organizational environment and cooperating managers' motivation. Our analyses described the effectiveness of GSS with guests under normal, not ideal, organizational conditions. Health communication field studies are not entirely under the researchers' control but are realistic because they approximate conditions in all large-scale health communication campaigns when deployed by industry personnel. Relatedly, GSS may not have ceased in some of the original intervention ski areas (Group A) during the following winter season when we deployed it in the original control ski areas (Group B), reducing the observed differences between experimental groups in the crossover design. Other limitations inherent to the methods of this study were related to the length of the survey (4-minute survey length may have produced fewer interviews with beginners who used very short lifts), location of the participating ski areas in western North America (potentially affecting generalizability), and self-report measures (which are open to demand and social desirability effects, although several sun protection behaviors were assessed through direct observation). Finally, the internal analysis that showed that guests who recalled GSS sun safety measures were more likely to engage in sun safety behavior was a post hoc finding not part of the original experiment procedure, which did not show such an effect.

Summary

Across five analyses, GSS has demonstrated the potential of theory-based health communication to influence sun protection in a winter outdoor recreation environment for employees and guests, and for children at ski and snowboard schools. This positive effect occurred over and above the effects of existing knowledge of risk factors for skin cancer and commercial messages selling sun protection products (e.g., advertising for sunscreen, sunscreen lip balm, and sunglasses). Theory-driven health communication is needed to motivate large proportions of adults to engage in sun safety behaviors and avoid sunburning. The success of GSS at ski areas is consistent with promotions in other recreation environments (Mayer et al., 2001) and further reinforces recent recommendations that sun safety promotions in recreational environments are an intervention with sufficient evidence of success to make them worthy of use at the community level (Centers for Disease Control and Prevention, 2003). While outdoor recreation has considerable physical and mental benefits, analyses of the 2005 National Health Interview Survey showed that physical activity, particularly by young people but also by those over 65, increased skin cancer risk behaviors (Coups, Manne, Meropol, & Weinberg, 2007). Outdoor recreation enthusiasts need to be repeatedly reminded of the importance of sun protection during pursuit of these healthy activities.

Acknowledgments

The authors thank the guests, managers, and employees at Alpine Meadows Ski Resort, Alta Ski Area, Alyeska Resort, Arapahoe Basin Ski Area, Aspen Skiing Company, Beaver Creek Resort, Big Mountain Resort, Bogus Basin Mountain Resort, Breckenridge Ski Resort, Deer Valley Resort, Durango Mountain Resort, Heavenly Ski Resort, Homewood Mountain Resort, Keystone Resort, Loveland Ski Area, Vail, Mammoth Mountain, Mt. Bachelor, Mt. Rose–Ski Tahoe, Northstar-at-Tahoe, Powder Mountain Winter Resort, Sierra-at-Tahoe Snowsport Resort, Ski Santa Fe, Tahoe Donner Association, Taos Ski Valley Resort, Timberline Lodge Ski Area, Whistler/Blackcomb Mountains, and Winter Park Resort for participating in this project. The authors also extend appreciation to the National Ski Areas Association, National Ski Patrol, Professional Ski Instructors of America, and American Association of Snowboard Instructors for their support. This project was funded by a grant from the National Cancer Institute (CA81028). The design, conduct of the study, interpretation of the data, and preparation, review, and approval of the article was performed solely by the authors.

References

- American Cancer Society. Cancer facts and figures. Author; Atlanta, GA: 2007.
- Andersen, PA.; Buller, DB.; Voeks, JH.; Walkosz, BJ.; Scott, MD.; Cutter, GR. Testing the long term effects of the Go Sun Smart worksite sun protection program: A group-randomized experimental study. Paper presented at the annual meeting of the International Communication Association; Dresden, Germany. Jun. 2006
- Bandura, A. Social foundations of thought and action: A social cognitive theory. Prentice-Hall; Englewood Cliffs, NJ: 1986.
- Bem, DJ. Self-perception theory. In: Berkowitz, L., editor. Advances in experimental social psychology. Vol. vol. 6. Academic Press; New York: 1972. p. 1-62.
- Blumthaler M, Ambach W. Human ultraviolet radiant exposure in high mountains. Atmospheric Environment 1988;22:749–753.
- Brandberg Y, Sjoden P, Rosdahl I. Assessment of sun-related behavior individuals with dysplastic naevus syndrome: A comparison between dairy recordings and questionnaire responses. Melanoma Research 1997;7:347–351. [PubMed: 9293486]
- Buller DB, Andersen PA, Walkosz B. Sun safety behaviours of alpine skiers and snowboarders in the western United States. Cancer Prevention & Control 1998;2:133–139. [PubMed: 10093624]
- Buller DB, Andersen PA, Walkosz BJ, Scott MD, Cutter GR, Dignan MB, et al. Randomized trial testing a worksite sun protection program in an outdoor recreation industry. Health Education & Behavior 2005;32:514–535. [PubMed: 16009748]
- Campbell, DT.; Stanley, JC. Experimental and quasi-experimental designs for research. Rand McNally; Chicago, IL: 1966.
- Centers for Disease Control and Prevention. Preventing skin cancer: Findings from the Task Force on Community Preventive Services on reducing exposure to ultraviolet light and counseling to prevent skin cancer: Recommendations and rational of the U.S. Preventive Services Task Force. Morbidity and Mortality Weekly Report 2003;52:1–17.
- Checkoway H, Pearce N, Kriebel D. Selecting appropriate study designs to address specific research questions in occupational epidemiology. Occupational and Environmental Medicine 2007;64:633–638. [PubMed: 17704203]
- Coups EJ, Manne SL, Meropol NJ, Weinberg DS. Multiple behavioral risk factors for colorectal cancer and colorectal cancer screening status. Cancer Epidemiology, Biomarkers and Prevention 2007;16:510–516.
- Dearing, J.; Rogers, E. Agenda setting. Sage; Newbury Park, CA: 1996.
- Dietrich AJ, Olson AL, Sox CH, Stevens M, Tosteson TD, Ahles T, et al. A community-based randomized trial encouraging sun protection for children. Pediatrics 1998;102:E64. [PubMed: 9832592]
- Dobbinson SJ, Wakefield MA, Jamsen KM, Herd NL, Spittal MJ, Lipscomb JE, et al. Weekend Sun Protection and Sunburn in Australia Trends (1987–2002) and Association with SunSmart Television Advertising. American Journal of Preventive Medicine 2008;34:94–101. [PubMed: 18201638]
- Donohew L, Lorch EP, Palmgreen P. Applications of a theoretic model of information exposure to health interventions. Human Communication Research 1998;24:454–468. [PubMed: 12293438]
- Frey, LR.; Botan, CH.; Friedman, PG.; Kreps, GL. Investigating communication: An introduction to research methods. Prentice-Hall; Englewood Cliffs, NJ: 1991.
- Glanz K, Buller DB, Saraiya M. Reducing ultraviolet radiation exposure among outdoor workers: State of the evidence and recommendations. Environmental Health 2007;6:22. [PubMed: 17686155]
- Glanz K, Geller AC, Shigaki D, Maddock JE, Isneq MR. A randomized trial of skin cancer prevention in aquatics settings: The Pool Cool program. Health Psychology 2002;21:579–587. [PubMed: 12433010]
- Glanz K, Lew RA, Song V, Murakami-Akatsuka L. Skin cancer prevention in outdoor recreation settings: Effects of the Hawaii SunSmart Program. Effective Clinical Practice 2000;3:53–61. [PubMed: 10915324]

- Glanz K, Maddock JE, Lew RA, Murakami-Akatsuka L. A randomized trial of the Hawaii SunSmart program's impact on outdoor recreation staff. *Journal of the American Academy of Dermatology* 2001;44:973–978. [PubMed: 11369909]
- Kahn HS, Tatham LM, Patel AV, Thun MJ, Heath CW Jr. Increased cancer mortality following a history of nonmelanoma skin cancer. *Journal of the American Medical Association* 1998;280:910–912. [PubMed: 9739976]
- Karagas MR, Stukel TA, Greenberg ER, Baron JA, Mott LA, Stern RS. Risk of subsequent basal cell carcinoma and squamous cell carcinoma of the skin among patients with prior skin cancer. *Skin Cancer Prevention Study Group. Journal of the American Medical Association* 1992;267:3305–3310. [PubMed: 1597912]
- Laird N, Ware H. Random-effects models for longitudinal data. *Biometrics* 1982;38:963–974. [PubMed: 7168798]
- Lovato C, Shoveller J, Peters L, Rivers J. Canadian national survey on sun exposure and protective habits. *Cancer Prevention and Control* 1998;2:128.
- Lustig, MW.; Andersen, PA. Generalizing about communication apprehension and avoidance: Multiple replications and meta-analyses. In: Neuliep, JW., editor. *Handbook of replication research in the behavioral and social sciences*. Select Press; San Francisco, CA: 1990.
- Mayer JA, Lewis EC, Eckhardt L, Slymen D, Belch G, Elder J, et al. Promoting sun safety among zoo visitors. *Preventive Medicine* 2001;33:162–169. [PubMed: 11522156]
- Mayer JA, Slymen DJ, Clapp EJ, Pichon LC, Eckhardt L, Eichenfield LF, et al. Promoting sun safety among U.S. Postal Service letter carriers: Impact of a 2-year intervention. *American Journal of Public Health* 2007;97:559–565. [PubMed: 17267715]
- Murray, D. *Design and analysis of group-randomized trials*. Oxford University Press; New York: 1998.
- Neuliep, JW. *Handbook of replication research in the behavioral and social sciences*. Select Press; San Francisco, CA: 1990.
- Olson AL, Gaffney C, Starr P, Gibson JJ, Cole BF, Dietrich AJ. SunSafe in the middle school years: A community-wide intervention to change early-adolescent sun protection. *Pediatrics* 2007;119:e247–e256. [PubMed: 17200250]
- Raudenbusch, S.; Bryk, S. *Hierarchical linear models: Applications and data analysis methods*. 2nd ed. Sage; Thousand Oaks, CA: 2002.
- Reiter R, Munzert K, Sladovic R. Results of 5-year concurrent recordings of global, diffuse, and UV radiation at three levels in the Northern Alps. *Meteorology and Atmospheric Physics* 1982;30:1–28.
- Rogers, EM. *Diffusion of innovations*. 5th ed. Free Press; New York: 2003.
- Rosenberg CA, Greenland P, Khandekar J, Loar A, Ascensao J, Lopez AM. Association of nonmelanoma skin cancer with second malignancy. *Cancer* 2004;100:130–138. [PubMed: 14692033]
- SAS Institute, Inc.. *Statistical analysis system*. Author; Cary, NC: 2002.
- Shoveller JA, Lovato CY. Measuring self-reported sunburn: Challenges and recommendations. *Chronic Diseases in Canada* 2001;22:83–98. [PubMed: 11779421]
- Slater MD. Operationalizing and analyzing exposure: The foundation of media effects research. *Journalism Mass Communication Quarterly* 2004;81:168–183.
- Stone, JS. *Conducting clinical research: A practical guide*. Mountainside Press; Cumberland, MD: 2006.
- United States Department of Agriculture (USDA) Forest Service. 1999–2000 National Survey on Recreation and the Environment. Author; Washington, DC: 2001.
- Van de Mei I, Blizzard L, Ponsonby A-L, Dwyer T. Validity and reliability of adult recall of past sun exposure in a case-control study of multiple sclerosis. *Cancer Epidemiology, Biomarkers and Prevention* 2006;15:1538–1544.
- Walkosz, BJ.; Buller, DB.; Andersen, PA.; Scott, MD.; Dignan, M.; Cutter, GR., et al. Increasing sun protection in outdoor recreation: A theory-based health communication program. Paper presented at the annual meeting of the International Communication Association; San Francisco, CA. 2007.

- Walkosz B, Voeks J, Andersen P, Scott M, Buller D, Cutter G, et al. Randomized trial on sun safety education at ski and snowboard schools in western North America. *Pediatric Dermatology* 2007;24:222–229. [PubMed: 17542868]
- Weinstock MA. Assessment of sun sensitivity by questionnaire: Validity of items and formulation of a prediction rule. *Journal of Clinical Epidemiology* 1992;45:547–552. [PubMed: 1588360]
- Winett RA, Cleaveland BL, Tate DF, Lombard DN, Lombard TN, Russ CR, et al. The effects of the sun-safe program on patrons' and lifeguards' skin cancer risk-reduction behaviors at swimming pools. *Journal of Health Psychology* 1997;2:85–95.
- Witte K. Putting the fear back in fear appeals: The extended parallel process model. *Communication Monographs* 1992;59:329–349.

Table 1

Profile of the guests who completed the interview

	Baseline 2001	Posttest 1 2002	Posttest 2 2003
Sex			
Male	71.8	72.9	72.8
Race & ethnicity			
White	96.0	95.4	94.6
Hispanic *	2.5	4.2	4.1
Education *			
High school or less	9.3	9.7	9.7
Some college	24.3	21.3	19.1
College degree	66.4	69.0	71.1
Age *			
18–25	15.5	16.4	17.0
26–35	25.6	24.2	23.4
36–45	28.0	27.0	24.4
46–55	19.3	18.5	20.3
Over 55	11.6	13.9	14.8
Type of equipment			
Skier	80.0	78.9	79.5
Snowboarder	19.8	21.0	20.4
Other	0.2	0.1	0.1
Expertise *			
Beginners	6.2	5.2	6.5
Intermediates	57.4	52.8	51.4
Experts	36.4	42.0	42.1
Type of guest *			
Destination	44.9	43.1	34.3
Days skied/snowboarded			
0–1 days	14.4	13.3	16.2
2–5 days	33.6	33.3	31.4
6–14 days	26.3	26.7	26.1
15–100 days	25.7	26.7	21.4
Location of ski area *			
Rocky Mountains	34.1	36.1	38.6
California	30.9	30.4	31.8
Pacific Northwest	25.9	24.5	20.9
Southwest	9.1	9.0	8.7
Cloud cover *			
Clear	44.4	44.0	38.1
Partly cloudy	27.7	24.6	30.9

	Baseline 2001	Posttest 1 2002	Posttest 2 2003
Cloudy	27.9	31.4	31.0
Winds *			
Calm winds	54.0	50.5	51.2
Light winds	29.5	31.4	35.4
Moderate/strong winds	16.5	18.1	13.4
Precipitation *			
None	75.6	71.8	69.5
Flurries/light snow	17.4	20.1	22.1
Heavy snow	6.8	7.4	5.9
Other	0.2	0.7	2.5

*
 $p < 0.05$.

Table 2

Interaction between experimental group (intervention v. control) and interview (pretest v. posttest 1 v. posttest 2) on sunburning, sun protection, and beliefs about sun safety.^a

Reported outcome	Pretest	Posttest 1	Posttest 2	F	p
Sunburned while skiing/snowboarding this winter					
Control	0.09	0.11	0.09	2.03	0.131
Intervention	0.08	0.08	0.10		
Sun Protection Behaviors					
Use of sunscreen with SPF 15+					
Control	0.50	0.51	0.51	0.37	0.693
Intervention	0.48	0.51	0.53		
Use of lip balm with SPF 15+					
Control	0.38	0.38	0.39	0.31	0.734
Intervention	0.39	0.41	0.41		
Composite of use of sunscreen and lip balm with SPF 15+					
Control	0.86	0.90	0.90	0.19	0.824
Intervention	0.86	0.93	0.91		
Wearing goggles/sunglasses					
Control	0.92	0.94	0.93	1.11	0.329
Intervention	0.92	0.94	0.91		
Wearing gloves					
Control	0.97	0.94	0.92	2.85	0.058
Intervention	0.98	0.93	0.90		
Wearing neck covering					
Control	0.62	0.47	0.42	3.57	0.028
Intervention	0.61	0.48	0.33		
Wearing face covering					
Control	0.08	0.10	0.12	7.71	<0.001
Intervention	0.10	0.11	0.04		
Wearing head covering (e.g., hat/helmet)					
Control	0.85	0.94	0.90	1.88	0.153
Intervention	0.88	0.93	0.89		

Reported outcome	Pretest	Posttest 1	Posttest 2	F	p
Wearing head covering with brim					
Control	0.18	0.11	0.11	1.04	0.355
Intervention	0.24	0.12	0.13		
Wearing head covering covering ears					
Control	0.82	0.86	0.90	4.17	0.016
Intervention	0.82	0.82	0.81		
Composite sun protection behaviors ^b					
Control	4.31	4.30	4.18	4.42	0.012
Intervention	4.38	4.33	3.96		
Reapplied sunscreen					
Control	0.15	0.12	0.14	0.90	0.407
Intervention	0.09	0.11	0.12		
Self-efficacy for practicing sun safety while skiing or snowboarding ^c					
Control	4.32	4.28	4.39	0.05	0.953
Intervention	4.33	4.28	4.41		
Importance of skin cancer as a health concern ^c					
Control	4.26	4.11	4.11	1.43	0.238
Intervention	4.29	4.10	4.19		
Recalled seeing or hearing a message about protecting skin and eyes from the sun					
Control	0.29	0.38	0.60	17.29	<0.001
Intervention	0.35	0.60	0.62		
Recalled seeing message on a poster or sign					
Control	0.25	0.29	0.58	73.81	<0.001
Intervention	0.29	0.56	0.53		
Recalled reading a message in brochure or trail map					
Control	0.08	0.07	0.08	0.15	0.865
Intervention	0.08	0.07	0.09		
Recalled Go Sun Smart logo ^d					
Control	–	0.07	0.38	188.29	<0.001
Intervention	–	0.37	0.34		
Recalled message being told by employee					

^aProportions and statistical tests adjusted for clustering within ski areas, pair matching, and significant covariates (determined through backward, stepwise elimination).

^bMean count of number of reported sun protection behaviors, not including reapplying sunscreen.

^cMean ratings on 1=strongly disagree to 5=strongly agree scales.

^dRecall of logo was measured only at posttest 1 and posttest 2; logo did not exist at pretest.

Reported outcome	Pretest	Posttest 1	Posttest 2	F	p
Control	0.17	0.16	0.16	1.16	0.313
Intervention	0.14	0.15	0.02		

Table 3

Interaction between experimental group (intervention v. control), sun safety message recall (recalled v. not recalled), and interview (pretest v. posttest 1 v. posttest 2) on sunburning, sun protection, and beliefs about sun safety^a

Reported Outcome	Pretest	Posttest 1	Posttest 2	F	p
Sunburned while skiing/snowboarding this winter					
Control					
No message	0.09	0.10	0.08	1.68	0.108
Message	0.11	0.11	0.10		
Intervention					
No message	0.08	0.09	0.12		
Message	0.07	0.08	0.10		
<i>Sun Protection Behaviors</i>					
Use of sunscreen with SPF 15+					
Control					
No message	0.52	0.52	0.51	2.51	0.014
Message	0.47	0.50	0.51		
Intervention					
No message	0.50	0.47	0.50		
Message	0.433	0.54	0.56		
Use of lip balm with SPF 15+					
Control					
No message	0.38	0.38	0.34	0.83	0.561
Message	0.38	0.41	0.41		
Intervention					
No message	0.38	0.37	0.37		
Message	0.40	0.45	0.45		
Composite of use of sunscreen and lip balm with SPF 15+					
Control					
No message	0.88	0.90	0.86	2.58	0.012
Message	0.83	0.90	0.93		
Intervention					
No message	0.88	0.82	0.85		

Reported Outcome	Pretest	Posttest 1	Posttest 2	F	p
Message	0.81	1.00	0.95		
Wearing goggles/sunglasses					
Control					
No message	0.92	0.94	0.96	1.65	0.116
Message	0.94	0.93	0.92		
Intervention					
No message	0.92	0.93	0.92		
Message	0.91	0.94	0.90		
Wearing gloves					
Control					
No message	0.97	0.93	0.93	2.44	0.017
Message	0.97	0.96	0.91		
Intervention					
No message	0.99	0.92	0.89		
Message	0.98	0.93	0.89		
Wearing neck covering					
Control					
No message	0.66	0.48	0.42	1.75	0.094
Message	0.54	0.44	0.42		
Intervention					
No message	0.63	0.49	0.35		
Message	0.58	0.48	0.32		
Wearing face covering					
Control					
No message	0.08	0.09	0.11	2.58	0.012
Message	0.06	0.11	0.12		
Intervention					
No message	0.10	0.10	0.05		
Message	0.09	0.12	0.04		
Wearing head covering (e.g., hat/helmet)					
Control					

Reported Outcome	Pretest	Posttest 1	Posttest 2	F	p
No message	0.87	0.95	0.91	0.75	0.629
Message	0.82	0.93	0.89		
Intervention					
No message	0.88	0.94	0.90		
Message	0.88	0.92	0.88		
Wearing head covering with brim					
Control					
No message	0.20	0.11	0.09	1.30	0.248
Message	0.15	0.12	0.12		
Intervention					
No message	0.24	0.12	0.09		
Message	0.22	0.13	0.16		
Wearing head covering covering ears					
Control					
No message	0.91	0.86	0.92	2.23	0.030
Message	0.86	0.84	0.90		
Intervention					
No message	0.85	0.85	0.88		
Message	0.88	0.81	0.78		
Composite sun protection behaviors ^b					
Control					
No message	4.37	4.30	4.20	3.13	0.003
Message	4.18	4.30	4.17		
Intervention					
No message	4.44	4.23	3.96		
Message	4.25	4.40	3.96		
Reapplied sunscreen					
Control					
No message	0.14	0.13	0.15	0.57	0.781
Message	0.17	0.12	0.13		
Intervention					

Reported Outcome	Pretest	Posttest 1	Posttest 2	F	p
No message	0.08	0.11	0.10		
Message	0.10	0.11	0.14		
Self-efficacy for practicing sun safety while skiing or snowboarding ^c					
Control					
No message	4.31	4.22	4.38	1.54	0.148
Message	4.32	4.37	4.39		
Intervention					
No message	4.29	4.24	4.36		
Message	4.36	4.31	4.43		
Importance of skin cancer as a health concern ^c					
Control					
No message	4.27	4.09	4.05	1.14	0.333
Message	4.22	4.14	4.15		
Intervention					
No message	4.27	4.06	4.16		
Message	4.31	4.12	4.21		

^aProportions and statistical tests adjusted for clustering within ski areas, pair matching, and significant covariates (determined through backward, stepwise elimination).

^bMean count of number of reported sun protection behaviors, not including reapplying sunscreen.

^cMean ratings on 1=strongly disagree to 5=strongly agree scales.