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Dissemination of Go Sun Smart in Outdoor Recreation: Effect of Program Exposure on Sun Protection of Guests at High Altitude Ski Areas

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Abstract

Go Sun Smart (GSS) is a theory-based health communication program designed to influence sun protection behaviors of employees and guests at high altitude ski areas to reduce skin cancer risk. The effects of GSS, in a Phase IV dissemination randomized posttest-only trial, upon sun protection behaviors of ski area guests are reported. Program use was assessed by on-site observation and guest message exposure and sun protection was measured in intercept surveys at ski areas. Dissemination strategy, enhanced versus basic, was not significantly related to sun safety practices. Additional analyses examined the relationship of message exposure to guests' sun safety practices. Ski areas displaying at least 6 GSS materials in guest-only areas and 9 GSS materials throughout the area increased guests' message exposure. Higher message exposure within the high-use ski areas was associated with improved sun protection by guests but not in the low-use ski areas. The importance of program implementation and message exposure on the success of evidence-based health communication efforts applied industry-wide are underscored.

Health communication programs have the capacity to motivate individuals to adopt recommended prevention-related behaviors (Atkin & Wallack, 1990; Backer, Rogers, & Sopory, 1992; Hornik, 2002; Maibach & Parrot, 1995). Given the high prevalence of skin cancers, prevention programs have been identified as a national priority (Centers for Disease Control and Prevention, 2002). Non-melanoma skin cancers (NMSC) are the most common cancers in the United States (American Cancer Society, 2012); melanoma can be fatal (American Cancer Society, 2012); and basal cell carcinoma is associated with an increased risk of cancer at other sites (Karagas, Stuckel, Greenberg, Baron, Mott, & Stern, 1992; Rosenberg, Greenland, Khandekar, Loar, Ascensoa, & Lopez, 2004). Excessive exposure to ultraviolet radiation (UVR) is the primary risk factor for skin cancer. This risk can be decreased significantly with sun safety practices (American Cancer Society, 2009; Centers for Disease Control and Prevention, 2002).

This manuscript reports the effectiveness of *Go Sun Smart* (GSS) when distributed throughout a North American ski industry. GSS, based on Diffusion of Innovation Theory, was a health communication program design to improve sun safety behaviors by guests who ski and snowboard at high-elevation ski areas. Guided by key principles of DIT, we examine how organizations adopt and implement an innovation like GSS; understanding these processes is critical as organizational-level adoption often precedes and is necessary for individual-level behavior change (Rogers, 2003).

Effectiveness of Sun Protection Programs in Recreation Setting

The continued growth of the outdoor recreation and leisure industry (U.S. Bureau of Labor Statistics, 2012) has focused attention on its social and health benefits. It was estimated that between 1999 and 2003, 98% of all U.S. residents over age 16 participated in at least one outdoor recreation activity annually, including 36 million who participated in downhill skiing, snowboarding or cross country skiing (USDA Forest Service, 2004). Unfortunately, intermittent, severe sun exposure and low levels of sun protection occur during many recreation and leisure activities (Dozier & Wagner, 1997; Gallagher, McClean, & Yang 1990; Kricker, Armstrong, English, & Heenan, 1995; Newmann, Agro, Woodruff, & Mayer 1996; Ting, 2003; Winett et al., 1997) and few outdoor recreation organizations promote sun safety (Dozier & Wagner, 1997; Rosenberg, Mayer, & Eckhardt 1997). Environmental features of ski areas such as altitude increases and climatic conditions elevate UVR (Blumthaler & Ambach, 1988; Reiter, Munzert, & Sladvoic, 1982) and risk for damaging sun exposure. Further, many skiers and snowboarders have skin phenotypes that are at elevated risk for UVR-induced skin damage (i.e., fair skin, light eyes, red or blond hair, and sensitive skin) (Rodenas, Delgado-Rodriguez, Tercedor, & Serrano, 1996; Weinstock, 1992), do not take adequate sun precautions, and experience sunburns (Authors, 1998). Fortunately, there is emerging evidence that health communication campaigns can influence people to take precautions against excessive sun exposure, particularly in recreational settings (Authors, 2008; Detweiler, Bedell, Salovey, Pronon, & Rothman, 1999; Glanz, Lew, Song, & Murakami-Akatsuka, 2000; Mayer et al., 2001; Winett et al., 1997; Weinstock, Rossi, Redding, & Maddock, 2002).

The Go Sun Smart Program

Go Sun Smart (GSS) is an occupational sun protection program developed in collaboration with the North American ski industry intended to prevent their employees from receiving high doses of UVR. Promotional communication also reaches guests within these outdoor recreation venues. In a randomized controlled effectiveness trial, GSS' multi-channel health communication program had beneficial effects on guests while they were skiing and snowboarding, including children enrolled in ski and snowboard schools (Authors, 2007, Authors, 2008) as well as on employees (Authors, 2005). With the success of GSS established, the National Ski Areas Association (NSAA) distributed GSS to its entire membership of over 350 North American ski areas. A randomized trial was conducted to evaluate the NSAA-sponsored dissemination in comparison to strategies designed to enhance use of GSS based primarily on diffusion of innovation theory (DIT) (Authors, 2010; Rogers, 2003).

Theoretical Basis of the Go Sun Smart Program

GSS and its dissemination strategies were guided by DIT (Rogers, 2003). DIT not only details the steps in individual behavior change but also explains how organizations adopt innovations such as on-mountain sun safety programs. The organizational diffusion process is more complicated than the individual adoption process (Rogers, 2003); for example, organizational diffusion is influenced by characteristics of managers and employees, organizational structure, and political culture in organizations (Rogers, 2003).

Two dissemination strategies were compared and tested in the current trial. First, the "Basic Dissemination Strategy" (BDS) was comprised of normal actions taken by NSAA to distribute safety programs to its members. BDS was used to distribute GSS to all member ski areas and served as the comparison condition. The second, "Enhanced Dissemination Strategy" (EDS), augmented the BDS with largely face-to-face contact between GSS project staff and ski areas' senior managers.

Implementation fidelity was essential to achieve the benefits of GSS witnessed in the effectiveness trial as the analyses in that trial showed a clear exposure (i.e., dose-response) effect. Guests (and employees) at ski areas implementing more program materials improved their sun safety (Authors, 2005). However, high implementation fidelity can be challenging during industry-wide dissemination. According to DIT, organizations often engage in redefining or re-inventing the evidence-based program to fit the organization (or changing the organization to improve fit), need to clarify and communicate changes created by such programs to employees, and take steps to routinize an innovation (i.e., becomes part of organization's regular activities or stages) (Dutton & Ashford, 1993; Dutton, Ashford, O'Neill, & Lawrence, 2001; McCormick & Tompkins, 1998; Scheirer, 1990) when implementing workplace innovations. Loosely-bundled programs like GSS give wide discretion to managers regarding the extent of program use and many managers may feel the need to change or re-invent the program to address perceived organizational needs or adapt to organizational culture and complexities (Douthwaite, Keatinge, & Park, 2002; Fennel, 1984; Rice & Rogers, 1980; Whitten, 1997).

The results of these processes determine whether a program such as GSS reaches and influences at risk individuals (Glasgow, Vogt, & Boles, 1999). Another factor for program success includes the need to take the necessary steps to insure that audiences have adequate and sufficient exposure to program messages (Hornik & Kelly, 2007; Hornik & Yanovitzky, 2003; Wakefield, Loken, & Hornik, 2010). The role of high message exposure in effective nutrition education programs (Hornick & Kelly, 2007) and an exposure-response relationship in the Center for Disease Control's VERB campaign (Huhman et al., 2007) demonstrate the relevance of this factor in campaign design and implementation. The analyses reported in this paper explored whether use of GSS by ski areas achieved through the two dissemination strategies would reach guests with sun safety communication and produce improvements in their sun protection. For the evaluation, it was hypothesized that:

H1: Guests at ski areas assigned to the EDS condition are (a) more likely to be exposed to GSS and (b) engage in more sun protection than guests at ski areas assigned to the BDS.

H2: Guests with more exposure to sun safety messages will engage in more sun protection.

RQ1: What is the optimal amount of GSS program use needed to have a positive impact on guests' exposure to sun safety messages?

Methods

Participants

A total of 3,380 adult guests at 61 U.S. and Canadian ski areas were interviewed on chairlifts in three ski seasons (2003-2004, 2004-2005, 2005-2006). Overall, 3,502 individuals were initially approached and 97 were ineligible (14 previously interviewed, 34 under the age of 18, 44 ski area employees, and 5 non-English speakers). Thus the completion rate among eligible guests ($n=3,405$) was 99.3% (0.7% refused [$n=25$]).

Study Procedures

Ski areas and their guests were enrolled in a group-randomized posttest-only two-group design, with ski areas as the unit of randomization. The BDS began in May 2004 at the annual NSAA conference, where the NSAA President announced GSS as NSAA's newest partner program. Project staff presented the program at annual national and mid-year regional tradeshows and a selection of free program materials were mailed to the entire NSAA membership during the 2004-05, 2005-06, and 2006-07 ski seasons (two packs per season). All ski areas received the BDS.

In 2004, 2005, and 2006, project staff contacted and recruited 69 ski areas in three waves ($n=28$ in 2004, $n=20$ in 2005, and $n=21$ in 2006) to participate in an evaluation of the two dissemination strategies. Half of the ski areas in each wave were randomly assigned to the EDS ($n=12$ in 2004, $n=11$ in 2005, and $n=10$ in 2006), which began in November and ended in April, when the ski areas closed for the season. The remaining ski areas received GSS through just the BDS. Both on-site observations of GSS use and surveys of guests were performed by project staff in the ski season when the ski areas were recruited to the study.

Analysis of the effects of dissemination strategy on program use was reported elsewhere (Authors, 2012a, 2012b).

A posttest-only design was implemented to control costs yet maintain a strong experimental design. Ski areas in the control condition in the earlier trial testing the effectiveness of GSS (Authors, 2005) communicated only rarely about sun safety with guests and visits to ski areas prior to this project re-confirmed this limited communication. Thus, a pretest was unlikely to show much variation in pre-existing communication so a within-subjects design offered little statistical advantage. Instead, we devoted project resources to enrolling and assessing a large sample of ski areas and used randomization to control potential confounders. Randomized posttest-only designs avoid several threats to internal validity including testing, history, maturation, instrumentation, mortality, regression, selection-mortality, and selection-testing and group-randomization at the level of ski areas reduced the possibility of contamination in the test of Hypothesis 1 (Shadish, Cook, & Campbell, 2002). Table 1 demonstrates that no significant differences in demographics, except for age, existed between conditions further supporting the use of randomization in the post-test only design as a control for confounding variables. In fact, the age trends actually work against finding an increase in sun protection in the Enhanced group as younger guests should be less likely to take precautions and are more prevalent in Enhanced group.

Still, the goal of this study was to evaluate two dissemination strategies, so there was no untreated control group, weakening the tests of Hypothesis 2. We had to assume that randomization equalized the groups on confounders that might increase sun protection apart from GSS (e.g., skin type, interest in sun protection, personal and family history of skin cancer, age, education) and examined differences in message exposure for indications of the potential of GSS to influence guests.

Dissemination Strategies

The BDS was developed from the existing strategies utilized by the NSAA for introducing and distributing other safety and educational programs to ski areas. It included informational booths at NSAA trade shows and mailings of free program materials (e.g., posters, brochures, lift pole magnets) to all ski areas that were members of NSAA. Ski areas also received the GSS Guidebook; a catalog with program materials; informational tip sheets based on DIT principles designed to provide guidance for implementation, address barriers (labeled “misconceptions”), show testimonials and evidence of success, and emphasize the importance of leadership roles in implementing GSS (labeled “leadership principles”); and letters from the President of NSAA and the project's Principal Investigator supporting the GSS program.

The EDS was based on principles of organizational innovation from DIT (Rogers, 2003) and our prior experience implementing GSS in the effectiveness trial, and literature on program implementation (Authors, 2010). Personal contact was made with ski area senior managers with the aim of motivating them to use GSS, gaining public commitment to use it, and supporting its use. In DIT, organizational diffusion has two processes: adoption and implementation. Adoption includes agenda setting processes (making organizations aware of problem and providing an innovative solution), matching (evaluating the problem and the fit

of the innovation for the organization) and the adoption decision. Following adoption, organization often restructure and redefine innovations to ensure fit with the organization, clarifying changes through communication to employees, and routinize the innovation, making it part of the organizational structure. Based on these principles, project staff visited each ski area during November and December and met with the manager most responsible for GSS and senior-most manager, presented GSS to other key managers, and spoke one-on-one about GSS with managers as requested to promote program adoption obtain managers' commitment to use it, and help them plan implementation. Project staff described the need for occupational sun safety, reviewed GSS, discussed ways of implementing it, discussed common barriers to its use, distributed the guidebook and catalog, provided advice on how to reach different employees, and tried to identify internal champions who could assist and support GSS. Project staff also distributed GSS promotional materials to managers including hats, magnets, lip balm, and post-it notes with the program logo, which were designed to boost program use but were not measured in the observation of program implementation. After the visit, project staff made follow-up contacts with managers by email or telephone at least once a month through March to maintain program use through social support and nourishment of the interpersonal relationship.

Observation of Use of Go Sun Smart

GSS use was measured through on-site observations by trained project staff (n=18), using a protocol from the previous effectiveness trial (Authors, 2005). All printed program materials on display (i.e., 15 posters/signs, 3 brochures, 2 static clings and 1 logo magnet) and any other sun protection messages not part of GSS (e.g., commercial advertising or other sun safety messages) were recorded, as well as noting whether materials were in areas accessible only to employees (e.g., administrative offices, locker rooms, workshops, garages, etc.). The observational measure was validated in 14 ski areas by showing that observations by independent blinded observers who visited the ski areas one week before the scheduled visit were positively correlated with the main observations (Authors, 2010).

Guest Surveys

Interview Procedures—Guests were surveyed face-to-face on chair lifts. After loading the lift, interviewers first read a consent statement approved by the Institutional Review Boards at the authors' organizations. Interviewers sat at the end of the chair, if possible, and recruited guests seated immediately next to them (if seated in the middle, the person to the right). If the initial guest invited refused or was ineligible, another guest on the chair was recruited. One interview was completed per lift ride to avoid clusters. Respondents received a free sunscreen lip balm after completion. Interviewers completed 12 – 20 4-minute surveys per day, attempting to interview on all eligible chair lifts although main lifts were over-sampled.

Measures—Questions on the survey assessed sun protection (frequency of protection behaviors and prevalence of sunburn), attitudes, self-efficacy, and norms regarding sun protection, and exposure to messages on sun safety. Guests' sun protection behaviors while on the mountain were ascertained by asking them whether they were wearing sunscreen (yes, no or don't know; and if so, 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) and sunscreen lip balm (yes/no or don't know; and if so, its SPF) at that moment and recording whether they were wearing a head cover, neck cover, face cover, gloves, and sunglasses or goggles. Same-day self-reported sun protection has been validated by observation (O'Riordan, Lunde, Steffen, & Maddock, 2006) and observations of sun protection have had adequate reproducibility in previous studies (Lombard, Neubauer, Canfield, & Winnett, 1991; Milne et al., 1990; O'Riordan et al., 2006). Two unweighted summed composite sun protection behavior scores were created: (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).

Sunburning was measured by asking if guests had ever been sunburned while skiing or snowboarding (yes/no or don't know; if so, whether they had been sunburned that winter [yes/no or don't know]). Sunburn was defined as when skin was red and/or painful from exposure to the sun, not from the wind or cold (Lovato, Shoveller, Peters, & Rivers, 1998; Shoveller & Lovato, 2001). In other studies, a measure of ever sunburned showed high reproducibility (Branstrom, Kristjansson, Ullen, & Branberg, 2002; Van de Mei, Blizzard, Ponsonby, & Dwyer, 2006). Sunburn recall measures have also been validated against a diary (Brandberg, Sjoden, & Rosdahl, 1997) and erythematous UV by dosimetry (Dennis, Kim, & Lowe, 2008; Thieden, Philipsen, Sandby-Moller, & Wulf, 2005a) and data on such measures found that sunburn was less common in dark-skinned people (construct validity) (Thieden, Philipsen, Sandby-Moller, & Wulf, 2005b; Westerdahl, Ingvar, Masbach, & Olsson, 2000).

Because implementation of GSS was a key outcome of the EDS, several questions detected guests' exposure to sun safety messages at the ski area. Guests were first asked whether they recalled seeing or hearing any messages on protecting their skin, lips, or eyes from the sun while at the ski area (yes, no or don't know); if so, they reported whether it was on a poster or sign, brochure, trail map or website on the Internet. Likewise, guests were asked if they had been told by anyone at the ski area to protect their skin, lips or eye from the sun (yes, no or don't know; if so, whether by a lift operator, ski/snowboard instructor, ski patroller, or someone else). Finally, guests were shown the GSS logo and asked if they had ever seen it (yes, no or don't know; and if so, where).

Information on guest demographics and weather conditions were recorded. Guests were asked to report their age, race, Hispanic ethnicity, education, 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 that winter (since November 1), time started skiing/snowboarding that day, and home zip code (to determine region of residence). Interviewers observed guests' sex, whether they used skis or a snowboard (or other equipment) and cloud cover (sunny, partly cloudy, cloudy), wind (none, light, moderate/strong), precipitation (none, flurries/light snow, heavy snow, other), and temperature. Finally, they recorded the time and date.

Statistical Analysis

Hypothesis 1 was tested by comparing the two dissemination conditions on exposure to sun safety messages (i.e., the proportion of guests who recalled receiving a sun safety message or recognizing the GSS logo), and on sun protection behavior. Two exposure variables were evaluated: the proportion of guests who recalled receiving a sun safety message at the ski area and who recognized the GSS logo. Frequency of sun protection behavior and prevalence of sunburn were tested as sun protection outcomes.

Hypothesis 2 was tested in a multi-step procedure. First, the number of GSS messages observed in use and its relationship with message recall was examined to determine how many GSS materials needed to be implemented to achieve program exposure, using signal detection techniques in a Receiver Operator Curve (ROC) analysis procedure. The ROC analysis resulted in two groups of ski areas based on number of GSS materials in use, disregarding dissemination strategy condition; the threshold separating the group represented the level of use associated with the most change in message recall. Second, ski areas were post-stratified on this threshold into high v. low program use groups and program awareness, exposure measures and sun protection and sunburn outcomes were compared between these groups. Third, the interaction of program exposure (message recall: yes v. no/don't know) and program use (high v. low) on sun protection and sunburn outcomes was examined.

All of these analyses were conducted at the individual guest level and adjusted for clustering of guests within ski areas as assessed by the intra-class correlation (ICC). Non-zero ICCs can make tests of statistical significance too liberal (Murray, 1998). PROC MIXED in SAS was used for analyses. Alpha criterion levels were set at 0.05 (two-tailed). We included all potential covariates in the analyses that demonstrated statistically-significant bivariate correlations with the outcome measures. The year that ski areas participated in the dissemination trial (i.e., wave) was included in all analyses.

Results

Profile of the Sample

The characteristics of the guest sample are displayed in Table 1. Most guests were under age 75, with half (53.1%) between ages 35 and 54 and are predominately non-Hispanic White and male. The sample was well educated with 68.3% a college diploma or having post-graduate education. Nearly two-thirds had been sunburned while skiing or snowboarding, with 11% reporting having been sunburn in the current season. See Table 1 that demonstrates that no significant differences in demographics existed between conditions supporting the use of randomization in the post-test only design as a control for confounding variables. These characteristics were very similar to those guests enrolled in the effectiveness trial on GSS (Authors, 2008).

Hypotheses 1: Effect of Dissemination Strategy on Guests' Program Exposure and Sun Protection

Hypotheses 1 predicted that guests would have greater program exposure and practice more sun protection at ski areas receiving GSS through the EDS as opposed to the BDS. There were no statistically significant differences in program exposure (i.e., message recall or logo recognition) by dissemination strategy condition among guests (see Table 2). Overall, just under half of guests reported seeing or hearing a message on sun safety at the ski area and 1 in 6 recognized the GSS logo. Not surprisingly, there was also no difference by dissemination strategy in guests' sun protection (Table 2). Nearly all guests were wearing sunglasses/goggles, gloves, and head covering (especially hats that covered the ears). Of the remaining behaviors, sunscreen was the most commonly used but very few guests reapplied sunscreen. Sunscreen lip balm and neck covering were also used by a third of guests. Thus, Hypotheses 1 was not confirmed.

Hypothesis 2 and Research Question 1: Relationship of GSS Implementation, Program Exposure and Sun Protection Behavior

GSS implementation and program exposure—The ROC analysis on recall of sun safety messages revealed that regardless of dissemination strategy, guests' program exposure increased when ski areas displayed 6 or more GSS materials in guest-accessible areas. Over half of guests reported seeing a sun protection message at the ski areas using 6 or more GSS materials compared to ski areas using 5 or less (52% v. 40.4%, $p < .01$) and over 1 in 5 guests recognized the GSS logo at those ski areas (21.6% v. 13.6%, $p < .02$). Thus, using 6 or more GSS items was optimal for maximizing program exposure (Research Question 1). Most guests who recalled a sun safety message, reported seeing it on a poster or sign (90.1%), with far fewer being told to take precautions by ski area employees (14.1%) or seeing it on a brochure or trail map (11.2%) or on a website (6.7%). Source of the message did not differ by dissemination condition ($p > .05$) or ski area strata based on number of GSS materials in use ($p > .05$).

Program exposure and sun protection behaviors—Hypothesis 2 predicted that program exposure would be associated with increased sun protection. This hypothesis was supported by analyses showing that guests who reported being exposed to the program at any ski area (assessed by message recall or logo recognition) were more likely to reapply sunscreen, sunscreen lip balm, neck and face covering, head covering, sunscreen and sunscreen lip balm combined and all sun protection behaviors combined than those who were not exposed to the program (see Table 3). Further, program exposure had the largest impact on guests' sun protection (i.e., use of sunscreen, face covering, head covering, hats with a brim, and all sun protection behaviors combined) in ski areas implementing 6 or more GSS materials in guest accessible areas (Table 3). This interaction between program exposure and GSS implementation suggested that the presence of GSS materials was potentially responsible for beneficial effects on their sun safety, while receiving a sun protection message at a ski area using less GSS items did not produce a significant interaction between message exposure and sun safety behavior. Unfortunately, guests did not alter their sun protection behavior or report different sunburn history between the strata of ski areas based on GSS implementation (i.e., <6 or ≥ 6 items in use).

Discussion

It was hypothesized that guests at ski areas assigned to the EDS condition would be more likely to be exposed to GSS and engage in more sun protection than guests at ski areas assigned to the BDS, and guests with more exposure to sun safety messages will engage in more sun protection. We were also interested in determining the optimal amount of GSS program materials that needed to be implemented to have a positive impact on guests' exposure to sun safety messages.

Our first hypothesis was not confirmed. It appears that both industry distribution in BDS and the added efforts by our project in the EDS did not produce enough implementation to reach guests, despite a higher mean number of GSS materials used in the EDS ski areas. (Authors, 2012). Several factors may explain this failure. First, GSS was pitched to managers as primarily designed for employees, and secondarily for guests. When initially created, organizational risk management needs for employees were most important to managers, given season-long concerns for employee safety and workers compensation and health insurance costs. Thus, some ski areas may have directed more GSS communication to employees than guests. Second, many guests were transient short-term visitors to the ski areas and encountered GSS materials only briefly. Third, the preparation, gear, weather conditions, and resort processes (e.g., parking, lift lines, base facilities, etc.) that must be negotiated at ski areas by guests may be novel and presented distractions that interfere with guests' ability to process GSS messages. Fourth, there was high variability in program implementation existed in both conditions, which may have reduced the impact on guests further if some efforts were directed more to employees, guest visits were brief, or guests were distracted. Finally, some guests may be resistant to sun protection advice because on vacation, they are disinhibited and take more risks or avoid careful planning in favor of more spontaneity (Ragsdale, Difranceisco, & Pinkerton, 2006; Tutenges & Hesse, 2008). Even in our earlier randomized trial evaluating GSS' effectiveness where more effort was devoted to ensuring implementation, the program's effect was smaller on guests than employees (Authors, 2005; 2008). Managers might be convinced to devote more energy to reaching guests by altering the dissemination strategies. However, additional methods for communicating with guests may be needed, say delivering pre-arrival messages to pack sun protective items (e.g., sunscreen), placing sun protection reminders in lodging, providing free sunscreen along with GSS messages, and incorporating sun safety messages in argument formats such as narratives to overcome resistance (Green & Brock, 2000, Green & Brock, 2002, Peterson & Lambert, 2003).

However, Hypothesis 2 was confirmed in that implementation of more GSS materials increased guests reported exposure (i.e., recall) to sun protection messages and implementation levels associated with higher message exposure were associated with greater sun safety. We conclude that GSS was able to improve guest sun protection, as in the effectiveness trial (Authors, 2008). These implementation – exposure – behavior relationship confirms theoretical principles of DIT and RE-AIM that effectiveness is determined not just by managers' decisions to adopt a program but more importantly by the fidelity with which they use it (Glasgow, Vogt, & Boles, 1999; Rogers, 2003).

Admittedly, our conclusions about program effectiveness are weakened by message exposure being self-selected and self-reported. Guests already practicing protection may have been more vigilant for sun safety messages than guests not taking precautions. If this alternative explanation was true, recall should be associated with higher sun protection at all ski areas regardless of how much program material was used. However, the interaction between the extent of program implementation and message recall showed that the largest gains in sun protection practices came only when message recall increased in the high-use ski areas where more GSS materials were available to influence guests' sun safety. Conceptually, we are positing moderated mediation in this interaction, but we did not conduct mediation analyses given the shortcomings in testing mediation in cross-sectional data (Weinstein, 2007). A third-variable, such as skin type or age, or biases due to social desirability and demand effects, could have produced both recall and more frequent sun protection. Again, we would expect both variables to be higher regardless of the level of GSS use, which did not happen. Also, we attempted to control for third variables by including covariates in the analysis. Instead, it appears that exposure to the theory-based message in GSS in the high-use ski areas produced the behavior change.

It continues to be notable that GSS appeared to affect guests' sun protection at all. Guests spend far less time at a ski area than employees and thus have fewer chances to be exposed to the GSS communication. In fact, analyses on employees reported elsewhere found that reported message exposure began to increase after just four GSS items were used anywhere in the ski areas, although it was only with high program use (9 or more items) that employee sun protection increased (Authors, 2012). By contrast, guest exposure did not increase until ski areas displayed six GSS items in *guest-accessible* areas. Still, when exposure was achieved, the GSS messages, which were grounded in theories of diffusion and persuasion, seemed to convince guests to take precautions. Outdoor recreation has many physical and mental health benefits and sun protection education appears to be effective to guard against excessive sun exposure in these healthy pursuits (Centers for Disease Control, 2002).

As noted, the implementation of GSS was highly variable and managers at many ski areas did not use all of the program materials supplied (Authors, 2012). The ROC analyses suggested that use of at least 6 GSS items in guest-accessible areas was optimal for reaching guests. By contrast, low use of the program severely reduced program effectiveness regardless of whether guests reported exposure to sun protection messages. This same pattern was seen in the effectiveness trial and suggested again that it was exposure to the theory-based sun safety messages in GSS, not just any sun protection message (say in commercial advertising for products such as sunscreen) that was effective at improving guests' sun safety. Once again, rival explanations for the effect of program exposure would need to account for why higher message exposure did not improve sun protection in low-use ski areas.

Health communication practitioners should not be surprised that implementation and program exposure are so important to successful dissemination of an evidence-based dissemination program. Research on media effects over many years has established that adults are selective in their exposure to media messages because they have limited capacity to process them (Kim & Rubin, 1997; Lang, Borse, Wise, & David, 2002; Zillman &

Bryant, 1985). Several structural features of the ski area environment and of GSS may have determined who was exposed to GSS. Ski areas communicate numerous safety, procedural, and commercial messages, so GSS competed with other messages for display space and guests' attention. Guests' selective exposure may be dictated by personal factors such as interest in, or involvement with, skin cancer or pre-existing intentions or habits. It is telling that despite these personal factors, message recall was impacted by the number of messages displayed at the ski areas. In the future, researchers should investigate the environmental, media, message, and audience processes that determine exposure to health communication (Slater, 2004).

Limitations

Several limitations existed in this study, not the least of which was the lack of randomization to groups of ski areas with different program fidelity or to whether a message was actually seen or heard by guests. We included several covariates in the analysis of GSS implementation and program exposure and tested the interaction of GSS implementation and program exposure to help reduce the third-variable threat. Other limitations included (a) the survey was limited to four minutes to be completed on chair lifts but this reduced the number of beginners interviewed and number of questions that could be asked; and (b) sunburning and use of sunscreen and sunscreen lip balm were measured through self-reports which are subject to social desirability biases and demand effects.

Conclusion

The GSS program appeared to demonstrate again its effectiveness at promoting sun protection to guests who were skiing or snowboarding at the ski areas during industry-wide dissemination. An increasing number of studies indicate that people's sun protection decreases in vacation and resort environments (or does not sufficiently increase for these high-UV outdoor environments) and sunburn is a common occurrence (perhaps more so than in home environments)(Branstrom et. al., 2006; O'Riordan, et al., 2008; Pettijohn, et. al, 2009). These trends suggest that many guests may already be aware that they need to take sun safety precautions when recreating outdoors but sun safety messages need to be placed in locations frequented by guests to remind them to take precautions. . Strategies that achieve greater program fidelity and reach are essential components in any effort to disseminate evidence-based cancer prevention program in recreation and vacation environments to ensure that their benefits are conferred on the at-risk population.

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Table 1

Profile of sample of participating guests at posttest (n=3,380)

Characteristics	Dissemination Strategy		Overall n=3,380 %	<i>p</i> ¹
	Basic n=1,737 %	Enhanced n=1,643 %		
Age (Mean = 41.3, Std dev = 13.2):				0.01
18-24	13.0	14.5	13.8	
25-34	19.5	15.2	17.5	
35-44	25.1	25.7	25.4	
45-54	28.1	27.4	27.7	
55-74	13.7	16.5	15.0	
75 or older	0.6	0.7	0.6	
Education:				0.04
High school graduate or less	10.4	10.6	10.5	
Trade, technical, or vocational education beyond high school or some college	19.5	22.9	21.1	
College graduate or postgraduate degree	70.1	66.5	68.4	
Hispanic Ethnicity:				0.12
Not Hispanic/Latino	95.4	96.5	95.9	
Hispanic/Latino	4.6	3.5	4.1	
Race:				0.78
American Indian/Alaska Native/First Nations	0.7	0.5	0.6	
Asian	1.9	2.2	2.1	
Black/African American	0.3	0.5	0.4	
Native Hawaiian/Other Pacific Islander	0.2	0.2	0.2	
White	96.2	95.6	95.9	
Mixed race	0.7	1.0	0.8	
Gender:				0.20
Male	72.0	70.0	71.1	
Female	28.0	30.0	29.9	

Characteristics	Dissemination Strategy		Overall n=3,380 %	<i>I</i> <i>p</i>
	Basic n=1,737 %	Enhanced n=1,643 %		
Ever Been Sunburned While Skiing:	No	36.9	37.5	0.50
	Yes	63.1	62.5	
Experienced a Sunburn in This Ski Season:	No	88.0	88.6	0.26
	Yes	12.0	11.4	

I Alpha criterion set at 0.05 (two-tailed)

Table 2

Differences in exposure to *Go Sun Smart* program and sun protection behaviors of guests by Basic and Enhanced Dissemination Strategy conditions

VARIABLE	Dissemination Strategy			OVERALL n=3,380	p ¹
	Basic n=1,737	Enhanced n=1,643			
EXPOSURE TO GO SUN SMART					
Ever seen any message at a ski area that told you to protect your skin, lips or eyes from the sun while skiing or snowboarding?	Yes	42.1%	46.0%	44.0%	0.20
Ever seen the GSS logo at a ski area?	Yes	14.3%	17.6%	15.9%	0.17
SUN PROTECTION BEHAVIORS					
SPF 15+ sunscreen on the skin	Yes	43.6%	43.3%	43.4%	0.78
Reapply sunscreen at anytime?	Yes	13.5%	13.0%	13.2%	0.90
SPF 15+ sunscreen lip balm	Yes	34.1%	33.6%	33.9%	0.96
Gloves	Yes	91.9%	89.5%	90.8%	0.15
Neck covering	Yes	35.3%	33.6%	34.5%	0.76
Face covering	Yes	12.5%	8.3%	10.4%	0.23
Sunglasses/goggles	Yes	92.8%	90.0%	91.4%	0.11
Head covering	Yes	89.9%	89.2%	89.6%	0.71
Hat with a brim	Yes	9.3%	10.4%	9.8%	0.61
Hat that covers the ears	Yes	83.0%	81.8%	82.4%	0.64
Combined Score: SPF 15+ sunscreen and sunscreen lip balm (range=0 to 2)	mean	0.78	0.77	0.77	0.82
	std	0.79	0.77	0.78	
Combined Score: All sun protection behaviors ² (range=0 to 8)	mean	4.83	4.69	4.76	0.37
	std	1.37	1.40	1.39	
SUNBURN HISTORY					
Has your skin been sunburned while skiing or snowboarding this winter?	Yes	10.8%	12.0%	11.4%	0.43

¹ Alpha criterion set at 0.05 (two-tailed)

² Sum of SPF 15+ sunscreen, SPF 15+ lip balm, sunglasses, gloves, neck covering, face covering, head covering, and ear covering.

Table 3

Significant differences in guests' sun protection behavior¹ by exposure to *Go Sun Smart* program and ski area strata based on number of program materials observed in use in guest-accessible areas

SUN PROTECTION BEHAVIORS		Number of <i>Go Sun Smart</i> materials observed in use in guest-accessible areas		OVERALL n=3,380	p ²
		< 6 items n=2,411	6 items n=969		
SPF 15+ sunscreen on the skin	Not Recall Message	42.7%	42.7%		Interaction: .01
	Recall Message	39.9%	48.6%		
Reapply sunscreen at any time	Not Recall Message			10.3%	Interaction: .18 Main Effect: .04
	Recall Message			14.0%	
SPF 15+ sunscreen lip balm	Not Recognize Logo			32.3%	Interaction: .42 Main Effect: <.01
	Recognize Logo			40.2%	
Neck covering	Not Recognize Logo			32.6%	Interaction: .28 Main Effect: .02
	Recognize Logo			37.5%	
Face covering	Not Recognize Logo			9.4%	Interaction: .02 Main Effect: .04
	Recognize Logo	11.7%	7.1%	12.1%	
Head covering	Not Recall Message	90.7%	81.7%	86.2%	Interaction: <.01 Main Effect: <.01
	Recall Message	92.0%	89.2%	90.6%	
Hat with a brim	Not Recall Message	8.2%	11.7%		Interaction: .04
	Recall Message	7.7%	15.8%		
Combined Score: SPF 15+ sunscreen and sunscreen lip balm (range=0 to 2)	Not Recognize Logo			0.75	Interaction: .10 Main Effect: <.01
	Recognize Logo			0.86	
Combined Score: All sun protection behaviors ³ (range=0 to 8)	Not Recall Message	4.80	4.45	4.63	Interaction: .02 Main Effect: <.01
	Recall Message	4.84	4.73	4.78	
	Not Recognize Logo			4.66	Interaction: .07 Main Effect: <.01
	Recognize Logo			4.90	

¹ Only behaviors for which significant main effect of program exposure or interaction of program exposure with ski area strata based on number of GSS materials implemented are presented for simplicity.

² Alpha criterion set at 0.05 (two-tailed); results reported for main effect of message recall or logo recognition and for interaction of those program exposure factors with ski area strata based on number of GSS items in use.

³ Sum of SPF 15+ sunscreen, SPF 15+ lip balm, sunglasses, gloves, neck covering, face covering, head covering, and ear covering.