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The Sustained Impact of an Occupational Skin Cancer Prevention Program on Outdoor Workers (2004–2012)

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Abstract

Objective—Sustainability of prevention programs is a public health goal.

Methods—The effectiveness of *Go Sun Smart (GSS)*, an occupational skin cancer prevention program, was evaluated five-seven years out from the conclusion of a controlled randomized dissemination trial that compared an enhanced v. basic dissemination strategy at 53 ski areas enrolled in the trial.

Results—Employees (n=2940) at ski areas in the enhanced condition reported fewer sunburns but did not differ from employees in the basic condition on other sun protection measures. Significant differences for all sun protection practices were identified at ski areas that displayed 9 or more *GSS* materials or a combined total of 9 or more *GSS* and other sun safety messages.

Conclusion—Exposure to prevention messages is an important determinant of program effectiveness and potentially of program sustainability.

Skin cancer prevention for outdoors workers remains an important public health issue. In 2012, over 3.5 million cases of non-melanoma skin cancers and 76,250 cases of melanoma were diagnosed in the U.S, resulting in 2,000 and 9,180 deaths respectively.(1) Research conducted in occupational settings in Australia,(4–6) Austria, (2, 3) Brazil,(7) Britain,(8) Canada,(9, 10) Germany,(2, 11, 12) New Zealand, (14–16) Switzerland, (2, 13) and the U.S. (17, 18) report that outdoor workers are exposed to substantial and often excessive ultraviolet radiation (UV), the principal cause of skin cancer.(19, 20)

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Many outdoor workers receive dangerous doses of UV because they are often outside for 4–8 hours per day(17) and spend many years in their occupations, incurring chronically high UV exposure and higher rates of basal cell and squamous cell carcinomas and possibly melanoma. (2, 5, 9, 10, 12, 13, 21–27) They also spend considerable time outdoors off the job, further elevating their risk. Because outdoor workers often do not take adequate precautions to protect themselves from UV, (6, 8, 15, 18, 26, 28, 29) targeted prevention efforts are critical.

Occupational prevention programs have the potential to address the escalating rates of skin cancer (28, 30) by focusing on prevention and early detection. Health authorities recommend that to reduce UV exposure, individuals avoid sunburning and suntanning, reduce sun exposure at midday, and wear protective hats, clothing, and sunscreen.(1, 31, 32)

A number of programs have proven successful in producing short-term effects for skin cancer among outdoor workers.(8, 28, 33–35) Prior studies, for the most part, have assessed the success of an intervention with an immediate posttest. Few, if any, however, have investigated the long-term effects of such programs for more than 6–12 months. While the aforementioned programs have shown some success, knowledge of how to sustain successful workplace sun safety programs over the long-term is imperative for reducing skin cancer rates and its impact on healthcare costs, sick leave from work and quality of life for those affected.

Sustainability, or the continuation of a program and its fundamental principles, after funding and external support have been terminated, is an important goal for public health.(36, 37) Given the magnitude of resources expended on the development and evaluation of prevention programs, focusing increased attention on how well evidence-based programs translate and sustain their effects over time in at-risk populations is critical.(37) This manuscript reports on the sustainability of an occupational skin cancer prevention program, *Go Sun Smart* that was conducted with the North American ski industry for over a decade and its impact on employee sun protection.

The *Go Sun Smart* Program

In partnership with the North American ski industry, *Go Sun Smart* (GSS), a multi-channel health communication skin cancer prevention program for outdoor workers was developed, implemented, and disseminated. GSS advocates sun protection to employees of high altitude ski areas who are exposed to high levels of UV while at work. Utilizing a multi-theoretical model, based primarily on the Diffusion of Innovations Theory (DIT), (38) GSS delivers advice and training through a variety of workplace communication channels (e.g., posters, newsletter articles, intranets, training programs, and websites). DIT provided a framework for the adoption of an innovation (practicing sun safety while at work), which was operationalized with three specific preventive behaviors: (a) applying sunscreen and protective lip balm, (b) wearing a hat, and (c) wearing protective eyewear. GSS advocated that key workplace opinion leaders recommend sun safety practices to coworkers.

In 2001, the GSS research commenced with an randomized controlled effectiveness trial conducted with 26 North American ski areas, that demonstrated that workers can be

educated to be sun protective: Among employees in ski areas that received the GSS program, sunburning significantly decreased and sun protection increased with these results lasting into the summer; the effect was also replicated in a crossover-design for ski areas in the control condition.(28, 39)

The Dissemination Trial

Based on the positive effects of the effectiveness trial, from 2004–2008, a dissemination trial was conducted with 68 ski areas to determine the most effective method to distribute GSS beyond the initial group of test worksites to a larger group of organizations.(40) The study posited that an Enhanced Dissemination Strategy (EDS) developed for GSS would be more effective than a Basic Dissemination Strategy (BDS) at reaching ski area employees with sun protection messages. The BDS was developed from industry-based strategies for introducing and distributing safety and educational programs utilized by the National Ski Areas Association (NSAA), the premier industry organization. The EDS, derived from Diffusion of Innovation Theory and the literature on dissemination of health programs suggested that GSS dissemination (both adoption and implementation) would be more successful if personal contact with key managers was increased with the aim of motivating them to use GSS and supporting its use.(38)

The EDS was effective in increasing overall use of GSS in ski areas, compared to the BDS or industry-based dissemination strategy. Managers in the EDS were motivated to deliver more sun protection messages by conducting more formal training of employees and linking to the GSS website. (40) Although no significant differences were identified for employee sun protection practices between the EDS and BDS, increased use of the GSS program and its subsequent impact on employee sun protection was identified. (40)

Methods

Recruitment

The 68 ski areas initially enrolled in the GSS dissemination trial (GSS II) comprised the eligible worksites in the recruitment database for the sustainability assessment (GSS III). See Figure 1 for the number of ski areas and employees included in the GSS research.

During June through August 2011, recruitment commenced with a letter of invitation explaining the project was sent to the ski areas that participated in the GSS dissemination trial. Project investigators and staff followed up by telephone to secure participation. Of the 68 ski areas in the dissemination trial, 53 (78%) agreed to participate in the sustainability assessment. Reasons for lack of participation included no response to the invitation (13%), and refusal to participate (7%) as a result of changes in organizational structure or declining interest in the program. All 53 ski areas completed the study with one area deferring data collection to 2013 because of lack of snow.

In January – April 2012, sustained use of GSS was measured, five to seven years after randomization of the dissemination trial (sustained use was assessed at 1 ski area in March 2013 because of lack of snow in 2012), using four methods: (1) project staff completed an on-site observation of GSS materials and other sun protection communication; (2) the

primary GSS contact manager or another senior manager was interviewed using a semi-structured interview protocol; (3) senior managers at the ski areas were invited to complete an online survey; and, (4) employees completed a survey on their sun protection practices. The level of sustained use of GSS is reported elsewhere (D.B. Buller, Ph.D., B.J. Walkosz, Ph.D., P.A. Andersen, Ph.D., M.D. Scott, Ph.D., and G.R. Cutter, Ph.D., unpublished data, 2015). This manuscript details the effect of sustained use of GSS on the sun protection practices of employees. All procedures were approved by the Institutional Review Boards of the participating investigators.

Research staff visited each ski area for two days. During the visit, observations of GSS materials were made employing the protocol and data collection forms from the dissemination trial. (40) The observation protocol was validated in the earlier effectiveness trial on GSS.(28) A systematic and thorough inspection of the entire property including all areas accessible to the public and restricted to employees only was conducted. All printed GSS program materials were recorded including 15 posters/signs, 3 brochures, 2 static clings and one logo magnet. Staff also recorded any other messages regarding sun protection displayed at the ski areas that were not part of the GSS program, including commercial advertisements for sunscreen, sunglasses, and hats and messages created by the resort personnel (e.g., written on whiteboards). Three measures of program use were created from the on-site observations by summing the counts of items: GSS items, non-GSS items (excluding commercial advertising), and total sun protection communication (GSS plus non-GSS items).

Surveys on sun protection practices and exposure to sun safety messages at the ski area were conducted with ski area employees using a modified version of the employee survey from the GSS dissemination trial. (40) A list of jobs in mountain operations that would receive a large amount of sun exposure either because the job was performed outdoors or was an inside job with skiing privileges was created based on the effectiveness trial (i.e., ski patrol, ski and snowboard school instructors and staff, lift operations staff, maintenance, marketing, sales and tickets, administration, mountain hosts, food service, and base operations). Research staff and the key contact managers distributed the survey to employees in these jobs. Postcard size announcements were also provided to employees that gave them option to take the survey online by pointing their web browser to the survey URL or scanning a QR code. The goal was to collect a minimum of 50 surveys at each of the 53 ski areas enrolled in the study. Surveys were not performed with employees who worked in housekeeping or at sites not associated with mountain operations. To be eligible, employees had to also be employed full- or part-time at the ski area and to be 18 years of age or older. Researchers collected the completed surveys that were available during the data collection visit and a preaddressed, postage-paid envelope was provided to the key contact manager to return any employees surveys completed after the visit. Employees were given a complimentary protein bar to thank them for completing the survey.

Employees were queried on their awareness of GSS and exposure to sun protection messages at the ski area, sunburns received in the last 3 months, sun protection behavior (use of sunscreen, sunglasses, protective clothing, hats, lip balm and seeking shade), and attitudes and self-efficacy toward sun protection. Sunburning was operationalized as both a

dichotomous measure of ever being sunburned (yes/no) and a continuous measure of the number of sunburns. Frequency ratings (1=never; 5=always) were collected for using sunscreen and sunscreen lip balm, wearing protective clothing, hats, and sunglasses/goggles, having sunscreen, sunglasses and a hat at all times while at work, minimizing time in the sun, and seeking shade. A series of Likert-type items (agree [1]/disagree [5]) assessed attitudes toward sun protection. A single item measured self-efficacy expectations and a composite measure of sun safety was calculated. The questionnaire also contained an assessment of employee's job and demographic characteristics.

Results

Ski area characteristics

The ski areas ranged from small to large (17 with <250 employees; 21 with 25–499 employees; 11 with 500–999 employees; 5 with >1000 employees). Management was primarily male as females comprised approximately only 26% of the managers in key positions. The geographic representation of the ski areas across the U.S. and Canada included 34% - Southwest, 22.6% - Northeast, 15% - West, 15% - Northwest, 11.3% - Rocky Mountain, and 1.9% Central and Southeast.

Employee Survey Results

2940 employees completed the survey. The mean age was 36 and the employees were primarily male (61% male v. 38% female) and college graduates or higher (48%), with 14% having a high school diploma and 37% attending a trade school or having some college. The majority were non-Hispanic white (94%) with approximately 6% Hispanic and other racial minorities comprising the rest of the sample. Over 43% had worked in the ski industry 6 years or more, 7% had been diagnosed with skin cancer, and 24% had received a sunburn in the last 3 months.

Comparison By Dissemination Condition

No significant differences were identified between the basic and enhanced condition for employee recall of having received GSS sun protection messages (28.22% v. 34.42%) nor having received any messages or training about person sun protection (73.15% v. 71.97%). However, more employees in the basic condition (27.47%) reported having a sunburn in the last month than in the enhanced condition (21.44%), $p=0.0138$. No significant differences were reported regarding any of the sun safety behaviors (using sunscreen and sunscreen lip balm, wearing a hat with a brim, sunglasses, goggles, and clothing, and combination of these behaviors) between the employees at resorts that had received the basic or enhanced dissemination strategy.

Comparison by Awareness of GSS or Reception of Sun Safety Messages

Employees who had ever heard of the GSS program or not were assessed for their sunburning and sun protection behaviors. While there was no significant difference on sunburn prevalence (24.76% [heard] v. 23.98% [not heard]), differences were identified for all of the sun safety behaviors between these groups, with those who had ever heard of the *Go Sun Smart* program engaging in more sun safety than those who had not heard of the

program. Overall sun protection scores were 23.98 (heard) v. 21.86 (not heard) ($p < .0001$). See Table 1.

Similarly, employees were asked if they had seen any messages or received any training about protecting themselves from the sun. Again no significant differences on sunburning were detected between those employees who had or had not received a message or training; however, significant differences existed between these groups on their sun safety behaviors. Overall sun protection scores were 23.21 (received message or training) v. 20.78 (not received message or training) ($p < .0001$). See Table 2.

Comparison by Program Exposure

As in the dissemination study (40), signal detection techniques in a receiver operator curve (ROC) analysis assessed the degree to which the number of GSS materials, total sun safety materials or non-GSS materials in use, discriminated between employees who were and were not exposed to a sun-protection message (i.e., recall receiving a message). The ROC analysis resulted in two groups of ski areas, those with <9 or ≥ 9 messages, based of the number of GSS and total sun safety 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.

Resorts were then re-classified based on whether they were using <9 or ≥ 9 materials and these groups were compared on employees' reports of sunburn and sun protection. Significantly more sun protection practices (using sunscreen, sunglasses, and protective clothing, and overall sun protective behavior) were reported at employers that were still implementing at least 9 GSS sun safety messages (overall sun protection score: employers with <9 GSS sun safety messages: 22.42; employers with ≥ 9 GSS sun safety messages: 24.12; $p = 0.0373$). Likewise, greater sun protection (using sunscreen, wearing a hat, sunglasses, and protective clothing, and overall sun protective behavior) was reported at resorts still using at least 9 total sun safety messages (overall sun protection score: employers with <9 total sun safety messages: 22.06; employers with ≥ 9 total sun safety messages: 24.25; $p < .0001$). No differences in sunburning were reported based on program exposure. See Table 3 and 4.

Survey Analysis

The analysis was conducted using SAS PROC GLIMMIX (for dichotomous outcomes) and PROC MIXED (for continuous outcomes), controlling for 9 covariates in those models. A two-tailed alpha criterion of 0.05 was used for all tests. Effect sizes for the hierarchical clustered analysis were estimated following techniques from Hedges.

Discussion

The results of the sustainability study of the GSS program underscore the importance of maximizing the use of prevention programs such as GSS when moving from a dissemination phase to sustainability of the program in order to achieve the benefits demonstrated in the controlled efficacy trials. The use of both GSS and non-GSS sun safety materials five to

seven years out from our last contact with the ski areas was encouraging given the transitional nature of employees in the ski industry many of whom are seasonal workers.

A number of outcomes in the sustainability assessment were similar to those found in both the efficacy and dissemination trials. For example, fewer employees in the enhanced condition reported sunburning than those in the basic condition. A reduction in employee sunburning was also found in the efficacy trial. Many of the materials targeted to employees focused on sunburn reduction and it is possible that these messages resonated once again. The significant results of exposure to program materials on employee sun protection measures also compared similarly to the results of the *GSS* effectiveness and dissemination trials indicating once again that dose of message exposure to public health information matters. The differences in the overall sun protection scores between groups exposed to *GSS* messages (Table 3) or total number of sun safety materials at the ski areas (Table 4) were of moderate effect sizes (.37, .45 respectively), indicating a meaningful difference in sun protection practices. Further, this effect combined with the significant difference for sunburning suggests that continued exposure to sun protection messages has the potential to reduce outdoor workers' total and intermittent exposure to harmful ultraviolet radiation, both risk factors for skin cancer.

While the average number of *GSS* materials on display at ski areas decreased across time, it was necessary to display at least nine *GSS* materials or a combination of nine *GSS* and other sun protection materials in a ski area in order to maximize employees' exposure to the program which then resulted in improved sun protection practices. Similarly, employees who had ever heard of the *GSS* program or who had received a sun safety message or training had significantly higher scores on sun protection than those employees who had not heard of the program or who had not received training.

These benefits could be attributed to employees having greater exposure to sun protection messages and these messages increasing their perceptions that they were at risk for skin cancer and that skin cancer was an important health concern, improving their self-efficacy for occupational sun protection, and increasing their knowledge of protective behaviors.

Message exposure has been determined to be a key factor in changing attitudes and behaviors across a number of important prevention areas including tobacco, road safety and organ donation.(41) In fact, long-term message exposure to the Sun Smart campaign in Australia provided evidence of improvements in attitudes and behaviors.(42) However, in some instances, behavior change was not sustained after media coverage stopped thus suggesting that need exists for sustained efforts to maintain the positive short-term effects and counter the secular trends that may emerge.(41)

Although some sustained use of *GSS* occurred in the industry, the challenge remains to determine strategies, such as industry-wide policy adoption of sun safety practices that will sustain occupational sun safety over the long-term. In the *GSS* II dissemination trial, based on DIT and organizational diffusion, we focused primarily on the adoption phase and initial steps in the implementation phase during which redefinition and clarification of the program occurred as needed. In the sustainability assessment, the focus was determining how

organizations may have clarified and routinized processes in the implementation phase(43) that clearly convey organizational commitment to sun safety including adoption of workplace policies related to sun safety and continued communication between managers and employees. The long-term goal of a prevention program like GSS is to have the program become part of the organizational culture.

Limitations and Future Research

One of the limitations to our sustainability assessment was that we did not collect any organizational documents, such as policies, that would have confirmed long-term organizational commitment to sun safety for their employees. Such commitments are critical as staff turn-over and changes in organizational structures occur over time. Future research on the sustainability of prevention programs should focus on how the organizational and environmental contexts affect sustained practice.(37) For example, as in the case of sun protection, global climate changes has increased employee risk for heat stress and the steps to prevent heat stress (e.g., increased hydration, use of cover-up clothing) can easily be integrated with sun protection recommendations. Additionally, research on how organizations adopt and implement health policies can inform how health communication programs can be sustained over time.

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Figure 1.
The *Go Sun Smart* Research

Table 1

Differences in employees' sunburning and sun protection behavior by awareness of the Go Sun Smart program.

	Have you ever heard of the "Go Sun Smart" program before filling out this survey?		Overall (n=2,949) 25 participants refused to answer ever heard	p-value
	No (n=2,020)	Yes (n=929)		
In the past 3 months, has your skin been sunburned, that is has it been red or painful from exposure to the sun, not from exposure to wind and cold? (Yes)	23.98%	24.76%	24.22%	0.7524
For each behavior please indicate whether you did it always, usually, sometimes, rarely, or never when outside:				
Have sunscreen, a hat, and eye protection with you at all times (mean (SD))	3.67 (1.18)	4.05 (0.96)	3.79 (1.13)	<.0001*
Apply a sunscreen with a sun protection factor (SPF) of 15 or more on all exposed skin areas (mean (SD))	2.98 (1.37)	3.55 (1.17)	3.16 (1.34)	<.0001*
Apply a lip balm with an SPF of 15 or more on your lips (mean (SD))	3.34 (1.36)	3.66 (1.24)	3.44 (1.33)	<.0001*
Wear clothing specifically to protect your skin from the sun, such as long-sleeved shirts and pants (mean (SD))	3.57 (1.34)	3.84 (1.16)	3.65 (1.29)	0.0242*
Wear a hat with a brim (mean (SD))	2.86 (1.41)	3.20 (1.32)	2.97 (1.39)	0.0017*
Wear sunglasses or goggles (mean (SD))	4.40 (0.94)	4.64 (0.66)	4.48 (0.87)	0.0001*
Limit your exposure to the sun during the mid-day hours (mean (SD))	2.44 (1.17)	2.62 (1.10)	2.50 (1.15)	0.0010*
Stay mostly in the shade (mean (SD))	2.31 (1.02)	2.45 (0.92)	2.36 (0.99)	<.0001*
Watch your skin closely to avoid getting sunburned (mean (SD))	3.10 (1.25)	3.54 (1.11)	3.24 (1.22)	<.0001*
Overall sun protection behavior: sum of wearing SPF 15+ sunscreen, wearing SPF 15+ lip balm, wearing protective clothing, wearing hat with a brim, wearing sunglasses/goggles, and limiting exposure to midday sun, staying mostly in the shade (mean (SD))	21.86 (5.07)	23.98 (4.32)	22.54 (4.94)	<.0001*
Mean sun protection behavior: mean of wearing SPF 15+ sunscreen, wearing SPF 15+ lip balm, wearing protective clothing, wearing hat with a brim, wearing sunglasses/goggles, and limiting exposure to midday sun, staying mostly in the shade (mean (SD))	3.13 (0.73)	3.42 (0.62)	3.22 (0.71)	<.0001*

* <0.05

Table 2

Differences in employees' sunburning and sun protection behavior by reception of sun safety messages or training.

	Did you see or receive any messages or training about protecting yourself from the sun?		Overall (n=2,952) 22 participants refused to answer questions related to message	p-value
	No (n=811)	Yes (n=2,141)		
In the past 3 months, has your skin been sunburned, that is has it been red or painful from exposure to the sun, not from exposure to wind and cold? (Yes)	18.91%	26.32%	24.28%	0.4628
For each behavior please indicate whether you did it always, usually, sometimes, rarely, or never when outside:				
Have sunscreen, a hat, and eye protection with you at all times (mean (SD))	3.42 (1.27)	3.94 (1.04)	3.80 (1.13)	<.0001*
Apply a sunscreen with a sun protection factor (SPF) of 15 or more on all exposed skin areas (mean (SD))	2.72 (1.39)	3.33 (1.28)	3.16 (1.34)	<.0001*
Apply a lip balm with an SPF of 15 or more on your lips (mean (SD))	3.17 (1.37)	3.55 (1.30)	3.45 (1.33)	<.0001*
Wear clothing specifically to protect your skin from the sun, such as long-sleeved shirts and pants (mean (SD))	3.37 (1.43)	3.76 (1.22)	3.65 (1.29)	<.0001*
Wear a hat with a brim (mean (SD))	2.66 (1.44)	3.08 (1.36)	2.97 (1.39)	0.0004*
Wear sunglasses or goggles (mean (SD))	4.27 (1.03)	4.56 (0.79)	4.48 (0.87)	0.0011*
Limit your exposure to the sun during the mid-day hours (mean (SD))	2.34 (1.16)	2.55 (1.14)	2.50 (1.15)	<.0001*
Stay mostly in the shade (mean (SD))	2.28 (1.05)	2.39 (0.97)	2.36 (0.99)	0.0002*
Watch your skin closely to avoid getting sunburned (mean (SD))	2.87 (1.28)	3.39 (1.17)	3.24 (1.22)	<.0001*
Overall sun protection behavior: sum of wearing SPF 15+ sunscreen, wearing SPF 15+ lip balm, wearing protective clothing, wearing hat with a brim, wearing sunglasses/goggles, and limiting exposure to midday sun, staying mostly in the shade (mean (SD))	20.78 (5.19)	23.21 (4.69)	22.55 (4.95)	<.0001*
Mean sun protection behavior: mean of wearing SPF 15+ sunscreen, wearing SPF 15+ lip balm, wearing protective clothing, wearing hat with a brim, wearing sunglasses/goggles, and limiting exposure to midday sun, staying mostly in the shade (mean (SD))	2.98 (0.75)	3.32 (0.67)	3.23 (0.71)	<.0001*

*
<0.05

Table 3

Differences in employees' sunburning and sun protection behavior by number of Go Sun Smart materials observed in use throughout the ski area

	Number of GSS materials		Overall (n=2,974)	p-value	Effect size
	<9 GSS items (n=2,756)	>=9 GSS items (n=218)			
Have you ever heard of the "Go Sun Smart" program before filling out this survey? (Yes)	28.74%	66.06%	31.50%	<.0001	0.89
During the past 3 months did you see or receive any messages or training about protecting yourself from the sun? (Yes)	70.96%	92.20%	72.53%	0.0021*	0.50
In the past 3 months, has your skin been sunburned, that is has it been red or painful from exposure to the sun, not from exposure to wind and cold? (Yes)	24.11%	26.39%	24.28%	0.4555	0.05
For each behavior please indicate whether you did it always, usually, sometimes, rarely, or never when outside:					
Have sunscreen, a hat, and eye protection with you at all times (mean (SD))	3.77 (1.13)	4.16 (1.03)	3.80 (1.13)	0.0111*	0.37
Apply a sunscreen with a sun protection factor (SPF) of 15 or more on all exposed skin areas (mean (SD))	3.13 (1.34)	3.62 (1.25)	3.16 (1.34)	0.0315*	0.39
Apply a lip balm with an SPF of 15 or more on your lips (mean (SD))	3.42 (1.33)	3.74 (1.29)	3.45 (1.33)	0.0813	0.24
Wear clothing specifically to protect your skin from the sun, such as long-sleeved shirts and pants (mean (SD))	3.63 (1.31)	4.00 (1.08)	3.65 (1.29)	0.0265*	0.31
Wear a hat with a brim (mean (SD))	2.95 (1.40)	3.17 (1.34)	2.97 (1.39)	0.1520	0.16
Wear sunglasses or goggles (mean (SD))	4.46 (0.88)	4.73 (0.59)	4.48 (0.87)	0.0307*	0.34
Limit your exposure to the sun during the mid-day hours (mean (SD))	2.49 (1.15)	2.57 (1.12)	2.50 (1.15)	0.5464	0.07
Stay mostly in the shade (mean (SD))	2.36 (1.00)	2.34 (0.87)	2.36 (0.99)	0.9905	0.04
Watch your skin closely to avoid getting sunburned (mean (SD))	3.23 (1.22)	3.44 (1.19)	3.24 (1.22)	0.1024	0.19
Overall sun protection behavior: sum of wearing SPF 15+ sunscreen, wearing SPF 15+ lip balm, wearing protective clothing, wearing hat with a brim, wearing sunglasses/goggles, and limiting exposure to midday sun, staying mostly in the shade (mean (SD))	22.42 (4.98)	24.12 (4.25)	22.55 (4.94)	0.0373*	0.36
Mean sun protection behavior: mean of wearing SPF 15+ sunscreen, wearing SPF 15+ lip balm, wearing protective clothing, wearing hat with a brim, wearing sunglasses/goggles, and limiting exposure to midday sun, staying mostly in the shade (mean (SD))	3.21 (0.72)	3.46 (0.62)	3.23 (0.71)	0.0321*	0.37

* <0.05

Differences in employees' sunburning and sun protection behavior by total number of sun safety materials observed in use throughout the ski area.

Table 4

	Number of total materials		Overall (n=2,974)	p-value	Effect size
	<9 total items (n=2,321)	>=9 total items (n=653)			
Have you ever heard of the "Go Sun Smart" program before filling out this survey? (Yes)	26.16%	50.46%	31.50%	<.0001*	0.58
During the past 3 months did you see or receive any messages or training about protecting yourself from the sun? (Yes)	67.93%	88.79%	72.53%	<.0001*	0.47
In the past 3 months, has your skin been sunburned, that is has it been red or painful from exposure to the sun, not from exposure to wind and cold? (Yes)	22.24%	31.53%	24.28%	0.0224*	0.21
For each behavior please indicate whether you did it always, usually, sometimes, rarely, or never when outside:					
Have sunscreen, a hat, and eye protection with you at all times (mean (SD))	3.70 (1.15)	4.14 (0.98)	3.80 (1.13)	<.0001*	0.40
Apply a sunscreen with a sun protection factor (SPF) of 15 or more on all exposed skin areas (mean (SD))	3.03 (1.33)	3.63 (1.25)	3.16 (1.34)	<.0001*	0.45
Apply a lip balm with an SPF of 15 or more on your lips (mean (SD))	3.36 (1.33)	3.76 (1.27)	3.45 (1.33)	<.0001*	0.31
Wear clothing specifically to protect your skin from the sun, such as long-sleeved shirts and pants (mean (SD))	3.56 (1.32)	4.00 (1.12)	3.65 (1.29)	<.0001*	0.35
Wear a hat with a brim (mean (SD))	2.92 (1.40)	3.12 (1.38)	2.97 (1.39)	0.0058*	0.15
Wear sunglasses or goggles (mean (SD))	4.42 (0.90)	4.66 (0.71)	4.48 (0.87)	0.0040*	0.27
Limit your exposure to the sun during the mid-day hours (mean (SD))	2.46 (1.15)	2.63 (1.14)	2.50 (1.15)	0.0034*	0.15
Stay mostly in the shade (mean (SD))	2.33 (1.00)	2.45 (0.97)	2.36 (0.99)	0.0068*	0.11
Watch your skin closely to avoid getting sunburned (mean (SD))	3.18 (1.23)	3.49 (1.16)	3.24 (1.22)	<.0001*	0.25
Overall sun protection behavior: sum of wearing SPF 15+ sunscreen, wearing SPF 15+ lip balm, wearing protective clothing, wearing hat with a brim, wearing sunglasses/goggles, and limiting exposure to midday sun, staying mostly in the shade (mean (SD))	22.06 (4.96)	24.25 (4.51)	22.55 (4.94)	<.0001*	0.45
Mean sun protection behavior: mean of wearing SPF 15+ sunscreen, wearing SPF 15+ lip balm, wearing protective clothing, wearing hat with a brim, wearing sunglasses/goggles, and limiting exposure to midday sun, staying mostly in the shade (mean (SD))	3.16 (0.71)	3.47 (0.65)	3.23 (0.71)	<.0001*	0.44

* <0.05