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Implementation of Project Students Are Sun Safe (SASS) in Rural High Schools Along the Arizona-Mexico Border

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Abstract The incidence of skin cancer is raising in Hispanics/Latinos, which is a concern for Hispanics/Latinos living in Arizona, a state with a high amount of ultraviolet radiation exposure. There is a dearth of research on skin cancer prevention education for Hispanic/Latino adolescents in high school. Using a community-based participatory research (CBPR) framework, academic and community partners conducted a project to adapt an existing efficacious skin cancer prevention program, Project Students are Sun Safe (SASS) and the current SASS online training model, for dissemination to predominantly Hispanic/Latino students attending high schools in rural southeastern Arizona, located along the Arizona-Mexico border. We assessed the feasibility of training some of these students as peer educators (n = 16) to implement the "Border SASS" lesson to their peers in high school classrooms (n = 198). Border SASS training and the classroom lesson were feasible for, and highly acceptable to, peer educators and classroom students. These students significantly improved skin cancer prevention knowledge scores and self-reported skin cancer prevention behaviors over a 3- to 4-month period post training and the intervention implementation. Here we report on the following: (1) academic-community partnership and adaptation of the SASS training model for rural Hispanic high school students, (2) training of the high school peer educators, (3) administration of the SASS lesson by the trained peer educators to high school students, and (4) further evaluation of peer educator training and classroom student outcomes.

Keywords Skin cancer prevention · Border health · Adolescents · CBPR

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Background

Skin cancer is a major public health problem in the USA affecting millions of Americans of all races and ages each year [1]. Most skin cancer occurs in non-Hispanic white males age 55–64 years; however, the incidence in Hispanics is increasing [2, 3]. Hispanic women have the second-highest incidence of nonmelanoma skin cancer compared to whites [3]. The age-adjusted annual incidence of melanoma among Hispanics in the USA increased by 19% from 1992 to 2008 [4]. Melanoma incidence is significantly higher for females than males among Hispanics under age 50 years [5]. Hispanics tend to have advanced and thicker melanomas at diagnosis and a poorer survival rate compared to whites [5]. These statistics are especially worrisome in Arizona where Hispanics comprise one third of the population and skin cancer is on the rise [6].

Despite its increased prevalence, most skin cancer can be prevented by avoiding overexposure to ultraviolet radiation (UVR) [7]. UVR exposure during childhood comprises approximately 25% of lifetime UVR exposure and is a major risk factor for skin cancer in adulthood [8]. A meta-analysis of 51 studies found that ever reporting a sunburn during childhood almost doubled the risk of melanoma in adulthood [9]. Among adolescents, intentional exposure to UVR, including

tanning bed use, continues to be prevalent [10, 11]. Thus, promoting UVR protection in adolescents is a key behavior for reducing skin cancer risk.

In UVR protection surveys, Hispanic adolescents tend to score lower on skin cancer knowledge than non-Hispanics [12], but their knowledge improves after engaging in UVR protection education [13]. One study found that Hispanic adolescents were more likely than non-Hispanic white adolescents to tan deeply and use tanning beds [14], whereas Hispanic adolescents were less likely to wear sun protective clothing and apply sunscreen with a minimum sun protection factor (SPF) of 15 [13, 14]. UVR protection education with a focus on Hispanic adolescents merits consideration.

Annually, this region of Arizona experiences about 300 days of full sun [15]. Educators and researchers at a large southwestern university have successfully implemented a UVR protection program, Project Students are Sun Safe (SASS), in urban middle and high schools, to date reaching 5182 students (personal communication, Denise Spartonos, 08/29/2017). In the current SASS model, university students in the health sciences (peer leaders) participate in a one-semester skin cancer prevention academic for-credit course. The course begins with an online pretest of skin cancer prevention knowledge, attitudes and behaviors. Students then access five online modules on skin cancer epidemiology, risk factors, types, and prevention, and communication techniques. After completing the modules, students attend a mid-semester in-person skills evaluation. The trained peer leaders then visit community classrooms to implement an interactive, 50-min, age-appropriate SASS lesson (covering basic skin cancer epidemiology and risk factors, UVR and UVR protection strategies, and tanning consequences) delivered via PowerPoint, followed by three interactive reinforcement activities (sunscreen ingredients, sun protective fabric, skin analyzer). To date, 300 peer educators have received SASS training (personal communication, Denise Spartonos, 08/29/2017). This is a feasible and effective approach for delivering UVR protection information to adolescents in schools in a metropolitan area [16]; however, university peer leaders cannot travel long distances (120 to 200 mi round trip) to deliver SASS to rural high schools along the USA-Mexico border. Additionally, disseminating SASS in diverse settings requires more contextual evidence to enhance external validity of the intervention [17].

To address these issues, we conducted a pilot project to adapt the current SASS training model for dissemination to predominantly Hispanic high school students in rural border regions. Our intent was to assess the feasibility of training students as peer educators to present the SASS lesson to their peers in high school classrooms. Accomplishing this goal required partnership with a community organization to develop strategies for "Border SASS." Here, we report the following: (1) university-community partnership and adaptation of the SASS training model for rural Hispanic high school students, (2) peer educator training, (3) administration of the SASS lesson by the peer educators to high school students, and (4) evaluation of peer educator training and classroom student outcomes.

University-Community Partnership

A health-equity focused community-based participatory research (CBPR) framework guided the study [18]. This framework consists of four dimensions. *Contexts* (i.e., contextual factors) ground community-university partnership *group dynamics*, which, if they are effective within their diverse contexts, can affect and change *research and intervention designs*. The implementation of research and/or interventions in turn can contribute to outcomes, which are *broad capacity and system changes*. Broad capacity and system changes include improved practices, sustained interventions, and enhanced partner/agency capacity. Contexts in this project are university and community partner capacity and readiness, culture, and the important health issue of skin cancer in Hispanic populations. Group dynamics include communication, core values, trust, stewardship, participatory decision-making, and negotiation. The domain of intervention and research fits local and cultural norms and practices, involves co-learning and synergy, and is appropriate for partnership.

The university's Institutional Review Board approved all project procedures. Border SASS resulted from a new partnership between the university and an established community organization devoted largely to promoting and supporting border-area high school students' interest in health, health professions, and community service. The first partnership goal was to provide and evaluate culturally relevant skin cancer prevention training and education to adolescents in three largely Hispanic and underserved rural border-area high schools. The second partnership goal was to provide a sustainable resource for delivering this information to underserved schools. After agreeing on these goals, the partnership team submitted for and received external peer reviewed funding in February 2016. The partnership team developed a plan to provide SASS training for the community partners, adapt SASS training for high school students, recruit and train peer educators, administer SASS to the classrooms, and evaluate the training and SASS administration.

Train Community Partners

The community partners, represented by the executive director and the program coordinator for the organization's Future Health Leaders program, knew little about skin cancer, skin cancer prevention, or skin cancer in Hispanics but believed that this knowledge was important personally and to

Table 1 Community partner training

Training activity	Format	Responsibility	Time frame
Introduced Project SASS • Reviewed mission and history • Presented existing 5 online training modules • Presented existing SASS classroom presentation • Summarized reinforcement activities • Delivered skin analyzers • Reviewed Community Desire-2-Learn (D2L) Reviewed data collection, intervention fidelity Oriented stakeholders to the cloud drive for project communication	In person	University partner	Month 1
Reached consensus on revision of project timeline	In person	University/community partner	
Received CITI certification	Online	Community partner	Month 2
Developed elevator speech for presentation to school governance officials	In person	University/community partner	
Participated in existing training modules via Community D2L	Online	Community partner	
Demonstrated SASS lesson reinforcement activity skills	In person	Community partner	Month 6
Presented one revised SASS training module to high school students	In person	Community partner	Month 8
Assessed stakeholder's training reinforcement of high school students	In person	University/community partner	Month 9

SASS Students Are Sun Safe

adolescents in rural southeastern Arizona. In March 2016, the university partners consisting of the primary investigator (co-developer of the original SASS training modules), project coordinator (previously taught the SASS course to university students), and the SASS coordinator initiated training of the community partners (Table 1**).**

Adapt SASS Training

The partnership team agreed that because the students were attending high schools that were not bilingual, then the modules should be in English to be consistent with the high school curricula. The community partners reviewed each training module and the SASS lesson for grade level appropriateness and cultural relevance over a 2-month period. The community partners condensed information in the five original modules into three modules. The partnership team made further changes to enhance clarity, images, and graphics, accounting for student attention span, reading level, and cultural relevancy of the content and images. Each module included citations for all sources and a reference list. Each module took no longer than 20 min to complete online. The reading level for the modules and SASS lesson ranged from 7.4 to 10.3. The university partners adapted the training pretest and posttest from the university SASS to reflect the modified module content. The partnership team agreed that adding voiceover to approximately 60% of the SASS PowerPoint lesson would enhance fidelity and facilitate completion within a 40-min class period. The partnership team reached consensus on all modifications of the training. Border SASS peer educator training was scheduled for October 2016.

The university partners loaded the three modules and the SASS lesson into Community Desire2Learn (D2L), an integrated learning platform available through the university. This platform allows users to access nonacademic university online courses securely using their own email address. The university partners developed screenshot instructions for accessing D2L, the modules, and the project surveys. The surveys were formatted in Qualtrics, with a link provided to the pretest and two posttests available in Community D2L. Users could re-access the modules as needed.

Peer Educator Training

Recruitment of peer educators began at the start of the 2016–2017 school year. The community partners chose each school's Health Career Club (HCC) as the recruitment source for the peer educators. The HCCs are part of Future Health Leaders Program, which provides opportunities for high school students to learn about health professions and to develop the skills and confidence to become successful in college. The community partners obtained permission to recruit from the HCC from the district superintendents and school principals. Peer educator eligibility criteria agreed upon by the partnership team were as follows: (1) at least a sophomore in high school, (2) complete the online training, (3) attend an in-person session at the university, (4) complete three surveys

throughout the project, and (5) participate in at least four peer presentations at their respective schools over the next 6 months. Participation incentives for the HCCs were a $300 gift and two skin analyzers (housed at the community agency) for future projects. Peer educator incentives were a certificate of completion, recognition by the school, a trip to the university campus, and letters of reference from the project investigators for scholarship applications.

The community partners recruited six HCC students from each high school (n = 18) who sign informed assent to participate in the peer educator training and provided signed parental informed consent. The partnership team instructed the peer educators to complete the online pretest and modules within 1 week.

The following week, the peer educators traveled to the university to participate in a half-day in-person session with the partnership team. The session started with faculty introductions and overview, student introductions, a brief explanation of the university-community partnership, and a presentation from a dermatologist who spoke about her personal journey through medical school and training. The university partners briefly reviewed the three training modules, presented the SASS classroom lesson, and modeled the three activities that reinforce main concepts of the classroom lesson. The peer educators participated in groups of three in a session to teach back the activities to the partnership team and their peers. The community partners reviewed the logistics of scheduling and presenting Border SASS at the high schools. At the conclusion of the session, students toured cancer research laboratories at the university. One week after the in-person training, peer educators not only completed posttest 1 that was identical to the pretest but also included items on acceptability of training. Four months later, peer educators completed posttest 2.

Border SASS Lesson Administered by the Peer Educators to High School Students

The community partners were responsible for scheduling Border SASS lessons at each high school. Peer educators in groups of three presented the SASS lesson to classrooms in their respective schools; a community partner stakeholder attended each presentation. One peer educator led the interactive portions of the SASS PowerPoint presentation. Each peer educator led an interactive sun protective fabric, sunscreen ingredient, or skin analyzer activity. The Border SASS lesson lasted approximately 40 min. All students in the classroom received the lesson; however, only students who had signed informed assent and provided signed parental informed consent took the pretest prior to the lesson and posttest 1 after completion of the last activity. Four months after the Border SASS lesson, the classroom students completed a second posttest. Students who completed all tests received $10 following posttest 2. Peer educators delivered the Border SASS lesson to approximately 220 students from December 2016 to March 2017.

Evaluation of Training and Classroom Evaluation

Statistical Procedures

The university partners performed statistical analysis on peer educators and classroom students who completed all three assessments. We used descriptive statistics to describe the sample and to describe responses to each item, Wilcoxon Signed Ranks Test to examine differences between the pretest and posttest responses for each item, and the Friedman test to examine differences across the three periods (pretest, posttest 1, and posttest 2) for each of the items. For significant items, the Wilcoxon Signed Ranks Test enabled examination of the differences between the pairs (pretest-posttest, pretest-posttest 1, posttest 1-posttest 2). Knowledge items were scored as correct (1) or not correct (0); scores were summed for a knowledge score and the percent correct computed. The partnership team based a 70% pass rate on the schools' grading criteria. Repeated measures ANOVA was used to examine changes in knowledge scores across time. One question, perceived percent chance of getting skin cancer in the future from 0 to 100%, was analyzed using both parametric (repeated measures ANOVA) and nonparametric statistics (Wilcoxon Signed Ranks Test for two time periods and Friedman Test for the three time periods).

Peer Educator Training

Feasibility Evaluation of the peer educators' skin cancer knowledge, beliefs, and self-reported skin cancer risk reducing behaviors of trainees occurred before and 2 weeks and 3 months after receiving Border SASS training. The pretest covered socio-demographics (5 items), risk factors (5 items), skin cancer beliefs (4 items), and skin cancer prevention knowledge (15 items) and behaviors (11 items). Posttests 1 and 2 were identical to the pretest excluding demographics and risk factors. Posttest 1 contained seven items on training acceptability. Of the 18 peer educators, we dropped two from analysis: one who completed the pretest after the training and one who never completed the pretest, but completed both posttests. Characteristics of the peer educators are in Table 2.

The university partners evaluated the training for feasibility of informing beliefs and improving skin cancer knowledge and self-reported risk reducing behaviors. The responses for comparative risk perception (Compared to your classmates and friends, how likely do you think you are to get skin cancer sometime in your future?) on pretest were "about the same."

Table 2 Sample characteristics of peer educators and classroom students

	Peer educators (n = 16)[a]	Classroom students (n = 220)
Age (mean, standard deviation)	16.81 (0.655)	15.07 (1.070)
	n (%)	n (%)
Gender	5 (31.3)	74 (33.6)
Male	11 (68.8)	144 (65.5)
Female		
Ethnicity	16 (100.0)	210 (95.5)
Hispanic or Latino		10 (4.5)
Not Hispanic or Latino		
Race	1 (6.3)	19 (8.6)
American Indian or Alaskan Native	15 (93.8)	5 (2.3)
Black or African-American		179 (81.4)
Native Islander or Pacific Native		
White		
Number of sunburns in past 12 months	3 (18.8)	81 (40.3)
0	7 (43.8)	51 (25.4)
1	5 (31.3)	39 (19.4)
2	1 (6.3)	20 (10.0)
3		2 (1.0)
4		7 (3.5)
5 or more		

[a] Data not available for two peer educators

This belief did not significantly change on either posttest. Absolute skin cancer risk over a lifetime increased from 33.75 to 44.13% at posttest 1 to 53.20% at posttest 2, but these changes were only trending toward significance (p = .09). Beliefs surrounding skin cancer as a serious disease were "probably" to "definitely" (mean = 4.81, standard deviation [SD] = 0.544) on pretest, increased to definitely on posttest 1 (mean = 5.0, SD = 0.000) and decreased slightly on posttest 2 (mean = 4.69, SD = 0.873); all changes were nonsignificant. Findings were similar for beliefs about the importance of examining one's skin over the three periods (mean = 4.81, SD = 0.403; mean = 5.0, SD = 0.000; mean = 4.94, SD = 0.25).

Knowledge scores for the pretest and posttests are in Table 3**.** Overall knowledge increased from mean = 57.5% (SD = 13.74) to 72.50% (SD = 16.67) (p < .001). Self-reported behaviors that increased significantly and were sustained from pretest to posttest were wearing a hat and not wearing shorts.

Acceptability The peer educators agreed that the training was acceptable. On a scale from 1 (strongly disagree) to 5 (strongly agree), the peer educators indicated that they knew more than they did before the training about sun safety (mean = 4.94, SD = 0.250), trusted the information they received from the training (mean = 5.0), received the right amount of training (mean = 2.46, SD = 0.814), the training was useful for daily life (mean = 4.81, SD = 0.403), felt prepared to present SASS to classroom students" (mean = 4.81, SD = 0.403), training helped build self-confidence (mean = 4.31, SD = 0.704), and training helped them move forward with their educational goals (mean = 4.75, SD = 0.447). The peer educators commented that the training was "empowering" and was important for their future careers as health leaders.

Appropriateness and Fidelity The primary language for most of the peer educators was Spanish, but all the peer educators were fluent in English so the modules were appropriate; however, we did not translate the parental consent form into Spanish, which was the primary language spoken by many parents. Using Community D2L for online training may not be appropriate for these students. Our partnership team had assumed incorrectly that adolescents would have exposure to Web-based courses; however, the border high schools' curricula did not incorporate these,

We used several methods to assess peer educators' fidelity to the training. Use of Community D2L allowed the university partners to track progress of each peer educator through the training modules. Tracking included date and time accessing the module, length of time spent on the module, and completion of the module. We found that some peer educators were not truthful about completing the modules. As a result, the partners reviewed the modules with the peer educators as a group during the in-person training. The university partners visited each group of students at their respective high schools within a month after the training to observe a peer educator demonstration of all

Table 3 Knowledge and behavior results for peer educator and classroom evaluation

Item	Peer educators (n = 16)				Classroom students (n = 198)			
Knowledge items (correct response)	Pretest	Posttest 1 (3 weeks)	Posttest 2 (3 months)	Sig level pretest to posttest 2*	Pretest	Posttest 1 (immediate)	Posttest 2 (3 months)	Sig level pretest to posttest 2*
	N (%)	*N* (%)	*N* (%)	*P* value	*N* (%)	*N* (%)	*N* (%)	*P* value
Skin is important for all of the following functions except photosynthesis	15 (93.8)	14 (87.5)	14 (87.5)	.779				
Most skin cancer arises from changes epidermis	10 (62.5)	13 (81.3)	13 (81.3)	.223				
The wavelengths of most concern in the causation of skin cancer are UVA/UVB	13 (81.3)	14 (87.5)	15 (93.8)	.223				
Photoaging causes all except rejuvenation of skin	15 (93.8)	15 (93.8)	16 (100.0)	.607				
UVB and UVA both contribute to skin cancer	10 (62.5)	16 (100.0)**	13 (81.3)	.317	89 (44.9)	123 (62.1)***	116 (58.6)**	.004
Nonmelanoma skin cancers have a high recurrence rate, especially on sun-exposed skin	9 (56.3)	11 (68.8)	8 (50.0)	.529				
Melanoma is the most common cancer in young adults	3 (18.8)	7 (43.8)	10 (62.5)**	.008				
Rule commonly used for assessing skin spots or moles is Asymmetry, Border, Color, Diameter, Evolving (ABCDE)	3 (18.8)	13 (81.3)***	9 (56.3)	.034				
Modifiable risk factors for skin cancer include exposure to ultraviolet radiation	9 (56.3)	13 (81.3)	12 (75.0)	.236				
The strongest risk factor for melanoma is strong family history of melanoma	6 (37.5)	8 (50.0)	8 (50.0)	.695				
"ACE" promotes the message of Avoid excessive exposure to ultraviolet radiation, Cover up with sun protective clothing or sunscreen, Examine skin for changes monthly	8 (50.0)	14 (87.5)**	11 (68.8)	.105				
Tanning beds are considered to be a carcinogen	11 (68.8)	13 (81.3)	12 (75.0)	.607				
Indices important for reducing ultraviolet radiation exposure include all of the following except the ABCDE rule	7 (43.8)	8 (50.0)	8 (50.0)	.926				
Tightly woven wide brimmed hats provide the best protection from the sun	8 (50.0)	9 (56.3)	9 (56.3)	.895	46 (23.2)	90 (45.5)***	81 (40.9)***	< .001
Ingredients in sunscreen should be zinc oxide,	11 (68.8)	16 (100.0)**	16 (100.0)	.025	115 (58.1)	129 (65.2)	120 (60.6)	.727

Table 3 (continued)

Item	Peer educators (n = 16)				Classroom students (n = 198)			
Knowledge items (correct response)	Pretest	Posttest 1 (3 weeks)	Posttest 2 (3 months)	Sig level pretest to posttest 2*	Pretest	Posttest 1 (immediate)	Posttest 2 (3 months)	Sig level pretest to posttest 2*
	N (%)	*N* (%)	*N* (%)	*P* value	*N* (%)	*N* (%)	*N* (%)	*P* value
titanium dioxide or avobenzone								
Preferred SPF in a broad spectrum sunscreen for persons living in southern Arizona is 30					101 (51.0)	151 (76.3)***	147 (74.2)***	< .001
Melanoma causes more deaths each year than basal or squamous cell cancers)					51 (25.8)	69 (34.8)**	64 (32.3)	.207
Overall knowledge of skin cancer prevention percent correct	57.5% (13.74)	76.67% (15.78)***	72.50% (16.67)**	.001	40.61 (20.8)	56.77 (23.4)***	53.33 (22.6) ***	< .001
Self-reported behaviors when in the sun								
Avoid sun exposure from 10 a.m. to 4 p.m.					66 (33.3)	131 (66.2)***	142 (71.7)***	< .001
Seek shade	15 (93.8)	14 (87.5)	16 (100.0)	.368				
Apply broad spectrum sunscreen with SPF of 30 or higher	11 (68.8)	12 (75.0)	13 (81.3)	.368	134 (67.7)	142 (71.7)	151 (76.3)	.053
Wear clothing that covers my arms	5 (31.3)	8 (50.0)	10 (62.5)	.121				
Wear shorts	12 (75.0)	5 (31.3)***	4 (25.0)	.01				
Wear long sleeves and long pants					97 (49.0)	148 (74.7)***	148 (73.6)***	< .001
Wear sandals	6 (37.5)	1 (6.3)	2 (12.5)	.072				
Wear a wide-brimmed hat	2 (12.5)	10 (62.5)***	11 (68.8)	.003	79 (39.9)	134 (67.7)***	123 (62.1)***	< .001
Wear sunglasses with UV protection	6 (37.5)	8 (50.0)	10 (62.5)	.180	106 (53.5)	153 (77.3)***	148 (74.7)***	< .001
Never gone to a tanning booth	15 (93.8)	16 (100)	15 (93.8)	.368				
Do nothing or do very little					43 (21.7)	33 (16.7)	8 (4.0)***	< .001

*Related samples of Wilcoxon Signed Rank Test; **$p < .05$; ***$p < .001$

activities learned in training. Peer educators demonstrating lack of fidelity to the intervention received additional coaching.

Classroom Evaluation

Two hundred twenty students completed a paper version of the pretest before receiving Border SASS. Table 2 shows demographic and risk factor characteristics (only obtained at pretest). Students completed posttest 1 immediately following the last SASS activity; however, only 212 students completed posttest 1, with reasons for the attrition of 8 students unknown. The evaluation was based on classroom students who completed the pretest, posttest 1, and posttest 2 (4 months later); the final sample for analysis was 198 students (90% response rate).

The classroom survey consisted of 17 items. Five knowledge items pertained to hats, appropriate sunscreen ingredients and SPF, effect of UVA and UVB radiation, and types of skin cancer. One item assessed skin examination beliefs. Six items assessed sun protection behaviors (avoid sun exposure from 10 a.m. to 4 p.m., apply broad-spectrum sunscreen with SPF of 30 or higher, wear long sleeves and long pants, wear a wide-brimmed hat, wear sunglasses with UV protection). Five items assessed demographic factors and risk factors. Posttest 2 included satisfaction items for the Border SASS lesson. The surveys had to be very short to enable completion of the Border SASS lesson, pretest, and posttest 1 within the class period.

Outcomes increased significantly from pretest to posttests 1 and 2 (Table 3). The overall correct score on

knowledge items increased from 40.61% (SD = 20.8) to 53.33% (SD = 22.62) (p = < 001). Number of sun protective behaviors increased from mean = 2.45 (SD = 1.33) behaviors to mean = 3.58 (SD = 1.33) behaviors (p = < .001). On pretest, 124 (62.6%) participants thought it was definitely important to examine their own skin. This number increased to 179 (90.4%) on posttest 2 (p = < .001). One additional item on posttest 2 asked participants to select a statement that was not part of the SASS message (Sunburn is a sign of skin damage but freckles indicate healthy skin); 57.1% correctly selected this statement.

Classroom participants were satisfied with their experience with SASS. Participants somewhat-to-strongly agreed that, overall, they enjoyed the SASS presentation (n = 180, 90.9%), enjoyed participating in the SASS activities (175, 88.4%), learned a lot about sun safety (n = 172, 86.9%), thought that the peer educators were knowledgeable about sun safety (172, 86.9%), felt that the peer educators held their attention (158, 79.8%), and thought SASS should be continued in the school (172, 86.9%).

Discussion

The key finding of this project was that training high school students as peer educators for Border SASS and their delivery of Border SASS lessons to high school classrooms in rural and underserved high schools is feasible and acceptable. Other researchers [13] have implemented a peer-to-peer sun safety intervention in younger Hispanic youth; however, to our knowledge, Border SASS is the first program to target rural Hispanic adolescents as peer educators for sun safety. Other than our previous report on SASS [16], we found few other school-focused skin cancer programs based on peer-to-peer models; those provided few or no details on the peer training and were conducted in elementary schools [13, 19, 20].

Peer educators' overall skin cancer prevention knowledge significantly improved from pretest to posttest and was sustained at an acceptable level (≥ 70%) for 4 months. There is no "gold standard" of acceptable skin cancer knowledge in adolescents, and most studies of this population report item scores versus total knowledge scores. Our peer educators demonstrated a ceiling effect of "optimal knowledge" (≥ 70% correct) for skin function, UVR wavelengths implicated in skin cancer causation, and photoaging; therefore, these areas may require less emphasis in future training. Knowledge of melanoma as the most common cancer in young adults, the ABCDE rule, and required sunscreen ingredients significantly improved from pretest. These items require continued emphasis in future training. Items that showed suboptimal knowledge (< 70% correct) should be covered more in depth in training. These include skin cancer types (melanoma and nonmelanoma), family history as a risk factor, the UV index, and types of hats, as well as topics that increased significantly on posttest 1 but dropped to suboptimal levels at posttest 2 (Avoid, Cover up, Examine [ACE] and the ABCDE rule).

Peer educators improved in all behaviors and significantly reduced wearing of shorts and trended reduced wearing of sandals while in the sun at 3 months. However, posttest 2 occurred in January, which could reflect the nonwearing of shorts and sandals due to colder weather on southeastern Arizona. The peer educators sustained behaviors of shade seeking, applying sunscreen with SPF of 30 or higher, and wearing of a wide-brimmed hat and sunglasses. All but one participant reported never going to a tanning booth, a finding that sharply contrast with Ma et al. [14] who reported that 15% of their Hispanic white participants had used a tanning booth within the past year.

The classroom participants had suboptimal baseline knowledge for all items (Table 3). Knowledge significantly improved for all items on the immediate posttest 1; this finding reflects similar previous knowledge tests of SASS in urban high school students [16] and in younger primarily Hispanic students [13]. Classroom participants showed sustained knowledge over 4 months for all items except for melanoma that causes more deaths each year than basal or squamous cell skin cancers and sunscreen ingredients. The Border SASS PowerPoint presentation includes information on sunscreen ingredients and students participate in an activity to identify sunscreen ingredients on sunscreen bottles. This is an important content to remember, and boosters (e.g., posters in schools, other student presentations) may help with knowledge retention in the future. Participants' improved scores remained below 70%. It is widely recognized that knowledge does not always predict behavior; however, in this project; sun protective behaviors of classroom students were significantly higher at 4 months after receiving Border SASS than at baseline. The exception sunscreen application trended toward significance and was practiced by about 70% of students from pretest to posttest 2. Unlike other school-based intervention studies [13, 21], behavioral change was the strongest intervention effect.

We found no other published school-targeted skin cancer prevention interventions that were implemented within a CBPR framework. Our university-community partnership was essential for the success of the project. Based on the health equity-focused CBPR framework [18], the partnership achieved enhanced community capacity through improved and sustained behaviors of over 200 primarily Hispanic students. This change was accomplished through increased participation, new skills, and empowerment, particularly for the peer educators. The community partners have continued access to the Community D2L modules for training future students to present Border SASS or for teaching individual students who are interested in skin cancer prevention; however,

students may require more orientation to online training. The community partners also have the Border SASS lesson for future use. Group dynamics played a major role in the success of Border SASS. The university partners understood that the project would not have succeeded without the buy-in and dedication of the community partners. Trusting environments were attributed, in part, to relationships developed with individual partners. The university partners used their social capital (access to educational, research, technical, and financial resources) for the benefit of the community partners and the participating rural high schools. The group dynamics produced synergy, which affected the Border SASS intervention designs to be more culturally appropriate or to fit better within the rural border school contexts [18].

Our findings are subject to additional limitations. The peer educator sample size was small but was larger than similar samples reported in a study targeting Los Angeles youth (n = 7) [20] and much smaller than a statewide study (n = 217) [19]. Time constraints in the classroom also necessitated brief pretests and posttests, which could not fully discriminate behaviors, beliefs, and knowledge of the classroom students. Since all measures were self-reported, the data were subject to over- or underreporting. We could only test short-term sustainability with posttest 2 evaluations at 3 months (peer educators) and 4 months (classroom students).

A major strength of the project was the focus on an understudied and increasingly vulnerable population of Hispanic adolescents living along the USA-Mexico border—an area with high UVR exposure. Adolescent UVR exposure and sun protection have been understudied in the Environmental Protection Agency's Border 2020 program [22]. Other strengths were rigorous development of community partner and peer educator training, as well as implementation of the intervention based on a CBPR framework. The sample size of classroom students receiving Border SASS and the retention rate of these students also were strengths.

In conclusion, comprehensive online training of rural high school students as peer educators for skin cancer prevention is feasible but needs further refinement and assessment. Nevertheless, peer educators were crucial for the success of this project. Using a CBPR framework may be a key to success for implementing a peer-to-peer, school-targeted skin cancer prevention interventions that result in risk-reducing behavior change. This approach is particularly important when the target population is underserved and understudied. Ultimately, educating Hispanic youth about skin cancer prevention may have an impact on the trajectory of skin cancer in Hispanics.

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Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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