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SunSmart: evaluation of a pilot school-based sun protection intervention in Hispanic early adolescents

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Abstract

The incidence of melanoma is rising among Hispanic populations in the United States. The purpose of this study is to evaluate the impact of a pilot sun safety educational intervention conducted from 2006 to 2012 on Hispanic early adolescents in a high ultraviolet environment. Nineteen schools with high Hispanic enrollment were recruited from urban neighborhoods in Los Angeles. The analytic sample was restricted to students identifying as Hispanic or Latino ($n = 777$). A mixed effects linear model was used to test mean changes from pre- to posttest on students' sun protection knowledge, attitudes and behaviors. Significant improvements were observed across several cognitive outcomes related to sun protection, including knowledge of and attitudes toward sun protection and self-efficacy to wear sunscreen. However, changes in sun protective behaviors were not achieved. Although some improvements were observed, future studies should identify the factors that motivate sun protection in this population and develop tailored prevention strategies, as improving the sun safe behaviors of Hispanic youths may aid in reducing the risk of melanoma in adulthood in this population.

Introduction

High ultraviolet (UV) radiation exposure and sunburn in childhood have been linked to increased risk of melanoma in adulthood [1–3]. While the precise mechanisms of these relationships are unclear, the immaturity of children's skin may afford less UV protection causing DNA damage to skin cells. In addition, excessive UV exposure in childhood may increase the number of melanocytic nevi, a primary risk factor for melanoma in adults [4, 5]. As a substantial amount of sun exposure occurs in childhood, there is a critical need for melanoma prevention efforts targeted to children and adolescents [1–3, 6].

While some sun protection interventions have been effective in influencing children's UV behaviors [7, 8] the majority have been largely ineffective at changing sun protective practices [4, 5, 9–11]. As a result, sun protection remains poorly practiced in children in the United States, with 70% of youths reporting one or more sunburns in the previous summer and <20% practicing routine use of sun protection methods such as use of sunscreen, sun protective clothing and hats [12]. Sun safety interventions have been more successful at improving cognitive constructs such as sun protection knowledge and attitudes, variables that have been shown to positively predict sun protective behaviors [13, 14]. Self-efficacy to use sun protection and sun protective attitudes, for example, may directly influence behaviors or may serve as mediators between knowledge of sun protective concepts and practices [15]. Thus strengthening these mediators may over time result in precautionary sun behaviors.

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To date, most sun safety interventions have been targeted to and conducted amongst predominantly non-Hispanic white (NHW) populations, given the risk profile of melanoma and non-melanoma skin cancers which have highest incidence among NHWs and fair-skinned populations. However, recent studies have found significant increases in incidence of melanoma among Hispanics in the United States [16–18]. While incidence rates remain relatively low (the age-adjusted rate for Hispanics is 4.42 per 100 000 compared to 29.29 in NHWs) [19], melanoma is increasing in Hispanics comparable to NHWs, with an annual incidence increase of 2.9%, comparable to 3.0% in NHWs. [20] Once diagnosed, Hispanics face poorer survival outcomes than NHWs, a disparity that has been attributed in part to less awareness of melanoma and less access to health care, leading to insufficient screening and delayed diagnosis [21, 22]. In addition, Hispanics practice less sun protection and have lower perceived risk for skin cancer in comparison to NHWs [23–25]. Skin cancer primary prevention efforts have not been directed toward this population, despite evidence that Hispanics experience sunburn at rates comparable to or exceeding NHWs [23, 24].

This study evaluates a multi-year pilot intervention, ‘SunSmart’, conducted in 19 elementary and middle schools in Los Angeles with high proportions of Hispanic students. The intention of the SunSmart pilot was to test an intervention approach amongst ethnic minority and darker-skinned early adolescents to determine both the feasibility and potential receptivity of this population to sun safety education. The Los Angeles Unified School District (LAUSD), in which the study took place, is the largest public school system in California, comprising 700 000 students, 74% of whom are Hispanic [26]. The intervention aimed to educate students about the risks of skin cancer associated with UV overexposure with emphasis on addressing the misperception that darker-skinned individuals are not at risk for harmful UV exposures in order to increase protective behaviors in this population.

Methods

Procedures

SunSmart was conducted in 16 LAUSD schools and three private parochial schools with high Hispanic enrollment. The intervention was taught during regular classroom time by trained college students participating in a university service-learning program. Process evaluation was conducted at two time points to ensure that program curriculum was delivered with fidelity.

Data on the effectiveness of the program were collected from 2006 to 2012. Classroom students were pretested before the intervention and posttested immediately following the intervention. Classroom teachers were present as observers during the intervention and testing.

The study was approved by the University of Southern California (USC) Institutional Review Board, and because of the educational nature of the study, consent was waived. Students were offered the chance to opt out of the program without penalty; all students chose to participate.

Description of the intervention

SunSmart was based upon a large-scale US sun safety intervention and further developed to target a predominantly Hispanic student population by USC Preventive Medicine faculty [10]. The general lesson format and content of sun protection messages regarding risks of excessive sun exposure and measures of protection to reduce risks was adapted from the prior intervention. To adhere to school scheduling requirements, the revised curriculum comprised three 1-h lessons over 3 weeks. Questionnaire items were adapted from those developed by Buller *et al.* [14]. Because the intervention was developed as a pilot and due to resource limitations, random assignment was not possible. Schools and classes within schools were selected through existing relationships with the university and comprised a convenience sample of classes participating both in Fall and Spring semesters.

Though set in a school district with high Hispanic enrollment, the intervention was not extensively culturally tailored to this population. Because data regarding the psychosocial factors motivating sun protection among Hispanics are sparse, culturally specific messages for sun protection were not readily available. Further, while the primary group of interest was Hispanic early adolescents due to rising skin cancer incidence in Hispanic adults, the school-based format necessitated broad delivery to all students, including non-Hispanics. Therefore, the importance of sun protection for all skin types including darker skin and the issue of skin cancer susceptibility in darker-skinned populations was emphasized throughout the curriculum.

SunSmart was grounded in social cognitive theory, with self-efficacy, observational learning and mastery experience used as central constructs [27, 28]. Each 1-h unit included a brief lecture, indoor project-based activities to illustrate theory-driven learning objectives and outdoor interactive activities designed to increase children's perceived self-efficacy and to reduce and overcome barriers in sun protective behaviors [29, 30]. Undergraduate instructors modeled sun protective behavior throughout, wearing hats, sunscreen, protective clothing and sunglasses and identifying shaded areas for outdoor classroom activities.

Pretest and posttest measures

The survey comprised items validated in prior studies with children that were averaged into several scales and single-item outcome measures [10, 14]. In Fall of 2011, the questionnaire was revised to include items regarding sun protective attitudes, and self-efficacy to use sunscreen. Results presented here identify questionnaire versions and sample sizes for all outcomes.

Knowledge

Seven true-false items measured topics covered in the curriculum including students' understanding of skin cancer risk related to UV, methods to avoid excessive exposure and sun protection factor (SPF) level of sunscreens. Correct responses were summed into a single knowledge score (Cronbach's coefficient alpha for pretest [α] = 0.54; posttest $\alpha = 0.57$).

Tanning desire

Tanning importance was measured with one item asking students to rate the importance of getting a tan from 'not important' to 'very important'.

Sun protection attitudes

Items to measure sun protection attitudes were added to the survey in 2011. Sun protection attitudes were measured with five items asking students to rate their agreement from 'strongly disagree to strongly agree' to statements about protective clothing, sunscreen and tanning (pretest $\alpha = 0.42$; posttest $\alpha = 0.47$).

Self-efficacy to use sunscreen

Self-efficacy to use sunscreen with SPF of 15 or greater was measured with one item.

Sun protective behaviors

Sun protective behaviors were measured to ascertain use of protection during peak hours on school days. These behaviors were assessed with four questions regarding sun protective practices (use of long-sleeves, a hat, sunscreen and shade) on the day prior to the questionnaire that were averaged into a single exposure score (pretest $\alpha = 0.16$; posttest $\alpha = 0.18$).

Sunburn in past month

A single item assessed sunburn in the month prior to the survey. Students were also asked to write in the number of times they were sunburned in the past month.

Statistical analyses

Analysis was restricted to students who identified as Latino/Hispanic ($N = 777$), representing 74% of the entire sample ($N = 1049$). Although race was not collected from the remaining 26% of students, school demographics show that these students were primarily African–American, who have very low prevalence of sun protection behaviors and low awareness of risk from excessive UV exposure, potentially attributable to the low rates of skin cancer in this population [31].

Therefore, to control for comparison bias and because the primary research question focused on Hispanics, we limited analysis to Hispanic students. Only participants with complete data at pretest and posttest were included in the analysis. A comparison of the demographic characteristics of students who completed and did not complete both pretest and posttest was conducted using analysis of variance and Pearson's chi-square test to determine any significant differences between groups.

Frequencies and means were calculated to provide descriptive information on study participants. Cronbach's alpha coefficient was calculated to determine internal consistency of scales [32]. Prevalence of sunburn behaviors was compared from pre- to posttest using Pearson's chi-square tests. Changes in sun protection behavior items were compared from pre- to posttest using Wilcoxon signed rank sum tests for ordinal data. A mixed effects linear model was used to assess main effects of the intervention, estimating mean difference in pre- and posttest outcome variables. Gender, grade level (4–5 versus 6–8), self-reported skin type (a 5-category item dichotomized at the mean as lighter versus darker) and season of participation (Fall or Spring) were included as fixed effects with regression parameters quantifying the mean difference in pre- and posttest outcome variables of the non-reference category to the reference category. School was included as a random effect covariate to account for intraclass correlation of students nested within schools. Subgroup analysis was then conducted by including interaction terms in the model between each covariate and time.

All tests were two-tailed, with an α criterion of $P < 0.05$. Because of the multiple comparisons performed, the Bonferroni correction was then applied: $\alpha = 0.05/6 = 0.008$. Data analysis was conducted using Stata version 12 [33].

Results

Description of the sample

The demographic characteristics of the children participating in SunSmart are described in Table I.

Table I. *Demographic profile of intervention participants (N = 777)*

Mean age (SD)	10.5 (1.22)
	N (%)
Gender	
Female	418 (54)
Male	353 (45)
Missing	6 (1)
Grade level	
Fourth to fifth	482 (62)
Sixth to eighth	295 (38)
Season of participation	
Fall	295 (38)
Spring	482 (62)
Hair color	
Red or blonde	15 (2)
Light or medium brown	225 (29)
Dark brown or black	530 (68)
Missing	7 (1)
Skin tone	
Fair or medium white	187 (23)
Olive or light brown	518 (67)
Dark brown or black	60 (8)
Missing	12 (2)

The program was delivered in 47 classrooms in 19 schools. The mean age of students was 10.5 years, and the sample was 54% female. Thirty-eight percent of students participated in the intervention in the Fall and 68% in Spring. Sixty-two percent of students participating in the intervention were in fourth or fifth grade; the remainder were in sixth to eighth grade. The majority of children reported having dark brown or black hair (70%), and light brown skin (55%).

Attrition analysis indicated no significant differences between those who completed and those who did not complete both pretest and posttest by age, grade level, gender, skin type or sunburn in the past month.

The prevalence of sun protective practices of SunSmart participants from pre- to posttest are described in Table II.

Pre- to posttest changes

Mean changes in summary outcome variables from pre- to posttest are shown in Table III.

Table II. *Prevalence of baseline sun protective practices of intervention participants* (N = 777)

	Baseline N (%)	Follow-up N (%)	Chi-square
Sunburn in last month (Fall)			
Yes	103 (34.92)	32 (10.85)	$\chi = 56.256$ (9); $P < 0.0001$
No	158 (53.56)	381 (79.05)	
Don't know	30 (10.17)	56 (11.62)	
Missing	4 (1.36)	6 (1.24)	
Sunburn in last month (Spring)			
Yes	84 (17.43)	39 (8.09)	$\chi = 93.91$ (9); $P < 0.0001$
No	328 (68.05)	381 (79.05)	
Don't know	66 (13.69)	56 (11.62)	
Missing	4 (0.83)	6 (1.24)	
Sunburn last summer			
Yes	321 (41.31)	—	
No	347 (44.66)	—	
Don't know	91 (11.71)	—	
Missing	18 (2.32)	—	
Sun protective behaviors at school	Mean changes		Wilcoxon signed rank P-value
Wore a hat[a]	1.23	1.29	0.16
Wore a three-fourth sleeve or long-sleeved shirt[a]	3.73	3.79	0.13
Wore sunscreen[b]	1.93	1.93	0.61
Played in shade[a]	2.11	2.1	0.63

[a]Measured on a five-point Likert scale. [b]Measured on a three-point Likert scale

Table III. *Multiple regression coefficients for sun protective knowledge, attitudes, and behaviors on change scores from pre- to posttest*

	Protective behaviors (N = 777)[a]	Sunburn in last month (N = 777)[a]	Knowledge (N = 777)[a]	Tanning importance (N = 777)[a]	Attitudes (N = 157)[b]	Self-efficacy (N = 157)[b]
All participants	0.02	−0.17***^	0.66***^	0.13**	0.22***^	0.63***^
Covariates						
Baseline[c]	0.09*	−0.22***^	0.32	0.16	0.09	0.75***^
Gender (ref: male)	0.02	−0.05	0.19	−0.09	−0.12	−0.09
Grade level (ref: 6–8 grade)	−0.16***^	−0.03	0.82***^	−0.07	0.15	−0.28
Skin type (ref: darker)	0.02	−0.02	−0.20	0.05	−0.04	0.19
Season (ref: Fall)	0.006	0.16***^	−0.31*	0.09	0.10	0.10

Numbers are standardized regression coefficients (betas). [a]Full sample 2006–12. [b]Subset 2011–12. [c]Estimated mean pre-post difference for male, 6–8 grade, darker-skinned, Fall participation students. *$P < 0.10$, **$P < 0.05$, ***$P < 0.01$. Bonferroni's ^$P < 0.008$.

Sun-protective behaviors

In univariate analyses, no significant differences were observed between pre and posttest on individual behavior items. No significant changes in sun protective behaviors during peak hours at school were observed from pre- to posttest in multiple regression models when items were averaged into a continuous summary score. However, in subgroup analyses, students in grades 4–5 improved their behaviors on average −0.16 points less from pre- to posttest compared to students in grades 6–8 ($P < 0.001$).

Sunburn in past month

Self-reported sunburn in the past month decreased significantly from pre- to posttest in the full sample ($\beta = -0.17$; $P < 0.001$). In subgroup analyses, students who participated in the Spring reported higher scores and thus, lower sunburn decreases from pre- to posttest compared to those who participated in Fall ($P < 0.001$).

Knowledge

Sun protection knowledge increased significantly from pre- to posttest for the full sample ($\beta = 0.66$, $P < 0.001$). In subgroup analyses, younger students (in grades 4–5) improved their scores 0.82 points more from pre- to posttest than students in grades 6–8, for a total pre- to posttest change of 1.14 points ($P < 0.001$). Younger students, however, started at a significantly lower level of knowledge at pretest (data not shown). There was a trend toward lower increases in knowledge at follow-up for students who participated in the Spring intervention than for Fall participants ($P = 0.07$); however, this trend was not significant after Bonferroni correction.

Tanning importance

In the full sample, students' rating of tanning importance increased from pre- to posttest ($\beta = 0.13$, $P = 0.01$), indicating their belief that having a tan was more, rather than less, important. However, this change was not statistically significant after the Bonferroni correction. In subgroup analyses, there were no significant differences from pre- to posttest with respect to age, gender, skin type or season of participation for tanning beliefs.

Sun protective attitudes

Students' sun protective attitudes significantly improved from pre- to posttest in the full sample ($\beta = 0.22$; $P < 0.002$). In subgroup analyses, there were no significant differences from pre- to posttest for sun protective attitudes with respect to covariates.

Self-efficacy to use sunscreen

There was a significant increase in self-efficacy to use a sunscreen of SPF15 from pre- to posttest in the full sample ($\beta = 0.63$, $P < 0.001$). In subgroup analyses, there were no significant differences from pre- to posttest for self-efficacy to use sunscreen with respect to covariates.

Discussion

Our intervention was conducted in a largely Hispanic youth sample, an understudied population with respect to sun protection education. As with prior studies among NHW children and adolescents, gains in cognitive and psychosocial constructs such as knowledge and self-efficacy proved to be the strongest intervention effects over changes in sun protective behaviors [8, 10]. While behavioral change is necessary to ultimately impact rates of melanoma and non-melanoma skin cancers, the large and significant effects for cognitive and attitudinal variables observed in this study is promising. In cross-sectional studies as well as in several interventions among NHW samples, for example, improvement in self-efficacy has been found to be predictive both of intentions and actual use of sunscreen in children and young adults [13, 14, 34, 35], and positive attitudes and reduced barriers toward sun protection have been associated with greater general sun protection among middle school youth [14, 36]. Thus, strengthening these variables may impact protective behaviors over time, and future research with longitudinal follow-up may provide more definitive answers as to their role in sun protection.

While significant reduction in self-reported sunburn was achieved for the sample overall, this effect was moderated by season, with students in Spring achieving significantly less reduction in sunburn at posttest than those in Fall. These findings suggest seasonal effects on intervention efficacy; however, as Los Angeles has relatively consistent year-round UV values, it is difficult to attribute these differences to rising or decreasing UV values. The months of late September through early November in Southern

California, when the Fall intervention was conducted, often have maximal UV values equal to or exceeding those of March to early April, when the Spring intervention was conducted. Therefore, students taking part in the Fall may have had similar or greater opportunity to operationalize intervention concepts than those in Spring, explaining some of the seasonal difference.

Positive tanning attitudes were low in the sample overall, with a majority of students responding that having a tan was 'not important' at both pre- and posttest. Of concern, however, was the finding that students increased their beliefs that having a tan was important, counter to intervention aims. A similar finding was reported among a study conducted among an ethnically diverse sample of adolescents, where greater knowledge of sun safety predicted greater pro-tanning attitudes [37]. The authors of that study suggested that the strength of tanning norms may lead adolescents to misinterpret sun safety information, using it to 'tan safely', e.g. without sunburning. It is possible that children in this study misinterpreted intervention aims in similar fashion, with increases in knowledge influencing tanning norms for some intervention participants.

Another explanation for the increase in pro-tanning attitudes may be the impact of acculturation, which has been associated with differences in sun safety among Hispanics, with English-acculturated Hispanics more likely to engage in tanning than Spanish-acculturated Hispanics [23, 38]. While acculturation was not measured in this study, it is possible that the intervention was received differently according to level of acculturation, e.g. influencing or reinforcing tanning norms among highly acculturated students. Thus, our results indicate the need for further research to elucidate the influence of ethnicity and acculturation on tanning and sun protection norms in Hispanic youths.

This study was subject to several limitations, most significantly the lack of a control group, limiting conclusions that the observed changes resulted from the intervention. However, due to the short follow-up period and the fact that no events related to sun exposure occurred out of the ordinary during the intervention period, common threats to validity such as maturation and history are unlikely to explain intervention effects.

Our intervention, though set in schools with high Hispanic enrollment, was not extensively culturally tailored to this population, due both to the lack of resources and a paucity of data on sun protection motivators and barriers in Hispanic adolescents. In addition, only 5% of undergraduate instructors of the curriculum were Hispanic, whereas the majority were either Asian (22%) or NHW (21%). It is possible that Hispanic adolescents did not culturally identify with SunSmart instructors, which may have caused them to regard the information presented as not personally relevant.

The use of self-reported measures and low alpha reliability measures for scales may reduce validity of findings. Further, measures that were used were predominantly validated in NHW samples and thus may not generalize well to Hispanic or darker-skinned children. In addition, the follow-up period was brief at 3 weeks. Future studies with longer follow-up periods are needed to determine the intervention effects, as learned concepts may be put to use as children mature and gain more autonomy over their UV-related exposure and practices.

Despite these limitations, significant improvements were achieved across several psychosocial constructs, providing positive evidence for the potential for intervention in this population. That results resembled prior interventions among NHW children is also important to note. Strategies required to translate cognitive improvements to behavioral outcomes are required across ethnic subpopulations and might be broadly applicable, such as the incorporation of the family into sun protection education to model and reinforce sun protection behaviors [8]. Finally, the large sample size and focus on an understudied population in a high UV setting were strengths of the intervention.

Due to rapidly increasing rates of melanoma in Hispanics, the largest and one of the fastest growing ethnic groups in the United States, increased sun safety education targeted to Hispanic children and adolescents is needed. As future research continues to investigate optimal strategies for improving children's sun protection, qualitative and quantitative studies are needed to identify the factors motivating sun protective behaviors among Hispanic early adolescents. In particular, the role of acculturation and social environment on behavior are important factors to be explored in addition to the unique barriers that Hispanic children might face in practicing sun protection. Tanning norms should also be examined, as these may not only differ between Hispanic and NHW adolescents, but may be differentially perceived according to level of acculturation to mainstream US culture. The simultaneous and in-depth assessment of such variables is necessary in order to develop tailored interventions to improve sun protection in this at-risk population.

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Conflict of interest statement

None declared.

References

1. Marks R. Role of childhood in the development of skin cancer. *Aust Paediatr J* 1988; **24**: 337–8.
2. Truhan AP. Sun protection in childhood. *Clin Pediatr* 1991; **30**: 676–81.
3. Whiteman DC, Whiteman CA, Green AC. Childhood sun exposure as a risk factor for melanoma: a systematic review of epidemiologic studies. *Cancer Causes Control* 2001; **12**: 69–82.
4. Wiecker TS, Luther H, Buettner P *et al*. Moderate sun exposure and nevus counts in parents are associated with development of melanocytic nevi in childhood: a risk factor study in 1,812 kindergarten children. *Cancer* 2003; **97**: 628–38.
5. Swerdlow AJ, English J, MacKie RM *et al*. Benign melanocytic naevi as a risk factor for malignant melanoma. *Br Med J* 1986; **292**: 1555–9.
6. Godar DE, Urbach F, Gasparro FP *et al*. UV doses of young adults. *Photochem Photobiol* 2003; **77**: 453–7.
7. Crane LA, Asdigian NL, Baron AE *et al*. Mailed intervention to promote sun protection of children: a randomized controlled trial. *Am J Prev Med* 2012; **43**: 399–410.
8. Glanz K, Steffen AD, Schoenfeld E *et al*. Randomized trial of tailored skin cancer prevention for children: the Project SCAPE family study. *J Health Commun* 2013; **18**: 1368–83.
9. Buller DB, Borland R. Skin cancer prevention for children: a critical review. *Health Educ Behav* 1999; **26**: 317–43.
10. Buller DB, Buller MK, Beach B *et al*. Sunny days, healthy ways: evaluation of a skin cancer prevention curriculum for elementary school-aged children. *J Am Acad Dermatol* 1996; **35**: 911–22.
11. Buller DB, Taylor AM, Buller MK *et al*. Evaluation of the Sunny Days, Healthy Ways sun safety curriculum for children in kindergarten through fifth grade. *Pediatr Dermatol* 2006; **23**: 321–9.
12. Buller DB, Cokkinides V, Hall HI *et al*. Prevalence of sunburn, sun protection, and indoor tanning behaviors among Americans: review from national surveys and case studies of 3 states. *J Am Acad Dermatol* 2011; **65**: S114–23.
13. Myers LB HM. Social cognitive predictors of sun protection intention and behavior. *Behav Med* 2006; **32**: 57–63.
14. Reynolds KD, Buller DB, Yaroch AL *et al*. Mediation of a middle school skin cancer prevention program. *Health Psychol* 2006; **25**: 616–25.
15. Wright C RA, Gray A, Cox B. Child sun protection: sun-related attitudes mediate the association between children's knowledge and behaviours. *J Paediatr Child Health* 2008; **44**: 692–8.
16. Cress RD, Holly EA. Incidence of cutaneous melanoma among non-Hispanic whites, Hispanics, Asians, and blacks: an analysis of california cancer registry data, 1988–93. *Cancer Causes Control* 1997; **8**: 246–52.
17. Cockburn MG, Zadnick J, Deapen D. Developing epidemic of melanoma in the Hispanic population of California. *Cancer* 2006; **106**: 1162–8.
18. Linos E, Swetter SM, Cockburn MG *et al*. Increasing burden of melanoma in the United States. *J Invest Dermatol* 2009; **129**: 1666–74.
19. Fast Stats: An Interactive Tool for Access to SEER Cancer Statistics. Surveillance Research Program, National Cancer Institute. Available at: http://seer.cancer.gov/faststats. Accessed: 12 December 2014.
20. Rouhani P, Hu S, Kirsner RS. Melanoma in Hispanic and black Americans. *Cancer Control* 2008; **15**: 248–53.
21. Wu XC, Eide MJ, King J *et al*. Racial and ethnic variations in incidence and survival of cutaneous melanoma in the United States, 1999–2006. *J Am Acad Dermatol* 2011; **65**: S26–37.
22. Cormier JN, Xing Y, Ding M *et al*. Ethnic differences among patients with cutaneous melanoma. *Arch Intern Med* 2006; **166**: 1907–14.

23. Andreeva VA, Unger JB, Yaroch AL *et al*. Acculturation and sun-safe behaviors among US Latinos: findings from the 2005 Health Information National Trends Survey. *Am J Public Health* 2009; **99**: 734–41.
24. Coups EJ, Stapleton JL, Hudson SV *et al*. Sun protection and exposure behaviors among Hispanic adults in the United States: differences according to acculturation and among Hispanic subgroups. *BMC Public Health* 2012; **12**: 985.
25. Ma F, Collado-Mesa F, Hu S *et al*. Skin cancer awareness and sun protection behaviors in white Hispanic and white non-Hispanic high school students in Miami, Florida. *Arch Dermatol* 2007; **143**: 983–8.
26. National Center for Education Statistics. U.S. Department of Education. Institute of Education Sciences. Available at: http://nces.ed.gov. Accessed: 12 December 2014.
27. Bandura A. *Social Foundations of Thought and Action : A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall, 1986.
28. Bandura A. Social cognitive theory: an agentic perspective. *Annu Rev Psychol* 2001; **52**: 1–26.
29. Schwarzer R. *Self-efficacy : Thought Control of Action*. Washington: Hemisphere Pub. Corp., 1992.
30. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev* 1977; **84**: 191–215.
31. Pichon LC, Corral I, Landrine H *et al*. Sun-protection behaviors among African Americans. *Am J Prev Med* 2010; **38**: 288–95.
32. Cortina JM. What is coefficient alpha? An examination of theory and applications. *J Appl Psychol* 993; **78**: 98–104.
33. StataCorp. *Stata Statistical Software: Release 12*. College Station, TX: StataCorp LP., 2011.
34. Craciun C, Schuz N, Lippke S *et al*. A mediator model of sunscreen use: a longitudinal analysis of social-cognitive predictors and mediators. *Int J Behav Med* 2012; **19**: 65–72.
35. Schuz N, Eid M. Beyond the usual suspects: target group- and behavior-specific factors add to a theory-based sun protection intervention for teenagers. *J Behav Med* 2012; **36**: 508–19.
36. Alberg AJ, Herbst RM, Genkinger JM *et al*. Knowledge, attitudes, and behaviors toward skin cancer in Maryland youths. *J Adolesc Health* 2002; **31**: 372–7.
37. Andreeva VA, Reynolds KD, Buller DB *et al*. Concurrent psychosocial predictors of sun safety among middle school youth. *J Sch Health* 2008; **78**: 374–81.
38. Coups EJ, Stapleton JL, Hudson SV *et al*. Linguistic acculturation and skin cancer-related behaviors among Hispanics in the southern and western United States. *JAMA Dermatol* 2013; **149**: 679–86.