Awareness, behavior and attitudes concerning sun exposure among beachgoers in the northern coast of Peru

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Background: Skin cancer incidence has increased over the last years, becoming a major public health problem.

Objective: To describe the awareness, behavior and attitudes concerning sun exposure among beachgoers in the northern coast of Peru.

Methods: We conducted a cross-sectional study in the Pimentel beach, Peru. The "Beach Questionnaire" was used and we surveyed all the beachgoers from 8 a.m. to 4 p.m. and from March 5 to March 19. For the statistical analysis, sun exposure habits, sunburns history, knowledge, attitudes and practices were crossed with sex using the chi2 test.

Results: We surveyed 410 beachgoers, the most frequent phototype was type III (40.5%). Only the 13.66% of the respondents correctly answered the seven knowledge questions related to sun exposure and skin cancer. Men were more frequently agreed that “when they are tanned their clothes looks nicer” (p = 0.048). Likewise, regarding the questions "Sunbathing is relaxing" and “Sunbathing improves my mood", men agreed or totally agreed with more frequency than women (63.64% vs. 46.15%, p <0.001; and 61.36% vs 49.15%, p = 0.014, respectively). Regarding sun protection practices, women more frequently used sunshade (p = 0.001) and sunscreen (SPF≥15) (p <0.001) when compared to the male group.

Conclusion: Sun exposure is a potentially preventable risk factor for skin cancer. Thus, awareness of the risks of UVR overexposure and adequate sun-protective behaviors and attitudes are essential. Our results, however, are not as favorable as expected. Public Health efforts should encourage sun-safety precautions and intervention campaigns should be carried out in recreational settings, such as the beaches.
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Short title: Sun exposure among Peruvian beachgoers

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ABSTRACT

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BACKGROUND

Skin cancer incidence has increased over the last years, becoming a major public health problem with a serious economic burden to the healthcare system of many countries (1–3). According to GLOBOCAN estimates, about 232,000 cases of melanoma and 55,000 deaths from this cause occurred worldwide in 2012 (4).

In recent years, global incidence rates of skin cancer have increased and there are some published reports that evidence this situation. For example, melanoma raw incidence rates per 100,000 US population has climbed from 22.2 to 23.6 (2009-2016 period). Similarly, raw mortality rates per 100,000 population has increased from 2.8 to 3.1 (5). In Europe, melanoma trends has also increased in recent years, with the highest incidence rates in the UK, Ireland and the Netherlands (6). Unfortunately, available data for Latin America is very limited (7). In Peru, there has been reported a growing trend of skin cancer, becoming the fourth most frequent type of cancer in the country (8).

Sun exposure is considered a potentially preventable risk factor for skin cancer (9) and an adequate knowledge and good practices play an important role in the prevention of the disease. In fact, some studies have been carried out in order to assess these variables in patients, workers and students (10–15). However, only a few have focused on beachgoers, who are an important population at risk (16–18), and two of these studies only focused on behaviors and did not address knowledge or attitudes. In addition, the countries where these studies were conducted have a UV index lower than that reported in Peru (19).
In Peru, high temperature peaks have been reported over the last years, especially in 2017 (20). In addition, Peru has been cataloged by the National Meteorology and Hydrology Service (SENAMHI) as one of the countries with the highest solar radiation, reaching an index of ultraviolet radiation (UV index) of 19 on a scale of 0 to 20 (20). The northern coast of Peru has a semi-warm and tropical-dry climate where rainfall is barely present (21,22). In summer, this region becomes even warmer, surpassing 30°C (20,21).

For the above mentioned, the objective of the present study was to describe the awareness, behavior and attitudes concerning sun exposure among beachgoers in the northern coast of Peru.
METHODS

Study design

We conducted a cross-sectional study in the Pimentel beach, Peru.

Setting and Participants

Pimentel is one of the main beaches in the northern Peru and belongs to Lambayeque, which is considered a semi-warm and tropical-dry region, with temperatures that exceed 30°C during summer (20,21) (Figure 1).

We surveyed all the beachgoers from 8 a.m. to 4 p.m. and from March 5 to March 19 (Peruvian summer, 2018) (20). No sample was calculated. We surveyed all Spanish-speaking adults aged 18 to 59 who were in the study place within the specified time range.

Variables and Data collection

We applied the "Beach Questionnaire", validated by de Troya M et al (2009) in a sample of Spanish beachgoers (23). This instrument aims to evaluate subjects’ behavior, attitudes and knowledge regarding sun exposure, and has been used in previous studies with similar populations (24,25). It has also been shown to be valid, reliable (Cronbach $\alpha > 0.7$) and with good sensitivity to change (23,26).
The questionnaire included all our study variables and had the following sections: 1) Sociodemographic and academic data: sex, age, marital status, country of birth and educational level; 2) Color of non-sun-exposed skin: very fair, fair olive and dark; 3) Phototype: according to the Fitzpatrick model: I-IV, according to the erythema and tanning response after the first 60-minute sun exposure in summer (25); 4) Sun exposure habits on the beach in the last two summers: number of days spent at the beach each last two summers, number of hours per day and number of hours at midday (defined as between 12.00-16.00); 5) Sunburns history in the last summer (sunburn was defined as painful reddening of the skin) (25); 6) Participants' general knowledge about sun exposure with dichotomous response (true or false); 7) Attitudes related with sun exposure and sun protection, on a Likert-like scale of five categories (from "totally disagree" to "totally agree") and 8) Sun protection practices.

Statistical analysis

Collected data was entered into Microsoft Excel® with a double entry method to avoid errors during the process. After quality control, the database was exported to Stata v13.0 (StataCorp LP, College Station, TX, USA).

We used relative and absolute frequencies to describe categorical variables and medians with interquartile ranges (after checking the absence of normality with Shapiro Wilk) for numerical variables. For bivariate analysis, we compared the categorical variables according to sex using the chi² test. We considered a P-value<0.05 as statistically significant.
Ethics

This study was approved by the Institutional Review Board of the Hospital Nacional Docente Madre-Niño San Bartolome (RCEI-40), Lima, Peru. The participation was voluntary, and participants provided their informed oral consent, prior filling the survey. The anonymity of the participants and data confidentiality were ensured.
RESULTS

Baseline characteristics of the study population

We surveyed a total of 410 beachgoers. The most frequent skin colors were olive (46.6%) and pale (35.4%). The most frequent Fitzpatrick phototype was type III (40.5%). Detailed sociodemographic and academic data are shown in table 1.

Sun-exposure habits and sunburns history

Men went to the beach more frequently in the last two summers (20.46% went more than 15 days vs 12.82% of women, p = 0.028). Likewise, 62.2% of the participants reported having suffered at least one sunburn last summer (Table 2).

Knowledge about sun exposure

Only the 13.66% of respondents (n = 56) correctly answered the seven questions related to sun exposure and skin cancer (Table 3). Individual analysis showed that the following questions had the lower percentage of correct answers: “Sun protection creams prevent aging of the skin produced by solar radiation” (60.0%) and “If I use total sun block I can sunbathe without any risk” (58.29%). Likewise, according to sex, significant differences were found in the response to "Once my skin is tanned, I don’t need to use sun protection cream” (76.14% of men answered correctly, versus 88.46% of women, p = 0.001).

Attitudes related with sun exposure

More than three quarters of the respondents agreed or totally agreed that it is necessary to use sunscreen creams to avoid problems in the future (90.49%) and that its use is worthwhile despite
164 not getting a tan (77.80%) (Table 4). Men were more frequently agreed that when they are tanned
165 their clothes looks nicer (p = 0.048). Likewise, regarding the question "Sunbathing is relaxing",
166 men agreed or totally agreed with more frequency than women (63.64% vs. 46.15%, p <0.001).
167 The same thing happened with the item "Sunbathing improves my mood" (61.36% of men vs
168 49.15% of women, p = 0.014).

170 **Sun protection practices**

171 The 63.9% of the respondents indicated that they usually or always use sunscreen when they go
172 to the beach (Table 5). However, the compliance percentage was lower for the rest of the
173 practices. Analysis by sex showed that women more frequently used sunshade (p = 0.001) and
174 sunscreen (SPF≥15) (p<0.001).
DISCUSSION

Sun-exposure habits and sunburns history

In our study, we found that men went with more frequency to the beach than women, which may be related to recreational activities that are often performed at the place of study (e.g. surfing and soccer). This finding differs from that found by Fernández T et al (2014). In their study, women went to the beach more frequently (75.5% compared to 66.4% of men) (15). However, this may be because its population was comprised only of adolescents, which may be related to another of their findings, which was a higher likelihood for sunbathing and tanning by the female group.

We found that more than 60% had suffered at least one sunburn in the last summer, a percentage higher than those reported in studies conducted in the US (27,28) and Europe (25,29,30). This may be due to the lack of education in the local population, which negatively affects their practices and habits regarding sun exposure. This finding is a call for the implementation of intervention and education strategies, since it has been demonstrated that a personal sunburns history is strongly associated with skin cancer (1,2,31,32).

Participants' general knowledge about sun exposure

Less than 15% of the respondents correctly answered the seven questions about sun exposure. This lack of knowledge could be a possible explanation for the growing trend of skin cancer in the Peruvian population (8). Studies conducted in adolescents and adults beachgoers in Spain have reported better levels of knowledge (15,16), which could be a reflection of the positive impact of the interventions and campaigns that have been carried out in that country (24,26,33).
Some studies suggest that a good level of knowledge about sun exposure may not always go hand in hand with adequate attitudes or practices (34–36). However, a systematic review showed that some sun protection behaviors were positively associated with a good level of knowledge about skin cancer (37). Also, a study conducted by de Troya M et al (2018) reported an important role of knowledge about sun exposure in the prevention of sunburns (25).

Attitudes related with sun exposure

Most of the participants presented good attitudes regarding the use of sunscreen. These results are more favorable to those found by Mousavi F et al (2011) (35) and Fernandez T et al (2017) (14). A possible explanation may be that during the last summer, high temperature peaks were reported in comparison to previous years, as well as heavy rains on the northern coast of Peru (20). To face the problem, intervention, reconstruction and prevention activities were carried out, including information campaigns which were disseminated by local and national media.

On the other hand, men presented inappropriate attitudes more frequently, which differs from the results reported in two studies conducted in Spain (14,15). A possible explanation may lie in the continuing influence of social media on current stereotypes and the perception of beauty and body image concerns (38,39). In this sense, since tanning has usually been related to concepts of beauty, our result could be understood a little more by the fact that nowadays men are increasingly adopting some attitudes that were previously prioritized by women, such as sunbathing and tanning (14,29).

Sun protection practices
More than half of the participants reported a frequent sunscreen use (usually or always). This result is similar to that found by Devos et al (2012) in a sample of beachgoers from the northern coast of Belgium (40), and better than those reported in other studies conducted in Europe (15,18) and Asia (35,36). However, the percentages of compliance for the other practices were less than 50%. Since current literature mentions that sunscreen use alone is not enough to control the skin exposure to UVR (41–43), beachgoers should adopt other measures, such as avoiding midday, wearing hat/cap and long-sleeved clothes, seeking for shade and skin self-examination (9,43–45).

Women had more and better sun protection practices, mainly related to the use of sunscreen and sunshade. Previous research have also reported better sun exposure behaviors and practices in this population (18,36,40,46). This may be linked to the attitudes that, according to our study, were also better in women. In addition, this could explain why sunburns are more frequent in men, according to some studies (25,47,48).

Relevance and implications
Skin cancer has become a major public health problem (1–3). In recent years, its global incidence rates have increased (5–7), and Peru is not the exception (8). Thus, awareness of the risks of sun exposure and adequate sun-protective behaviors and attitudes are needed. Our results, however, are not as favorable as expected.

Evidence suggest that Public Health efforts should encourage sun-safety precautions to avoid UVR overexposure (29,49). In addition, beach seems to be an ideal setting for promoting adequate sun-protective behaviors (16). In this sense, prevention, detection and intervention campaigns related
to sun protection and skin cancer should be carried out, as they have shown satisfactory results in
other studies (17,24,33,50).

Limitations
Some limitations must be highlighted. First, we used self-report questions; despite using a
validated instrument to measure our variables, social desirability bias might arise. Second, we did
not address some variables that could potentially influence the results of our study, such as current
or previous illnesses and family history of skin cancer. Finally, the extrapolation of our results is
limited to the Pimentel beachgoers. However, given that it is the busiest beach in Lambayeque, it
gives us a good approximation to the possible reality in the region.

Conclusion
Only one or two out of ten respondents correctly answered all the questions related to sun exposure
knowledge. Negative attitudes were more frequent in men, and women presented better practices.
Future research should study other variables that are also related to sun protection. Thus,
interventions could be more targeted and with even more promising results. Finally, we
recommend that future studies develop and evaluate the impact of sun-protective interventions, as
previous research have shown their potential to promote sun protection in recreational settings
(51–53).

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AUTHORS’ CONTRIBUTIONS

CJT-H and SJB-M conceived the idea of the manuscript. SJB-M, LMV-T, JP-F, OWV-T, RMB-M, and JAZ-G collected the data. CJT-H and CB performed the statistical analyses and wrote the first draft. All authors read and approved the final manuscript.
REFERENCES

1. Erdmann F, Lortet-Tieulent J, Schüz J, Zeeb H, Greinert R, Breitbart EW, Bray F. International trends in the incidence of malignant melanoma 1953-2008--are recent generations at higher or lower risk? Int J Cancer. 2013;132(2):385-400.

2. Garbe C, Leiter U. Melanoma epidemiology and trends. Clin Dermatol. 2009;27(1):3-9.

3. Guy GP, Machlin SR, Ekwueme DU, Yabroff KR. Prevalence and costs of skin cancer treatment in the U.S., 2002-2006 and 2007-2011. Am J Prev Med. 2015;48(2):183-7.

4. Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, Parkin DM, Forman D, Bray F. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. Int J Cancer. 2015;136(5):E359-386.

5. Glazer AM, Winkelmann RR, Farberg AS, Rigel DS. Analysis of Trends in US Melanoma Incidence and Mortality. JAMA Dermatol. 2017;153(2):225-6.

6. Arnold M, Holterhues C, Hollestein LM, Coebergh JWW, Nijsten T, Pukkala E, Holleczek B, Tryggvadóttir L, Comber H, Bento MJ, Diba ChS, Micallef R, Primic-Žakelj M, Izarzugaza MI, Perucha J, Marcos-Gragera R, Galceran J, Ardanaz E, Schaffar R, Pring A, de Vries E. Trends in incidence and predictions of cutaneous melanoma across Europe up to 2015. J Eur Acad Dermatol Venereol. 2014;28(9):1170-8.

7. Schmerling RA, Loria D, Cinat G, Ramos WE, Cardona AF, Sánchez JL, Martinez-Said H, Buzaid AC. Cutaneous melanoma in Latin America: the need for more data. Rev Panam Salud Publica. 2011;30(5):431-8.

8. Sordo C, Gutiérrez C. Cáncer de piel y radiación solar: experiencia peruana en la prevención y detección temprana del cáncer de piel y melanoma. Rev Peru Med Exp Salud Pública. 2013;30:113-7.

9. Molho-Pessach V, Lotem M. Ultraviolet radiation and cutaneous carcinogenesis. Curr Prob Dermatol. 2007;35:14-27.
10. Thomas-Gavelan E, Sáenz-Anduaga E, Ramos W, Sánchez-Saldaña L, Sialer M del C. Knowledge, attitudes and practices about sun exposure and photoprotection in outpatients attending dermatology clinics at four hospitals in Lima, Peru. An Bras Dermatol. 2011;86(6):1122-8.

11. Lucena EE de S, Costa DCB, da Silveira EJD, Lima KC. Occupation and factors associated with exposure to the sun among beach workers. Cienc Saude Coletiva. 2014;19(4):1171-8.

12. Hault K, Rönsch H, Beissert S, Knuschke P, Bauer A. Knowledge of outdoor workers on the effects of natural UV radiation and methods of protection against exposure. J Eur Acad Dermatol Venereol. 2016;30 Suppl 3:34-7.

13. Gao Q, Liu G, Liu Y. Knowledge, attitude and practice regarding solar ultraviolet exposure among medical university students in Northeast China. J Photochem Photobiol B. 2014;140:14-9.

14. Fernández-Morano T, Rivas-Ruiz F, de Troya-Martín M, Blázquez-Sánchez N, Ruiz MP, Buendía-Eisman A. Adolescents’ Attitudes to Sun Exposure and Sun Protection. J Cancer Educ. 2017;32(3):596-603.

15. Fernández-Morano T, De Troya-Martín M, Rivas-Ruiz F, Blázquez-Sánchez N, Del Boz-González J, Fernández-Peñas P, Buendía-Eisman A. Behaviour, attitudes and awareness concerning sun exposure in adolescents on the Costa del Sol. Eur J Dermatol. 2014;24(1):85-93.

16. Cercato MC, Ramazzotti V, Sperduti I, Asensio-Pascual A, Ribes I, Guillén C, Nagore E. Sun protection among Spanish beachgoers: knowledge, attitude and behaviour. J Cancer Educ. 2015;30(1):4-11.

17. Pagoto S, McChargue D, Fuqua RW. Effects of a multicomponent intervention on motivation and sun protection behaviors among midwestern beachgoers. Health Psychol. 2003;22(4):429-33.
18. Weinstock MA, Rossi JS, Redding CA, Maddock JE, Cottrill SD. Sun protection behaviors and stages of change for the primary prevention of skin cancers among beachgoers in southeastern New England. Ann Behav Med Publ Soc Behav Med. 2000;22(4):286-93.

19. Newman PA, McKenzie R. UV impacts avoided by the Montreal Protocol. Photochem Photobiol Sci. 2011;10(7):1152-60.

20. Servicio Nacional de Meteorología e Hidrología. Perú: SENAMHI; 2017.

21. Oficina Nacional de Gobierno Electrónico e Informática. Sistema Nacional de Información Geográfica Sayhuite. Perú; 2017.

22. Feddema JJ. A Revised Thornthwaite-Type Global Climate Classification. Phys Geogr. 2005;26(6):442-66.

23. de Troya-Martín M, Blázquez-Sánchez N, Rivas-Ruiz F, Fernández-Canedo I, Rupérez-Sandoval A, Pons-Palliser J, Perea-Milla E. Validación de un cuestionario en español sobre comportamientos, actitudes y conocimientos relacionados con la exposición solar: «Cuestionario a pie de playa». Actas Dermo-Sifiliográficas. 2009;100(7):586-95.

24. de Troya-Martín M, Delgado-Sánchez N, Blázquez-Sánchez N, Ortega-Tudela G, Toribio-Montero JC, Jabalera-Mesa ML, Ríos-Almellones I, Rivas-Ruiz F. Skin cancer prevention campaign aimed at beachgoers on the Costa del Sol (southern Spain). Int J Dermatol. 2014;53(11):e526-530.

25. de Troya-Martín M, de Gálvez-Aranda MV, Rivas-Ruiz F, Blázquez-Sánchez N, Fernández-Morano MT, Padilla-España L, Herrera-Ceballos E. Prevalence and predictors of sunburn among beachgoers. Photodermatol Photoimmunol Photomed. 2018;34(2):122-9.

26. Fernández-Morano T, de Troya-Martín M, Rivas-Ruiz F, Blázquez-Sánchez N, Buendía-Eisman A. Sensitivity to change of the Beach Questionnaire to behaviour, attitudes and knowledge related to sun exposure: quasi-experimental before-after study. BMC Public Health. 2015;15:60.
27. Buller DB, Cokkinides V, Hall HI, Hartman AM, Saraiya M, Miller E, Paddock L, Glanz K. 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(5 Suppl 1):S114-123.

28. Holman DM, Berkowitz Z, Guy GP, Hartman AM, Perna FM. The association between demographic and behavioral characteristics and sunburn among U.S. adults - National Health Interview Survey, 2010. Prev Med. 2014;63:6-12.

29. Haluza D, Simic S, Höltge J, Cervinka R, Moshammer H. Gender aspects of recreational sun-protective behavior: results of a representative, population-based survey among Austrian residents. Photodermatol Photoimmunol Photomed. 2016;32(1):11-21.

30. Kritsotakis G, Psarrou M, Vassilaki M, Androulaki Z, Philalithis AE. Gender differences in the prevalence and clustering of multiple health risk behaviours in young adults. J Adv Nurs. 2016;72(9):2098-113.

31. Sánchez G, Nova J, de la Hoz F. Risk Factors for Basal Cell Carcinoma: A Study From the National Dermatology Center of Colombia. Actas Dermo-Sifiliográficas. 2012;103(4):294-300.

32. Wu S, Cho E, Li W-Q, Weinstock MA, Han J, Qureshi AA. History of Severe Sunburn and Risk of Skin Cancer Among Women and Men in 2 Prospective Cohort Studies. Am J Epidemiol. 2016;183(9):824-33.

33. del Boz J, Fernández-Morano T, Padilla-España L, Aguilar-Bernier M, Rivas-Ruiz F, de Troya-Martín M. Campaña de prevención y detección de cáncer cutáneo en campos de golf de la Costa del Sol. Actas Dermo-Sifiliográficas. 2015;106(1):51-60.

34. Haluza D, Simic S, Moshammer H. Sun Exposure Prevalence and Associated Skin Health Habits: Results from the Austrian Population-Based UVSkinRisk Survey. Int J Environ Res Public Health. 2016;13(1).
35. Mousavi F, Golestan B, Vaseie M, Vaseie L, Khajeh-Kazemi R. Knowledge, attitude, and practice of adults to the protective actions against sun in northwest Tehran, Iran. Arch Iran Med. 2011;14(2):126-31.

36. Yan S, Xu F, Yang C, Li F, Fan J, Wang L, Cai M, Zhu J, Kan H, Xu J. Demographic differences in sun protection beliefs and behavior: a community-based study in Shanghai, China. Int J Environ Res Public Health. 2015;12(3):3232-45.

37. Day AK, Wilson CJ, Hutchinson AD, Roberts RM. The role of skin cancer knowledge in sun-related behaviours: a systematic review. J Health Psychol. 2014;19(9):1143-62.

38. Fardouly J, Vartanian LR. Social Media and Body Image Concerns: Current Research and Future Directions. Curr Opin Psychol. 2016;9:1-5.

39. Barlett CP, Vowels CL, Saucier DA. Meta-Analyses of the Effects of Media Images on Men’s Body-image Concerns. J Soc Clin Psychol. 2008;27(3):279-310.

40. Devos SA, Van der Endt JD, Broeckx W, Vandaele M, del Marmol V, Roseeuw D, Maselis T. Sunscreen use and skin protection behaviour on the Belgian beach: a comparison 9 years later. Eur J Cancer Prev. 2012;21(5):474.

41. Diffey B. Sunscreen isn’t enough. J Photochem Photobiol B. 2001;64(2):105-8.

42. Iannacone MR, Hughes MCB, Green AC. Effects of sunscreen on skin cancer and photoaging. Photodermatol Photoimmunol Photomed. 2014;30(2-3):55-61.

43. Grossman DC, Curry SJ, Owens DK, Barry MJ, Caughey AB, Davidson KW, Doubeni CA, Epling JW Jr, Kemper AR, Krist AH, Kubik M, Landefeld S, Mangione CM, Silverstein M, Simon MA, Tseng CW. Behavioral Counseling to Prevent Skin Cancer: US Preventive Services Task Force Recommendation Statement. JAMA. 2018;319(11):1134-42.

44. Skotarczak K, Osmola-Mańkowska A, Lodyga M, Polańska A, Mazur M, Adamski Z. Photoprotection: facts and controversies. Eur Rev Med Pharmacol Sci. 2015;19(1):98-112.

45. Mancebo SE, Hu JY, Wang SQ. Sunscreens: a review of health benefits, regulations, and controversies. Dermatol Clin. 2014;32(3):427-38, x.
46. Olsen CM, Thompson BS, Green AC, Neale RE, Whiteman DC, QSkin Sun and Health Study Group. Sun Protection and Skin Examination Practices in a Setting of High Ambient Solar Radiation: A Population-Based Cohort Study. JAMA Dermatol. 2015;151(9):982-90.

47. Reuter NP, Bower M, Scoggins CR, Martin RCG, McMasters KM, Chagpar AB. The lower incidence of melanoma in women may be related to increased preventative behaviors. Am J Surg. 2010;200(6):765-9.

48. Kasparian NA, McLoone JK, Meiser B. Skin cancer-related prevention and screening behaviors: a review of the literature. J Behav Med. 2009;32(5):406-28.

49. Blumthaler M. UV Monitoring for Public Health. Int J Environ Res Public Health. 2018;15(8).

50. Emmons KM, Geller AC, Puleo E, Savadatti SS, Hu SW, Gorham S, Werchniak AE; Dana-Farber Skin Cancer Screening Group. Skin cancer education and early detection at the beach: a randomized trial of dermatologist examination and biometric feedback. J Am Acad Dermatol. 2011;64(2):282-9.

51. Hay JL, Berwick M, Zielaskowski K, White KA, Rodríguez VM, Robers E, Guest DD, Sussman A, Talamantes Y, Schwartz MR, Greb J, Bigney J, Kaphingst KA, Hunley K, Buller DB. Implementing an Internet-Delivered Skin Cancer Genetic Testing Intervention to Improve Sun Protection Behavior in a Diverse Population: Protocol for a Randomized Controlled Trial. JMIR Res Protoc. 2017;6(4):e52.

52. Rodrigues AM, Sniehotta FF, Birch-Machin MA, Olivier P, Araújo-Soares V. Systematic and Iterative Development of a Smartphone App to Promote Sun-Protection Among Holidaymakers: Design of a Prototype and Results of Usability and Acceptability Testing. JMIR Res Protoc. 2017;6(6):e112.

53. Rodrigues A, Sniehotta FF, Araujo-Soares V. Are Interventions to Promote Sun-Protective Behaviors in Recreational and Tourist Settings Effective? A Systematic Review with Meta-analysis and Moderator Analysis. Ann Behav Med. 2013;45(2):224-38.
Figure 1
Map of the study area
Table 1 (on next page)

Sociodemographic, skin color and phototype data (n=410)

* Median (Interquartile range)
1 Table 1. Sociodemographic, skin color and phototype data (n=410)

| Characteristics          | n (%)       |
|--------------------------|------------|
| **Sex**                  |            |
| Male                     | 176 (42.9) |
| Female                   | 234 (57.1) |
| **Age (years)**          | 28 (18-65) |
| **Marital status**       |            |
| Single                   | 226 (55.1) |
| Married or living w/partner | 175 (42.7) |
| Separated/Divorced       | 6 (1.5)    |
| Widowed                  | 3 (0.7)    |
| **Country of birth**     |            |
| Peru                     | 401 (98.1) |
| Argentina                | 2 (0.5)    |
| Colombia                 | 3 (0.7)    |
| Ecuador                  | 2 (0.5)    |
| Mexico                   | 1 (0.2)    |
| **Education**            |            |
| None                     | 4 (1.0)    |
| Primary                  | 11 (2.7)   |
| Secondary                | 137 (33.4) |
| Higher Education         | 258 (62.9) |
| **Skin color**           |            |
| Very fair                | 22 (5.4)   |
| Fair                     | 145 (35.4) |
| Olive                    | 191 (46.6) |
| Dark                     | 52 (12.7)  |
| **Phototype**            |            |
| I                        | 62 (15.1)  |
| II                       | 79 (19.3)  |
| III                      | 166 (40.5) |
| IV                       | 103 (25.1) |

* Median (Interquartile range)
Table 2 (on next page)

Sun-exposure habits and sunburns history

*Chi2 test
Table 2: Sun-exposure habits and sunburns history

| Item                                                 | Men n (%) | Women n (%) | Total n (%) | p*  |
|-------------------------------------------------------|-----------|-------------|-------------|-----|
| In relation with the last two summers, choose…        |           |             |             |     |
| Days of sun on the beach                              |           |             |             |     |
| None                                                  | 16 (9.09) | 40 (17.09)  | 56 (13.66)  | 0.028 |
| 1 - 5                                                 | 95 (53.98)| 120 (51.28) | 215 (52.44) |     |
| 6 - 15                                                | 29 (16.48)| 44 (18.80)  | 73 (17.80)  |     |
| 16 - 30                                               | 17 (9.66) | 9 (3.85)    | 26 (6.34)   |     |
| >30                                                   | 19 (10.80)| 21 (8.97)   | 40 (9.76)   |     |
| Hours of sun exposure on the beach                    |           |             |             |     |
| <30 minutes                                           | 26 (14.77)| 41 (17.52)  | 67 (16.34)  | 0.706 |
| 30 minutes - 1 hour                                   | 43 (24.43)| 52 (22.22)  | 95 (23.17)  |     |
| 1 - 3 hours                                           | 65 (36.93)| 93 (79.74)  | 158 (38.54) |     |
| >3 hours                                              | 42 (23.86)| 48 (20.51)  | 90 (21.95)  |     |
| Hours of sun at midday                                |           |             |             |     |
| No sun                                                | 24 (13.64)| 42 (17.95)  | 66 (16.10)  | 0.184 |
| <1 hour                                               | 48 (27.27)| 42 (17.95)  | 90 (21.95)  |     |
| 1 - 2 hours                                           | 38 (21.59)| 61 (26.07)  | 99 (24.15)  |     |
| 2 - 4 hours                                           | 39 (22.16)| 56 (23.93)  | 95 (23.17)  |     |
| No sun                                                | 24 (13.64)| 42 (17.95)  | 66 (16.10)  | 0.184 |
| <1 hour                                               | 48 (27.27)| 42 (17.95)  | 90 (21.95)  |     |
| 1 - 2 hours                                           | 38 (21.59)| 61 (26.07)  | 99 (24.15)  |     |
| 2 - 4 hours                                           | 39 (22.16)| 56 (23.93)  | 95 (23.17)  |     |
| Last summer…                                          |           |             |             |     |
| Sunburns                                              |           |             |             |     |
| None                                                  | 63 (35.80)| 92 (39.32)  | 155 (37.80) | 0.818 |
| 1 - 2                                                 | 73 (41.48)| 100 (42.74)| 173 (42.20) |     |
| 3 - 5                                                 | 28 (19.51)| 29 (12.39)  | 57 (13.90)  |     |
| 6 - 10                                                | 5 (2.84)  | 5 (2.14)    | 10 (2.44)   |     |
| >10                                                   | 7 (3.98)  | 8 (3.42)    | 15 (3.66)   |     |

*Chi2 test
Table 3 (on next page)

Participants' general knowledge about sun exposure

*Chi2 test
### Table 3. Participants’ general knowledge about sun exposure

| Item                                                                 | Men n (%)       | Women n (%)      | Total n (%) | p*  |
|----------------------------------------------------------------------|-----------------|------------------|-------------|-----|
| **Sun protection creams prevent aging of the skin produced by solar radiation** |                 |                  |             |     |
| True                                                                | 107 (60.80)     | 139 (59.40)      | 246 (60.0)  | 0.776|
| False                                                               | 69 (39.20)      | 95 (40.60)       | 164 (40.0)  |     |
| **Sun is the main cause of skin cancer**                            |                 |                  |             | 0.452|
| True                                                                | 163 (92.61)     | 221 (94.44)      | 384 (93.66) |     |
| False                                                               | 13 (7.39)       | 13 (5.56)        | 26 (6.34)   |     |
| **Sun produces marks on the skin**                                  |                 |                  |             | 0.135|
| True                                                                | 152 (86.36)     | 213 (91.03)      | 365 (89.02) |     |
| False                                                               | 24 (13.64)      | 21 (8.97)        | 45 (10.98)  |     |
| **If I use sunscreen I can sunbathe without any risk**               |                 |                  |             |     |
| True                                                                | 79 (44.89)      | 92 (39.32)       | 171 (41.71) | 0.258|
| False                                                               | 97 (55.11)      | 142 (60.68)      | 239 (58.29) |     |
| **Avoiding the midday sun (11-17 hours) is the most efficient way of protecting my skin** |                 |                  |             |     |
| True                                                                | 137 (77.84)     | 176 (75.21)      | 313 (76.34) | 0.536|
| False                                                               | 39 (22.16)      | 58 (24.79)       | 97 (23.66)  |     |
| **Once my skin is tanned, I don’t need to use sun protection cream**|                 |                  |             | 0.001|
| True                                                                | 42 (23.86)      | 27 (11.54)       | 69 (16.83)  |     |
| False                                                               | 134 (76.14)     | 207 (88.46)      | 341 (83.17) |     |

*Chi2 test
Table 4 (on next page)

Attitudes related with sun exposure

*Chi2 test
| Item                                                                 | Men n (%) | Women n (%) | Total n (%) | p*  |
|---------------------------------------------------------------------|-----------|-------------|-------------|-----|
| **When I am tanned my clothes look nicer**                         |           |             |             |     |
| Totally agree / Agree                                               | 61 (34.66)| 60 (25.64)  | 121 (29.51)| 0.048|
| Indifferent / Disagree / Totally disagree                           | 115 (65.34)| 174 (74.36) | 289 (70.49)|     |
| **Sunbathing helps prevent health problems**                        |           |             |             |     |
| Totally agree / Agree                                               | 76 (43.18)| 109 (46.58) | 185 (45.12)| 0.494|
| Indifferent / Disagree / Totally disagree                           | 100 (56.82)| 125 (53.42) | 225 (54.88)|     |
| **I like the feeling of the sun on my skin when I am lying on the beach** |           |             |             |     |
| Totally agree / Agree                                               | 64 (36.36)| 65 (27.78)  | 129 (31.46)| 0.064|
| Indifferent / Disagree / Totally disagree                           | 112 (63.64)| 169 (72.22) | 281 (54.88)|     |
| **It is worth using sun protection cream to avoid future problems** |           |             |             |     |
| Totally agree / Agree                                               | 161 (91.48)| 210 (89.74) | 371 (90.49)| 0.554|
| Indifferent / Disagree / Totally disagree                           | 15 (8.52)  | 24 (10.26)  | 39 (9.51)  |     |
| **I find sun protection creams unpleasant**                         |           |             |             |     |
| Totally agree / Agree                                               | 52 (29.55)| 69 (29.49)  | 121 (29.51)| 0.990|
| Indifferent / Disagree / Totally disagree                           | 124 (70.45)| 165 (70.51) | 289 (70.49)|     |
| **It is worth using sun protection cream even though I don’t get a tan** |           |             |             |     |
| Totally agree / Agree                                               | 136 (77.27)| 183 (78.21) | 319 (77.80)| 0.822|
| Indifferent / Disagree / Totally disagree                           | 40 (22.73) | 51 (21.79)  | 91 (22.20) |     |
| **People with a tan are more attractive**                           |           |             |             |     |
| Totally agree / Agree                                               | 67 (38.07)| 79 (33.76)  | 146 (35.61)| 0.367|
| Indifferent / Disagree / Totally disagree                           | 109 (61.93)| 155 (66.24) | 264 (64.39)|     |
| **Sunbathing is healthy for my body**                              |           |             |             |     |
| Totally agree / Agree                                               | 95 (53.98)| 107 (45.73) | 202 (49.27)| 0.098|
| Indifferent / Disagree / Totally disagree                           | 81 (46.02) | 127 (54.27) | 208 (50.73)|     |
| **Sunbathing is relaxing**                                         |           |             |             | <0.001|
| Totally agree / Agree                                               | 112 (63.64)| 108 (46.15) | 220 (53.66)|     |
| Indifferent / Disagree / Totally disagree                           | 64 (36.36) | 126 (53.85) | 190 (46.34)|     |
| **Having a tan makes you look young and relaxed**                  |           |             |             | 0.123|
| Totally agree / Agree                                               | 63 (35.80)| 67 (28.63)  | 130 (31.71)|     |
| Indifferent / Disagree / Totally disagree                           | 113 (64.20)| 167 (71.37) | 280 (68.29)|     |
| **Sunbathing improves my mood**                                     |           |             |             |     |
| Totally agree / Agree                                               | 108 (61.36)| 115 (49.15) | 223 (54.39)| 0.014|
| Indifferent / Disagree / Totally disagree                           | 68 (38.64) | 119 (50.85) | 187 (45.61)|     |
| **I like sunbathing**                                               |           |             |             | 0.051|
| Totally agree / Agree                                               | 108 (61.36)| 121 (51.71) | 229 (55.85)|     |
| Indifferent / Disagree / Totally disagree                           | 68 (38.64) | 113 (48.29) | 181 (44.15)|     |
| **When I go to the beach I prefer to be in the shade**              |           |             |             | 0.785|
| Totally agree / Agree                                               | 128 (72.73)| 173 (73.93) | 301 (73.41)|     |
| Indifferent / Disagree / Totally disagree                           | 48 (27.27) | 61 (26.07)  | 109 (26.59)|     |
| **I don’t like high-protection creams because they are anti-aesthetic** |           |             |             |     |
|                      | Category 1 | Category 2 | Category 3 | Chi2 Test |
|----------------------|------------|------------|------------|-----------|
| **Totally agree / Agree** | 53 (30.11) | 62 (26.50) | 115 (28.05) | 0.420     |
| **Indifferent / Disagree / Totally disagree** | 123 (69.89) | 172 (73.50) | 295 (71.95) |           |

*Chi2 test
Table 5 (on next page)

Sun protection practices

SPF = Sun Protection Factor*Chi2 test
### Table 5. Sun protection practices

| Item                                         | Men n (%) | Women n (%) | Total n (%) | p*       |
|----------------------------------------------|-----------|-------------|-------------|----------|
| **Use sunshade**                             |           |             |             |          |
| When you go to the beach, you…              |           |             |             |          |
| Use sunshade                                 |           |             |             |          |
| Always                                       | 37 (21.02)| 92 (39.32)  | 129 (31.46) | 0.001    |
| Usually                                      | 27 (15.34)| 27 (11.54)  | 54 (13.17)  |          |
| Sometimes                                    | 50 (28.41)| 63 (26.92)  | 113 (27.56) |          |
| Almost never                                 | 25 (14.20)| 25 (10.68)  | 50 (12.20)  |          |
| Never                                        | 37 (21.02)| 27 (11.54)  | 64 (15.61)  |          |
| **Use sunglasses**                           |           |             |             |          |
| Always                                       | 35 (19.89)| 65 (27.78)  | 100 (24.39) | 0.406    |
| Usually                                      | 23 (13.07)| 28 (11.97)  | 51 (12.44)  |          |
| Sometimes                                    | 43 (24.43)| 58 (24.79)  | 101 (24.63) |          |
| Almost never                                 | 25 (14.20)| 28 (11.97)  | 53 (12.93)  |          |
| Never                                        | 50 (28.41)| 55 (23.50)  | 105 (25.61) |          |
| **Use hat or cap**                           |           |             |             |          |
| Always                                       | 57 (32.39)| 73 (31.20)  | 130 (31.71) | 0.718    |
| Usually                                      | 28 (15.91)| 35 (14.96)  | 63 (15.37)  |          |
| Sometimes                                    | 37 (21.02)| 60 (25.64)  | 97 (23.66)  |          |
| Almost never                                 | 20 (11.36)| 30 (12.82)  | 50 (12.20)  |          |
| Never                                        | 34 (19.32)| 36 (15.38)  | 70 (17.07)  |          |
| **Wear long sleeves or long trousers**       |           |             |             |          |
| Always                                       | 22 (12.50)| 27 (11.54)  | 49 (11.95)  | 0.742    |
| Usually                                      | 17 (9.66)| 16 (6.84)   | 33 (8.05)   |          |
| Sometimes                                    | 29 (16.48)| 48 (20.51)  | 77 (18.78)  |          |
| Almost never                                 | 33 (18.75)| 45 (19.23)  | 78 (19.02)  |          |
| Never                                        | 75 (42.61)| 98 (41.88)  | 173 (42.20) |          |
| **Avoid sun 12.00-16.00**                    |           |             |             |          |
| Always                                       | 38 (21.59)| 60 (25.64)  | 98 (23.90)  | 0.802    |
| Usually                                      | 32 (18.18)| 44 (18.80)  | 76 (18.54)  |          |
| Sometimes                                    | 61 (34.66)| 72 (30.77)  | 133 (32.44) |          |
| Almost never                                 | 15 (8.52)| 23 (9.83)   | 38 (9.27)   |          |
| Never                                        | 30 (17.05)| 35 (14.96)  | 65 (15.85)  |          |
| **Use sunscreen (SPF ≥15)**                  |           |             |             |          |
| Always                                       | 54 (30.68)| 125 (53.42) | 179 (43.66) | <0.001   |
| Usually                                      | 37 (21.02)| 46 (19.66)  | 83 (20.24)  |          |
| Sometimes                                    | 42 (23.86)| 43 (18.38)  | 85 (20.73)  |          |
| Almost never                                 | 14 (7.95)| 10 (4.27)   | 24 (5.85)   |          |
| Never                                        | 29 (16.48)| 10 (4.27)   | 39 (9.51)   |          |

SPF = Sun Protection Factor

*Chi² test