

## RESEARCH ARTICLE

# Sun Protection Use Behaviour among University Students from 25 Low, Middle Income and Emerging Economy Countries

Supa Pengpid<sup>1,2</sup>, Karl Peltzer<sup>1,3,4\*</sup>**Abstract**

The aim of this study was to investigate the sun protection use behaviour among university students from 25 low, middle income and emerging economy countries. Using anonymous questionnaires, data were collected from 18,687 undergraduate university students aged 18-30 years (mean age 20.8, SD=2.8) from 26 universities in 25 countries across Asia, Africa and the Americas. Overall, 57.2% of university students reported liking to sunbathe and of those only 48.1% used sun protection when sunbathing. In multivariate logistic regression, younger age, being female, coming from a wealthy or quite well off economic family background, living in an upper middle or high income country, lighter skin tone, and other health behaviours were found to be associated with sun protection use behaviour. Low sun protection use calls for health promotion programmes to prevent unprotected sun exposure.

**Keywords:** Sunbathing - sun protection use - skin tone - risk factors - university students - multi-country study

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**Introduction**

Over the past decades the incidence of both non-melanoma and melanoma skin cancers has been increasing (Kozma and Eide, 2014; WHO, 2014). According to WHO (2014, p.1), “currently, between 2 and 3 million non-melanoma skin cancers and 132,000 melanoma skin cancers occur globally each year. As ozone levels are depleted, the atmosphere loses more and more of its protective filter function and more solar UV radiation reaches the Earth’s surface. It is estimated that a 10 percent decrease in ozone levels will result in an additional 300,000 non-melanoma and 4,500 melanoma skin cancer cases. The global incidence of melanoma continues to increase - however, the main factors that predispose to the development of melanoma seem to be connected with recreational exposure to the sun and a history of sunburn. These factors lie within each individual’s own responsibility.”

“Skin cancer is less prevalent in people of color than in the white population. However, when skin cancer occurs in non-whites, it often presents at a more advanced stage, and thus the prognosis is worse compared with white patients... Public education campaigns should be expanded to target communities of color to promote self-skin examination and stress importance of photoprotection, avoidance of tanning bed use, and early skin cancer detection and treatment” (Agbai et al., 2014, p.748).

In various surveys among adolescents and university students in high income and middle income countries low to high sun protection use behaviour has been observed. In a study among European university students from 13 countries in 2000, 83% of men and 94% of women were sunbathing and sun protection use when sunbathing was 63% in men and 87% in women, respectively (Peacey et al., 2006). Similarly, high sunscreen use (51% in men and 70% in women) has been found among Swedish university students (Jerkegren et al., 1999), while a study among US university students only 5.1% regularly use sunscreen when exposed to the sun (Spradlin et al., 2010). Studies in middle income countries, found among high school students in Brazil that about 47% reported sunscreen use in summer and only 3% reported using sunscreen during winter (Benvenuto-Andrade et al., 2005), while among university students in Brazil only 12.5% of men and 13.1% sunbathed, and 75.1% of men and 91.1% of women used sunscreen either regularly or irregularly (Castilho et al., 2010). In Malaysia 42.9% of a sample of university students used sun protection (Al-Naggat et al., 2013) and in Thailand 27.1% of the male and 52.9% of the female university students (Nanakorn et al., 1999). Among school children in South Africa, 65.4% used sunscreen (Wright et al., 2014), and among girl students in Iran 24.7% reported that they always use sunscreen (Davati et al., 2013). In health care staff and students in Turkey only 19.4% of men and 39.2% of women used sun protection (Ermertcan et

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al., 2005).

Sun protection use has been associated with sociodemographic factors, being female (Jerkegren et al., 1999; Nanakorn et al., 1999; Dalli et al., 2004; Peacey et al., 2006; Kasparian et al., 2009; Al-Naggar et al., 2013), not being an adolescent or young adult (Kasparian et al., 2009), and higher socioeconomic status (Ermertcan et al., 2005; Peacey et al., 2006; Al-Naggar et al., 2013), *ii*) lighter skin tone (Wright et al., 2014) or individuals with sun-sensitive skin types (skin types I and II) (Kasparian et al., 2009), *iii*) health benefits (Peacey et al., 2006; Kasparian et al., 2009), and *iiii*) other health behaviour such as fiber intake and brushing the teeth (Al-Naggar et al., 2013).

The aim of this study was to investigate the sun protection use behaviour among university students from 25 low, middle income and emerging economy countries.

## Materials and Methods

### Sample and procedure

This cross-sectional study was carried out with a network of collaborators in participating countries (see Acknowledgments). The anonymous, self-administered questionnaire used for data collection was developed in English, then translated and back-translated into languages (Arabic, Bahasa, Chinese, French, Lao, Russian, Spanish, Thai, Turkish) of the participating countries. The study was initiated through personal, academic contacts of the principal investigators. These collaborators arranged for data to be collected from intended 400 male and 400 female undergraduate university students aged 16-30 years by trained research assistants in 2013 in 1 or 2 universities in their respective countries. The universities involved were located in the capital cities or other major cities in the participating countries. Research assistants working in the participating universities asked undergraduate students to complete the questionnaire at the end of a teaching class. Classes were recruited according to timetable scheduling using stratified random sampling. Informed consent was obtained from participating students, and the study was conducted in 2013. Participation rates in most countries were over 90%. Ethics approvals were obtained from all participating institutions.

### Measures

**Sun protection use:** Participants were asked, "When you sunbathe, do you use sun protection, sunscreen cream or lotion? Response options were "Yes", "No", or "I never sunbathe." (Peacey et al., 2006) Socio-demographic questions included age, gender, and socioeconomic background was assessed by asking survey participants to rate their family background as wealthy (within the highest 25% in their "country", in terms of wealth), quite well off (within the 50% to 75% range for their country), not very well off (within the 25% to 50% range from "country"), or quite poor (within the lowest 25% in their country, in terms of wealth). The study population was subsequently divided into less wealthy (quite poor and not very well off) and more wealthy (quite well off, wealthy) (Wardle and Steptoe, 1991).

### Other health behaviours

Other health behaviour assessed included 1) Tobacco use, which was assessed with the question: Do you currently use one or more of the following tobacco products (cigarettes, snuff, chewing tobacco, cigars, etc.)? Response options were "yes" or "no" (World Health Organization, 2008); 2) Seat belt use, which was assessed with the question, "When driving or riding in the front seat of a car do you wear a seat belt?" Response options were, All the time, Some of the time, Never, I don't ride in cars; 3) Dietary behaviour which included the question of trying to avoid eating foods that contain fat and cholesterol (yes, no); and 4) The use of skin Lighteners which was assessed with the question, "How often have you used skin Lighteners (or bleachers) in the past year?" Response options ranged from 1=never to 4=more than 10 times.

### Data analysis

The data were analysed using IBM SPSS (version 20.0). The proportion of sunbathing and sun protection use behaviour were calculated as a percentage. Logistic regression analysis was done with STATA to calculate the crude odds ratio (OR) with 95% confidence interval (CI) to determine the associations between sociodemographic variables, skin tone or type, other health risk behaviour and sun protection use. The country was entered as the primary sampling unit for survey analysis in STATA in order to achieve accurate CIs, given the clustered nature of the data.

## Results

### Sunbathing and sun protection use behaviour

The total sample included 18687 undergraduate university students (mean age 20.8, SD=2.8, age range of 16-30 years) from 25 countries. Table 1 shows the number of participants in each university or country, and the proportion of students who sunbath and the proportion using sun protection when sunbathing. Overall, 57.2% of university students sunbath and of those who sunbath 48.1% used sun protection when sunbathing. The prevalence of sunbathing was highest (>80%) in university students from South American study countries (Columbia and Venezuela), North Africa and Central Asia (Tunisia, Turkey, Russia and Kyrgyzstan), and lowest (<33%) in Caribbean countries (Barbados, Grenada and Jamaica), Ivory Coast and Thailand. The use of sun protection when sunbathing was the highest among students in India (63.6%), followed by Bangladesh (57.3%), and Nigeria (55.4%) and lowest (<21%) in the Philippines, Jamaica and Namibia. The prevalence of sun protection use when sunbathing was higher in females than males in most study countries, in particular in Turkey and India (see Table 1).

### Associations with sun protection use behaviour

In multivariate logistic regression, younger age, being female, coming from a wealthy or quite well off economic family background, living in an upper middle or high income country, lighter skin tone, and other health behaviours were found to be associated with sun protection use behaviour (see Table 2).

**Table 1. Sunbathing and Use of Sun Protection by Country and Gender**

Country	Sample N	Proportion who sunbath			Proportion using sun protection when sunbathing			Skin type <sup>5</sup>
		All %	Men %	Women %	All %	Men %	Women %	
All	18687	57.2	56.8	57.5	48.1	32.0	59.4*	
Caribbean and South America								
Barbados <sup>4</sup>	570	29.8	26.5	34.3	50.6	38.3	55.3	IV
Grenada <sup>3</sup>	423	32.1	33.8	31.0	34.1	34.3	33.8	IV
Jamaica <sup>3</sup>	757	22.7	20.2	23.5	20.9	13.4	25.7	IV
Colombia <sup>3</sup>	816	97.8	97.2	98.2	43.9	32.4	55.1*	IV
Venezuela <sup>3</sup>	559	92.3	90.1	93.8	39.0	32.1	53.3*	IV
Sub-Saharan Africa								
Cameroon <sup>2</sup>	627	88.8	88.8	88.9	42.7	21.4	58.6*	V
Ivory Coast <sup>2</sup>	784	27.4	27.3	27.6	49.8	45.5	50.9	V
Madagascar <sup>1</sup>	787	66.1	65.2	67.0	49.6	26.9	54.6*	V
Mauritius <sup>3</sup>	495	42.8	45.8	41.5	33.5	23.2	48.3*	V
Namibia (89.3% African Black) <sup>3</sup>	452	67.5	53.8	72.5*	20.6	13.5	22.8	V
Nigeria <sup>2</sup>	744	47.3	48.0	46.4	55.4	48.1	57.6	V
South Africa (99.7% African Black) <sup>3</sup>	820	60.8	61.0	60.3	43.7	41.8	44.8	V
North Africa and Central Asia								
Tunisia <sup>3</sup>	884	82.7	77.2	85.4*	30.5	16.4	57.8*	III/IV
Turkey <sup>3</sup>	796	85.1	84.3	85.8	49.3	38.4	74.0*	III
Russia <sup>3</sup>	797	90.3	88.7	91.9	48.2	30.7	64.5*	II
Kyrgyzstan <sup>1</sup>	837	85.5	85.2	85.8	42.6	17.7	64.2*	III
South Asia and China								
Bangladesh <sup>1</sup>	788	46.6	47.1	46.2	57.3	52.5	59.7	IV
India <sup>2</sup>	785	44.1	41.5	49.4	63.6	48.4	72.1*	V
Pakistan <sup>2</sup>	811	38.7	35.5	46.0*	49.7	40.3	55.4*	V
China <sup>3</sup>	1102	50.5	46.5	51.7	22.5	14.4	39.2*	III
Southeast Asia								
Indonesia <sup>2</sup>	747	52.9	53.7	52.5	31.4	12.2	52.1*	IV/V
Laos <sup>2</sup>	806	56.8	58.6	55.9	34.9	23.7	46.1	IV/V
Philippines <sup>2</sup>	781	47.2	34.3	51.7	18.7	10.6	29.2*	IV
Singapore <sup>4</sup>	879	37.2	37.1	37.3	49.8	36.7	66.0*	IV
Thailand <sup>3</sup>	840	31.7	31.3	31.8	27.1	21.5	42.3*	IV

<sup>1</sup>Low income country; <sup>2</sup>Lower middle income country; <sup>3</sup>Upper middle income country; <sup>4</sup>High income country (Source: World Bank, New Country Classifications, 2013) \*p<0.01 or p<0.001; <sup>5</sup>Fitzpatrick Scale: Type I: very light, Type II: light Type III: light intermediate; Type IV: Dark intermediate or "olive skin", Type V: Dark or "brown", Type VI: Very dark, or "black" (Fitzpatrick, 1975)

**Table 2. Relationship between Sociodemographics, Skin Type, other Health Behaviours and Sun Protection Use Behaviour**

Variables	Unadjusted Odds Ratio (95%CI)	Adjusted Odds Ratio (95%CI)
Sociodemographics		
Age in years	0.97 (0.96-0.99)***	0.98 (0.96-0.99)**
Gender		
Female	1	1
Male	0.32 (0.30-0.35)***	0.38 (0.34-0.42)***
Economic family background		
Not well off/Poor	1	1
Wealthy/ Quite well off	1.18 (1.09-1.27)***	1.28 (1.16-1.42)***
Country income		
Upper middle income/High income	1	1
Low income/Lower middle income	0.55 (0.57-0.60)***	0.67 (0.60-0.75)***
Skin type		
V	1	1
IV	2.23 (2.03-2.46)***	1.85 (1.64-2.09)***
II or III	2.99 (2.70-3.30)***	2.77 2.41-3.17)***
Other health behaviours		
Current tobacco use	0.75 (0.67-0.83)***	0.96 (0.84-1.10)
Consistently using seatbelt	1.50 (1.38-1.62)***	1.48 (1.34-1.63)***
Having used skin lightening products	1.96 (1.79-2.14)***	2.02 (1.79-2.28)***
Avoiding fat and cholesterol	1.54 (1.42-1.66)***	1.40 (1.27-1.55)***

## Discussion

The study found, among a large sample of university students across 25 low and middle and emerging economy countries, an overall low rate of sun protection use behaviour, which is comparable with several previous studies (Al-Naggar et al., 2013; Nanakorn et al., 1999), but lower than in a few studies in high income countries (Jerkegren et al., 1999; Peacey et al., 2006). Health promotion campaigns should stress the importance of photoprotection.

Compared to a study among European university students from 13 countries in 2000 (Peacey et al., 2006), this study found a much lower prevalence of sunbathing. In a review Kasparian et al. (2009) notes that paradoxically, individuals with sun-sensitive skin types (skin types I and II) like in the European 13 country university students study report higher frequencies of sunbathing. This study also found that university students from countries with a lighter skin tone engaged more frequently in sunbathing, but they also used more often sun protection, which was also found in previous studies (Kasparian et al., 2009; Wright et al., 2014).

In agreement with a number of studies (Jerkegren et al., 1999; Nanakorn et al., 1999; Dalli et al., 2004; Peacey et al., 2006; Kasparian et al., 2009; Al-Naggar et al., 2013), this study also found that female university students were more likely to use sun protection than male students. Further, the study found that university students coming from a wealthy or quite well off economic family background and living in an upper middle or high income country were more likely to use sun protection than students with a lower socioeconomic status. This finding has also been found in several previous studies (Ermertcan et al., 2005; Peacey et al., 2006; Al-Naggar et al., 2013). It is possible that costs are a significant barrier to the use of sunscreen in these developing countries, which needs further investigation.

This study also confirmed that sun protection use behaviour may cluster with other health behaviours, as also found in a study among university students in Malaysia (Al-Naggar et al., 2013). Regarding the found association between the use of skin lightening products and sun protection use, it is possible that skin lightening agents are combined with sunscreen (Badreshia-Bansal and Draelos, 2007).

### Study limitations

This study had several limitations. The study was cross-sectional, so causal conclusions cannot be drawn. The investigation was carried out with students from one or two universities in each country, and inclusion of other centres could have resulted in different results. University students are not representative of young adults in general, and the sun protection use behaviour may be different in other sectors of the population. Further, information on sunbathing frequency, the type and frequency of sun protection use, knowledge, and attitude of skin cancer and protection was not collected and should be included in future surveys (Jerkegren et al., 1999; Peacey et al., 2006; Davati et al., 2013; Saridi et al., 2014; Yilmaz et al., 2014).

In conclusion, Results show that sun protection use among this large sample of undergraduate university students was inadequate. Efforts should be made to develop educational programmes that can increase the importance of sun protection use.

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