Original Article

Sun Exposure and Sun Safety Habits Among Adults in Singapore: A Cross-Sectional Study

Kah Wai Cheong, *[1,2]MBBS, MRCP (UK), Yik Weng Yew, *[2]MBBS, MPH, Wei Jie Seow, [3]BSc, MSc, ScD

Abstract

Introduction: Sun exposure increases skin cancer risk. Studies have shown that demographic factors influence sun safety behaviour but there is a paucity of such data in Singapore. We aimed to identify sociodemographic predictors of sun safety habits in Singapore. Materials and Methods: A total of 2328 adults participated in a cross-sectional survey on time spent under the sun and sun safety habits (using protective headgear, body attire, umbrellas and sunscreens). A composite Sun Protection Score (higher scores represented better habits [range, 0–15]) and the average daily hours (ADH) of sun exposure were derived from the data. The relationship between the Sun Protection Score and ADH of sun exposure with sociodemographic factors was analysed using univariate (Mann-Whitney U or Kruskal-Wallis tests), multiple linear and logistic regression analyses. Results: The following statistically significant variables predicted a lower Sun Protection Score: men (β = -1.48, P <0.001), Indians (β = -1.04, P <0.001), history of diabetes (β = -0.60, P = 0.007) and people who do not consume alcohol (β = 0.31, P = 0.03). Younger adults (β = -0.2, P <0.001), men (β = 0.80, P <0.001), darker skin type (β = 0.27, P <0.001) and lower education level (β = -0.18, P <0.001) were statistically significant variables that predicted a longer ADH of sun exposure. Conclusion: The study has identified sociodemographic predictors of sun safety habits in Singapore.

Ann Acad Med Singapore 2019;48:412–28

Key words: Skin cancers, Ultraviolet radiation

Introduction

Exposure to solar ultraviolet radiation (UVR) is a major risk factor for skin cancers.[1,2] Although Asians have a lower risk of melanoma,[3] there has been a steady increase in the overall incidence of skin cancers from 7.4/100,000 in 2003–2006[4] to 19.3/100,000 (for men) and 14.4/100,000 in 2011–2015 (for women).[5]

Singapore is located near the equator and receives solar exposure all year. Studies have shown that demographic factors influence sun safety behaviour. For instance, white women are more likely to use tanning beds, men are more likely to get sunburned and the young tend to spend more time outdoors under the sun. Women tend to have better sun safety habits such as seeking shade and wearing protective clothing, hats or sunscreen.[6–11] However, clear cultural differences exist between countries and there is a paucity of such data in Singapore.

In this study, we aimed to identify sociodemographic predictors of sun safety habits and examine if there were any correlations between these habits and other health behaviours such as smoking and alcohol consumption in Singapore residents.

[1]Internal Medicine, National Healthcare Group, Singapore
[2]National Skin Centre, Singapore
[3]Saw Swee Hock School of Public Health, National University of Singapore and National University Health System, Singapore
*Co-first authors
Address for Correspondence: Dr Cheong Kah Wai, National Skin Centre, 1 Mandalay Road, Singapore 308205.
Email: kahwai1512@gmail.com

Materials and Methods

Study Population

A total of 2328 Singapore citizens and permanent residents aged 18–79 years old were recruited under the Singapore Health (SH) study from August 2012 to March 2013. The SH study is a nationally representative cross-sectional survey designed to estimate the prevalence of chronic diseases and specific health behaviours.[12] Information on umbrella, sunscreen, headgear and protective attire use was obtained. Demographic data such as age, gender, ethnic group, Fitzpatrick skin type, marital status, employment status, smoking history, alcohol consumption, body mass index (BMI), education level, household income, history of diabetes mellitus, hypertension and hyperlipidaemia were obtained in the same interview session. In line with local clinical practice guidelines for obesity,[13] BMI >23 was considered overweight (instead of the World Health Organization's classification of 25). Interviewers were asked to classify the Fitzpatrick skin type of the participant using a chart.[14] Consent was obtained from all participants. The study was approved by the ethics review board of the National University of Singapore.

Sun Protection Score

A composite Sun Protection Score was formulated from the responses with a higher score representing better habits (range, 0–15). Three points were each allocated to the following categories: headgear use, umbrella use, habits at work, habits at leisure time where shade is available, and habits at leisure time where shade is not available. The latter 3 categories were divided into 3 sub-questions to examine upper body attire, lower body attire and sunscreen use during each period. Only participants who applied sunscreen with a sun protection factor (SPF) of ≥30 were awarded a point. This is because using a sunscreen of SPF of ≤30 is more likely to provide inadequate sun protection as studies have shown that SPF values on product labels are often overestimated and that many individuals apply less than half the recommended amount of sunscreen.[15–17]

Average Daily Hours (ADH) of Sun Exposure

Participants were asked how many hours they spent under direct sun exposure on work days and on rest days. The average number of hours spent under the sun in a day, or average daily hours (ADH), was calculated using the number of days the participant reported to work per week.

Statistical Analysis

Univariate analysis was performed (with Sun Protection Score and ADH as dependent variables) using the Mann-Whitney U test for independent variables with 2 groups and the Kruskal-Wallis test for independent variables with multiple groups. *P* values were calculated to test the null hypotheses of no significant difference of Sun Protection Score and ADH with the variables of interest.

Multiple linear regression analysis was then performed with Sun Protection Score and ADH hours as continuous dependent variables and age, gender, ethnic groups, Fitzpatrick skin type, marital status, employment status, smoking history, alcohol consumption, BMI, education level, household income, history of diabetes mellitus, hypertension and hyperlipidaemia as independent variables. Beta coefficient (β) and *P* values were calculated to test the null hypotheses of no significant association between the variables of interest with Sun Protection Score and ADH. Multicollinearity between the independent variables was assessed using variance inflation factor.

Multiple logistic regression analysis was performed with the individual sun safety habits ("umbrella use", "protective headgear use", "sunscreen use", "wearing of protective upper body attire", "wearing of protective lower body attire", "wearing of protective attire at any time") dichotomised into "yes" or "no" responses as the dependent variables and age, gender, ethnic groups, Fitzpatrick skin type, marital status, employment status, smoking history, alcohol consumption, BMI, education level, household income, history of diabetes mellitus, hypertension and hyperlipidaemia as independent variables. Odds ratios (ORs), 95% confidence intervals (CIs) and *P* values were calculated to test the null hypotheses of no association between variables of interest and sun safety habits.

A two-sided *P* <0.05 was considered statistically significant. Statistical Package for Social Sciences (version 25) was used to conduct the analysis.

Results

The mean age of the participants was 42.6 ± 15.1 years and 48.5% were male. There was an overrepresentation of Malays, Indians and other races compared to the racial make-up in Singapore. The majority of participants had either Fitzpatrick type 3 or 4 skin. The mean ADH was 1.45 ± 1.59 hours (range, 0–12 hours), of which 1.39 ± 1.95 hours (range, 0–12 hours) were spent at work and 1.52 ± 1.57 hours (range, 0–12 hours) were spent on rest days.

Few participants engaged in regular sun safety habits. Only 14.2% of participants wore protective headgear, 18.8% used umbrellas regularly and 23.9% applied sunscreens with an SPF of ≥30. Less than half wore protective upper or lower body attire at any time (Tables 1 and 2; Supplementary Table 1 provides a detailed breakdown analysis on use of upper and lower body protective attire). The mean Sun Protection Score was 3.31 ± 2.44 (range, 0–13).

Table 1. Logistic Regression Model With Protective Headgear and Umbrella Use as Dichotomous Dependent Variables

Variable	Protective Headgear Use						Umbrella Use					
	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value
Age (years)	-	-	1.01	0.99	1.02	0.11	-	-	1.03	1.01	1.04	<0.001
Gender												
Male	187	770	2.26	1.58	3.25	<0.001	35	922	0.08	0.05	0.12	<0.001
Female	94	932	1.00	-	-	-	338	688	1.00	-	-	-
Race												
Chinese	76	218	1.00	-	-	-	151	543	1.00	-	-	-
Malay	98	422	2.06	1.34	3.18	0.001	74	446	0.60	0.41	0.92	0.02
Indian	37	397	0.72	0.43	1.20	0.21	69	365	0.70	0.51	1.23	0.29
Fitzpatrick skin type												
1	2	32	1.00	-	-	-	10	24	1.00	-	-	-
2	17	103	2.62	0.54	12.7	0.23	37	83	1.51	0.46	3.35	0.43
3	154	1088	1.76	0.40	7.75	0.45	260	982	1.02	0.34	2.00	0.96
4	89	355	3.00	0.67	13.5	0.15	53	391	0.99	0.29	1.96	0.98
5	19	118	1.88	0.39	9.20	0.43	13	124	0.67	0.21	2.01	0.52
6	0	6	0	-	-	0.99	0	6	0	-	-	0.99
Marital status												
Married	208	1141	1.16	0.81	1.62	0.41	279	1070	1.54	1.20	2.23	0.01
Single/divorced/widowed	72	554	1.00	-	-	-	90	536	1.00	-	-	-
Employment status												
Employed	213	1182	1.16	0.80	1.67	0.43	214	1181	0.65	0.57	0.99	0.05
Unemployed	67	512	1.00	-	-	-	156	423	1.00	-	-	-
Ever smoked												
Yes	138	565	1.15	0.80	1.63	0.43	50	853	0.61	0.43	0.95	0.02
No	142	1131	1.00	-	-	-	320	953	1.00	-	-	-
Ever drank alcohol												
Yes	151	910	1.05	0.75	1.49	0.76	180	881	1.48	1.04	1.96	0.02
No	129	786	1.00	-	-	-	190	725	1.00	-	-	-
Body mass index (>23)												
Yes	171	988	0.89	0.66	1.21	0.47	190	969	0.93	0.70	1.22	0.62
No	109	708	1.00	-	-	-	180	637	1.00	-	-	-

CI: Confidence interval; GCE: General Certificate of Education; OR: Odds ratio; PSLE: Primary School Leaving Examination
The variance inflation factor values ranged from 1.138–2.318.

Table 1. Logistic Regression Model With Protective Headgear and Umbrella Use as Dichotomous Dependent Variables (Cont'd)

Variable	Protective Headgear Use						Umbrella Use					
	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value
Hypertension												
Yes	49	304	0.87	0.58	1.31	0.51	71	282	1.08	0.68	1.49	0.72
No	228	1375	1.00	-	-	-	297	1306	1.00	-	-	-
Diabetes mellitus												
Yes	27	161	0.75	0.44	1.29	0.30	28	160	0.50	0.30	0.83	0.04
No	248	1522	1.00	-	-	-	340	1430	1.00	-	-	-
Hyperlipidaemia												
Yes	74	419	0.93	0.65	1.34	0.70	74	419	1.24	0.93	1.84	0.22
No	195	1218	1.00	-	-	-	195	1218	1.00	-	-	-
Education						0.07						0.09
PSLE or below	60	285	1.00	-	-	-	76	269	1.00	-	-	-
GCE Ordinary or Normal level	95	644	0.65	0.43	1.01	0.05	145	594	1.43	0.92	2.14	0.09
GCE Advanced level or diploma	72	375	1.02	0.62	1.7	0.93	58	389	1.28	0.73	2.15	0.36
University degree and above	52	391	0.84	0.47	1.49	0.55	91	352	1.88	1.05	3.11	0.02
Household income per month						0.52						0.68
<$2000	59	282	1.00	-	-	-	65	276	1.00	-	-	-
$2000–3999	86	493	0.84	0.56	1.26	0.39	109	470	1.12	0.73	1.67	0.59
$4000–5999	51	353	0.73	0.45	1.16	0.18	73	331	0.98	0.61	1.53	0.96
≥$6000	60	415	0.72	0.44	1.17	0.18	89	386	0.87	0.52	1.37	0.57
Total, n (%)	281 (14.2)	1702 (85.8)					373 (18.8)	1610 (81.2)				

CI: Confidence interval; GCE: General Certificate of Education; OR: Odds ratio; PSLE: Primary School Leaving Examination
The variance inflation factor values ranged from 1.138–2.318.

Table 2. Logistic Regression Model With Wearing of Protective Body Attire and Sunscreen Use as Dichotomous Dependent Variables

Variable	Wearing of Any Form of Protective Attire At Any Time*						Sunscreen Use					
	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value
Age (years)	-	-	0.97	0.96	0.98	<0.001	-	-	1.00	0.99	1.02	0.55
Gender												
Male	689	163	1.38	0.98	1.95	0.07	82	770	0.14	0.10	0.20	<0.001
Female	675	194	1.00	-	-	-	330	539	1.00	-	-	-
Race						<0.001						<0.001
Chinese	495	86	1.00	-	-	-	177	404	1.00	-	-	-
Malay	372	92	0.98	0.64	1.50	0.92	88	376	0.58	0.38	0.87	0.009
Indian	258	117	0.43	0.28	0.66	<0.001	67	308	0.39	0.25	0.62	<0.001
Fitzpatrick skin type						0.20						0.54
1	21	4	1.00	-	-	-	9	16	1.00	-	-	-
2	88	13	0.89	0.17	4.58	0.89	34	67	1.10	0.36	3.33	0.87
3	891	183	0.68	0.15	3.08	0.62	282	792	0.99	0.36	2.74	0.99
4	281	120	0.45	0.09	2.08	0.31	70	331	1.47	0.51	4.25	0.48
5	79	37	0.46	0.09	2.20	0.33	17	99	1.32	0.40	4.36	0.64
6	4	0	0	-	-	0.99	0	4	0	-	-	0.99
Marital status												
Married	642	707	0.77	0.54	1.09	0.14	281	883	1.03	0.75	1.42	0.85
Single/divorced/widowed	257	369	1.00	-	-	-	130	420	1.00	-	-	-
Employment status												
Employed	976	238	1.12	0.82	1.53	0.48	286	928	1.22	0.90	1.65	0.20
Unemployed	384	115	1.00	-	-	-	125	374	1.00	-	-	-
Ever smoked												
Yes	486	140	0.66	0.47	0.94	0.02	91	535	0.95	0.67	1.36	0.78
No	875	214	1.00	-	-	-	320	769	1.00	-	-	-
Ever drank alcohol												
Yes	763	165	1.33	0.97	1.84	0.07	230	698	1.35	0.98	1.86	0.07
No	598	189	1.00	-	-	-	181	606	1.00	-	-	-
Body mass index (>23)												
Yes	787	210	1.25	0.94	1.66	0.13	200	797	0.89	0.67	1.12	0.41
No	574	144	1.00	-	-	-	211	507	1.00	-	-	-

CI: Confidence interval; GCE: General Certificate of Education; OR: Odds ratio; PSLE: Primary School Leaving Examination
The variance inflation factors ranged from 1.138–2.318.
*See Supplementary Table 2 for a detailed breakdown analysis of the use of upper and lower body protective attire (as dependent variables).

Table 2. Logistic Regression Model With Wearing of Protective Body Attire and Sunscreen Use as Dichotomous Dependent Variables (Cont'd)

Variable	Wearing of Any Form of Protective Attire At Any Time[*]						Sunscreen Use					
	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value
Hypertension												
Yes	220	72	1.08	0.73	1.58	0.71	57	235	0.91	0.60	1.37	0.64
No	1130	275	1.00	-	-	-	353	1052	1.00	-	-	-
Diabetes mellitus												
Yes	104	49	0.72	0.46	1.13	0.15	24	129	0.61	0.40	1.08	0.09
No	1246	299	1.00	-	-	-	384	1161	1.00	-	-	-
Hyperlipidaemia												
Yes	315	90	1.26	0.89	1.79	0.19	96	309	1.19	0.83	1.69	0.34
No	1010	245	1.00	-	-	-	308	947	1.00	-	-	-
Education						0.23						0.001
PSLE or below	175	94	1.00	-	-	-	42	227	1.00	-	-	-
GCE Ordinary or Normal level	516	140	1.45	0.99	2.12	0.06	166	490	2.37	1.49	3.77	<0.001
GCE Advanced level or diploma	338	63	1.30	0.81	2.12	0.27	90	311	1.82	1.05	3.14	0.03
University degree and above	331	57	1.56	0.92	2.64	0.09	113	275	2.48	1.41	4.35	0.02
Household income per month						0.22						0.16
<$2000	199	86	1.00	-	-	-	58	227	1.00	-	-	-
$2000 – 3999	289	110	1.20	0.82	1.73	0.35	100	399	0.82	0.64	1.24	0.35
$4000 – 5999	293	68	1.31	0.86	2.00	0.21	88	273	0.99	0.63	1.54	0.97
≥$6000	360	61	1.64	1.03	2.60	0.04	129	292	1.26	0.80	1.99	0.32
Total, n (%)	1364 (79.3)	357 (20.7)					412 (23.9)	1309 (76.1)				

CI: Confidence interval; GCE: General Certificate of Education; OR: Odds ratio; PSLE: Primary School Leaving Examination
The variance inflation factors ranged from 1.138–2.318.
[*]See Supplementary Table 2 for a detailed breakdown analysis of the use of upper and lower body protective attire (as dependent variables).

Univariate Analysis

A lower Sun Protection Score was associated with male gender (P <0.001), Indian ethnicity (P <0.001), high BMI (P <0.001), darker skin type (P <0.001), smokers (P <0.001), current employment (P <0.001) and history of diabetes mellitus (P = 0.003). A longer ADH was associated with an older age (P <0.001), male gender (P <0.001), Malay ethnicity (P <0.001), smokers (P <0.001), darker skin type (P <0.001), participants without hypertension (P = 0.006) and without hyperlipidaemia (P <0.001). More educated participants also tended to have longer ADH, although those with a university degree abstained more from the sun (P <0.001). These findings are presented in Table 3.

Multiple Linear Regression Analysis

By using multiple linear regression analysis to adjust for the independent variables, the following were statistically significant and predicted a lower Sun Protection Score: men (β = -1.43, P <0.001), Indians (β = -1.03, P <0.001), diabetics (β = -0.56, P = 0.007) and people who do not consume alcohol (β = 0.31, P = 0.03). The relationships between BMI, skin type, smoking history and employment with Sun Protection Score seen in univariate analysis were no longer statistically significant when adjusting for all covariates.

On the other hand, the statistically significant variables of younger age (β = -0.02, P <0.001), male gender (β = 0.80, P <0.001), darker skin type (β = 0.27, P <0.001) and lower education level (β = -0.18, P <0.001) predicted longer ADH in the multiple linear regression model. The relationships between Malay ethnicity, smoking history, hypertension and hyperlipidaemia with ADH seen in univariate analysis were no longer statistically significant when adjusting for covariates. These findings are presented in Table 4. Supplementary Table 2 compares the average number of hours spent under the sun at work and on rest days.

Multiple Logistic Regression Analysis

In the multiple logistic regression model, dichotomous individual sun safety habits comprised the dependent variables and demographic variables comprised the independent variables. Malays (OR = 2.06, P <0.001) and males (OR = 2.26, P <0.001) were more likely to use headgear. Males (OR = 0.08, P <0.001), Malays (OR = 0.60, P = 0.02), diabetics (OR = 0.50, P = 0.04), unmarried individuals (OR = 0.65, P = 0.01), smokers (OR = 0.61, P = 0.02), people who do not consume alcohol (OR = 0.68, P = 0.02) and those without a university degree (OR = 0.53, P = 0.02) were less likely to use umbrellas. Sunscreen use was less likely in males (OR = 0.14, P <0.001), Indians (OR = 0.39, P <0.001) and in those who had received Primary School Leaving Examination education or below

(P = 0.001). Indians (OR = 0.43, P <0.001), smokers (OR = 0.66, P = 0.02) and those who earned an income of <\$6000 per month (OR = 0.61, P = 0.04) were less likely to wear protective clothes at any time. There was no evidence of multicollinearity between the independent variables in the linear or logistic regression models.

Determinants of Risky Sun Exposure and Safety Habits

This study has identified 4 vulnerable demographic groups. First, males are at greater risk because they spent an average of 53 more minutes under the sun per day (71 more minutes at work and 23 more minutes on rest days). In addition, they had an average score that was 1.5 points lower on the Sun Protection Score. Men had 86% and 92% lower odds of using sunscreen and umbrellas, respectively. Second, younger adults spent more time under the sun—both during work and on rest days—but did not compensate by having better sun safety habits. Third, Indians and individuals with dark skin demonstrated riskier behaviour. Indians scored an average score that was 1 point lower than the Chinese in the Sun Protection Score, had 57% lower odds of wearing any form of protective attire and 61% lower odds of using sunscreen compared to the Chinese. Those with darker skin type were more likely to spend more time under the sun (especially at work). Fourth, participants who had less education spent more hours under the sun (especially at work) and were less likely to use sunscreen and umbrellas.

Discussion

This is the first study to examine sun safety habits in Singapore. The multiracial make-up of Singapore's population presents a good opportunity to compare the differences between the racial groups and skin phototypes. The findings suggest that most do not regularly engage in sun safety habits as evidenced by the majority's reluctance to use umbrellas, wear headgear, apply sunscreen and wear adequate protective clothing. A lack of awareness about the harmful effects of sun exposure or fear of discomfort in the hot and humid climate may explain the reluctance among the local population.

It is not surprising to find men and young adults at greater risk as they are more likely to perform manual labour, work outdoors or engage in outdoor sports. Many other studies worldwide have similarly found that men[9,18–20] and young adults[6,8–11,18,19] are at greater risk. More emphasis on educating men and young adults on the risk of skin cancers may be needed.

Indians and individuals with dark skin also demonstrated riskier behaviour possibly due to the belief that dark skin gives them natural protection from the sun. Other ethnicity-specific or cultural practices may be additional reasons why dark-skinned individuals demonstrated poor

Table 3. Univariate Analysis Examining the Relationship Between Sun Protection Score and ADH With Demographic Variables

Question	Option	Distribution (%)	Mean Sun Protection Score	P Value	Mean ADH	P Value
Age (years)				0.43		<0.001
	<40	804 (40.5)	3.24		1.74	
	≥40	1179 (59.5)	3.35		1.25	
Gender				<0.001		<0.001
	Male	1130 (48.5)	2.55		1.91	
	Female	1198 (51.5)	4.06		1.03	
Race*				<0.001		<0.001
	Chinese	798 (34.3)	3.61		1.21	
	Malay	599 (25.7)	3.24		1.71	
	Indian	535 (23.0)	2.61		1.51	
	Others	389 (16.7)	3.71		1.46	
Fitzpatrick skin type				<0.001		<0.001
Interviewers were asked to classify the participant's skin type using a chart	1. Never tans, always burns, pale white skin	34 (1.5)	4.24		0.76	
	2. Tans poorly, burns easily, fair skin	120 (5.2)	4.17		1.04	
	3. Tans after initial burn, darker white skin	1242 (53.4)	3.52		1.30	
	4. Tans easily, burns minimally, light brown skin	444 (19.1)	2.77		1.85	
	5. Tans darkly easily, rarely burns, brown skin	137 (5.9)	2.29		2.07	
	6. Tans darkly easily, never burns, dark brown or black skin	6 (0.3)	2.25		0.87	
Marital status†				0.34		<0.001
	Married	1554 (66.8)	3.35		1.33	
	Unmarried	766 (32.9)	3.22		1.71	
Currently working‡				<0.001		0.11
	Yes	1618 (69.5)	3.19		1.49	
	No	692 (29.7)	3.61		1.37	
Smoking history§				<0.001		<0.001
Have you ever smoked cigarettes?	Yes	843 (36.2)	2.71		1.82	
	No	1478 (63.5)	3.65		1.25	

ADH: Average daily hours
*Seven missing. "Others" comprised Burmese, Javanese, Filipinos, Sikhs, Indonesians, Eurasians, Boyanese, Japanese, Malayalees, Persians and Thai.
†Eight missing.
‡Nine missing.
§Nine missing.

Table 3. Univariate Analysis Examining the Relationship Between Sun Protection Score and ADH With Demographic Variables (Cont'd)

Question	Option	Distribution (%)	Mean Sun Protection Score	P Value	Mean ADH	P Value
Alcohol history‖				0.51		0.12
Have you ever consumed alcohol?	Yes	1236 (53.1)	3.27		1.51	
	No	1085 (46.6)	3.35		1.39	
Body mass index				<0.001		0.05
	<23	961 (41.3)	3.56		1.37	
	≥23	1360 (58.4)	3.13		1.51	
Education¶				0.16		<0.001
What is the highest level of education that you have attained?	Primary School Leaving Examination or below	414 (17.9)	3.09		1.25	
	General Certificate of Education Ordinary or Normal level	871 (27.6)	3.33		1.56	
	General Certificate of Education Advanced level or diploma	521 (22.5)	3.21		1.73	
	University degree and above	509 (22.0)	3.53		1.15	
Household income#				0.08		0.74
Over the last 12 months, what is the average earnings (S$) of the household per month?	<$2000	423 (18.2)	3.21		1.44	
	$2000 – 3999	667 (28.7)	3.15		1.57	
	$4000 – 5999	465 (20.0)	3.19		1.37	
	≥$6000	546 (23.5)	3.61		1.35	
History of diabetes mellitus**				0.003		0.31
Have you ever been told by a doctor (western trained) that you have diabetes?	Yes	223 (9.6)	2.76		1.34	
	No	2076 (89.2)	3.37		1.47	
History of hypertension††				0.46		0.006
Have you ever been told by a doctor (western trained) that you have high blood pressure?	Yes	412 (17.7)	3.22		1.25	
	No	1886 (81.0)	3.34		1.50	
History of hyperlipidaemia‡‡				0.72		<0.001
Have you ever been told by a doctor (western trained) that you have high cholesterol or lipids?	Yes	556 (23.9)	3.38		1.23	
	No	1680 (72.2)	3.33		1.55	

ADH: Average daily hours
‖Seven missing.
¶Ten missing.
#Two-hundred-and-twenty-seven missing (participants either refused to reveal or did not know their average household income per month).
**Twenty-nine missing.
††Thirty missing.
‡‡Ninety-two missing.

Table 4. Linear Regression Model With Sun Protection Score and Average Daily Hours as Dependent Variables

Variable	Sun Protection Score					Average Daily Hours Under the Sun[*]				
	Mean Score	β	95% Lower CI	95% Upper CI	P Value	Mean Hours	β	95% Lower CI	95% Upper CI	P Value
Age (years)	-	0.005	-0.006	0.02	0.41	-	-0.02	-0.02	-0.016	<0.001
Gender										
Male	2.55	-1.43	-1.70	-1.14	<0.001	1.91	0.80	0.62	0.97	<0.001
Female	4.06	-	-	-	-	1.03	-	-	-	-
Race										
Chinese	3.61	-0.10	-0.47	0.26	0.58	1.21	-0.21	-0.43	0.02	0.07
Malay	3.24	-0.24	-0.61	0.12	0.19	1.71	0.10	-0.13	0.33	0.39
Indian	2.61	-1.03	-1.42	-0.64	<0.001	1.51	-0.19	-0.43	0.05	0.13
Fitzpatrick skin type	-	-0.10	-0.28	0.08	0.27	-	0.27	0.16	0.38	<0.001
Marital status										
Married	3.35	0.15	-0.14	0.44	0.32	1.33	-0.11	-0.28	0.07	0.23
Single/divorced/widowed	3.22	-	-	-	-	1.71	-	-	-	-
Employment status										
Employed	3.19	-0.15	-0.43	0.12	0.28	1.49	-0.09	-0.26	0.08	0.29
Unemployed	3.61	-	-	-	-	1.37	-	-	-	-
Ever smoked										
Yes	2.71	-0.24	-0.53	0.06	0.11	1.82	0.07	-0.11	0.25	0.45
No	3.65	-	-	-	-	1.25	-	-	-	-
Ever drank alcohol										
Yes	3.27	0.31	0.03	0.58	0.03	1.51	0.03	-0.14	0.21	0.71
No	3.35	-	-	-	-	1.39	-	-	-	-
Body mass index (>23)										
Yes	3.13	-0.02	-0.27	0.23	0.90	1.51	0.08	-0.08	0.23	0.33
No	3.56	-	-	-	-	1.37	-	-	-	-

β: Beta coefficient; CI: Confidence interval

The variance inflation factor values ranged from 1.132–2.317.

[*]See Supplementary Table 1 for a detailed breakdown analysis of average daily hours at work and rest days (as dependent variables).

Table 4. Linear Regression Model With Sun Protection Score and Average Daily Hours as Dependent Variables (Cont'd)

Variable	Sun Protection Score					Average Daily Hours Under the Sun[*]				
	Mean Score	β	95% Lower CI	95% Upper CI	P Value	Mean Hours	β	95% Lower CI	95% Upper CI	P Value
Hypertension										
Yes	3.22	0.09	-0.25	0.44	0.59	1.25	-0.09	-0.30	0.12	0.41
No	3.34	-	-	-	-	1.50	-	-	-	-
Diabetes mellitus										
Yes	2.76	-0.56	-1.03	-0.16	0.007	1.34	0.06	-0.20	0.32	0.65
No	3.37	-	-	-	-	1.47	-	-	-	-
Hyperlipidaemia										
Yes	3.38	0.08	-0.23	0.39	0.62	1.23	-0.13	-0.32	0.06	0.17
No	3.33	-	-	-	-	1.55	-	-	-	-
Education	-	0.15	-0.002	0.29	0.53	-	-0.18	-0.27	-0.08	<0.001
Household income	-	0.04	-0.09	0.17	0.54	-	0.003	-0.08	0.081	0.94

β: Beta coefficient; CI: Confidence interval

The variance inflation factor values ranged from 1.132–2.317.

[*]See Supplementary Table 1 for a detailed breakdown analysis of average daily hours at work and rest days (as dependent variables).

sun safety habits. Although having dark skin is protective to a certain extent, experimental studies have confirmed the presence of deoxyribonucleic acid (DNA) damage in dark skin after UVR exposure.[21] A local health survey in 2003 had found that 50% of Malay and >50% of Indian children had suffered sunburns in the first 10 years of life.[22] Considering their riskier behaviour, potential for misdiagnosis and poorer overall prognosis from skin cancer,[1,23,24] it will be prudent for clinicians to have a higher index of suspicion for skin cancer when dark-skinned individuals present with skin lesions.

A lower education level is associated with more sun exposure at work but not on rest days. This may imply that lower educated individuals are more likely to work in outdoor environments. Despite this, they were also less likely to wear protective lower body attire, use umbrellas or sunscreen—a common finding also seen in other studies.[8,25,26] Those who earned <$6000 per month were also less likely to wear protective clothes at any time. Studies have shown that the risk of non-melanoma skin cancer increases when people work outdoors.[27] There is a need to encourage sun safety habits if it is not possible to avoid the sun at work.

Diabetic individuals have an overall lower Sun Protection Score than non-diabetic individuals and were less likely to use an umbrella. Similarly, smokers were also less likely to use an umbrella and wear protective attire (especially of the upper body). Conversely, alcohol consumers seemed to be more conscious of sun safety (higher Sun Protection Score) and used umbrellas more frequently. Interestingly, married people spent less hours under the sun on their rest days and used more umbrellas. Interpretation of these findings is limited but may reflect clustering of health behaviours or from residual confounders.

The local population spent a mean duration of 1.45 hours per day exposed to direct sun—with more time spent under the sun on their rest days than work days—which may suggest that people enjoy outdoor activities and seek the sun for leisure. In comparison, Caucasian populations spent longer average durations under the sun in summer (up to 3 or 4 hours a day).[28] This may, to some extent, reflect differences in beauty ideals between Asian and Western societies—with Asian societies valuing "white skin" while their Western counterparts value "tan skin".[29]

The effects of UVR on the skin are complex. Absorbed UVR damages DNA and causes mutations, ultimately leading to skin tumours, photoageing and pigmentary disorders.[30] On the other hand, exposure to ultraviolet B radiation is important for the endogenous production of vitamin D that is important for skeletal and muscular health. Exposing the arms and legs for 5 to 30 minutes between the hours of 10 am to 3 pm twice a week is generally adequate to obtain sufficient vitamin D while minimising photodamage.[31] Despite a mean ADH of 1.45 hours found

in this study, the local prevalence of vitamin D deficiency is high at 42% in a healthy population[32] and 57.5% in those who suffered a hip fracture,[33] which may suggest that there are other more important factors that contribute to vitamin D deficiency such as diet or physical inactivity.[34]

There are several limitations in this study. Information obtained by self-reporting during the interviews may result in recall or social desirability bias. Due to the study design, we were unable to examine cause-and-effect relationships and found that several statistically significant results were likely explained by residual confounders. The Sun Protection Score was designed to capture general sun safety habits but is not a validated scoring system. Further studies that examine factors such as indoor and outdoor tanning, family history of skin cancer, incidence of sunburn and attitudes towards change may provide more information to guide more effective health initiatives.[35]

Conclusion

This study revealed that although our local population spends less time under the sun as compared to Western populations, sun safety habits are not widely practised. The study has identified that men, young adults, Indians, dark-skinned individuals and those with lower education are most vulnerable to poor sun safety habits and prolonged sun exposure, and may benefit the most from sun safety health promotions. Future research may include longitudinal studies to examine sun exposure trends among the local population over time and determine the effectiveness of health initiatives.

REFERENCES

1. Armstrong BK, Kricker A. The epidemiology of UV induced skin cancer. J Photochem Photobiol B 2001;63:8–18.

2. Zanetti R, Rosso S, Martinez C, Nieto A, Miranda A, Mercier M, et al. Comparison of risk patterns in carcinoma and melanoma of the skin in men: a multi-centre case-case-control study. Br J Cancer 2006;94:743–51.

3. Gandini S, Sera F, Cattaruzza MS, Pasquini P, Zanetti R, Masini C, et al. Meta-analysis of risk factors for cutaneous melanoma: III. Family history, actinic damage and phenotypic factors. Eur J Cancer 2005;41:2040–59.

4. Sng J, Koh D, Siong WC, Choo TB. Skin cancer trends among Asians living in Singapore from 1968 to 2006. J Am Acad Dermatol 2009;61:426–32.

5. National Registry of Diseases Office. Singapore Cancer Registry: Annual Registry Report 2015. Available at: https://www.nrdo.gov.sg/docs/librariesprovider3/Publications-Cancer/cancer-registry-annual-report-2015_web.pdf?sfvrsn=10. Accessed on 10 February 2019.

6. Boldeman C, Bränström R, Dal H, Kristjansson S, Rodvall Y, Jansson B, et al. Tanning habits and sunburn in a Swedish population age 13–50 years. Eur J Cancer 2001;37:2441–8.

7. Geller AC, Colditz G, Oliveria S, Emmons K, Jorgensen C, Aweh GN, et al. Use of sunscreen, sunburning rates, and tanning bed use among more than 10,000 US children and adolescents. Pediatrics 2002;109:1009–14.

8. Falk M, Anderson C. Influence of age, gender, educational level and self-estimation of skin type on sun exposure habits and readiness to increase sun protection. Cancer Epidemiol 2013;37:127–32.

9. Buller DB, Cokkinides V, Hall HI, Hartman AM, Saraiya M, Miller E, 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.

10. Pengpid S, Peltzer K. Sun protection use behaviour among University students from 25 low, middle income and emerging economy countries. Asian Pac J Cancer Prev 2015;16:1385–9.

11. Dobbinson S, Wakefield M, Hill D, Girgis A, Aitken JF, Beckmann K, et al. Prevalence and determinants of Australian adolescents' and adults' weekend sun protection and sunburn, summer 2003–2004. J Am Acad Dermatol 2008;59:602–14.

12. Saw Swee Hock School of Public Health, National University of Singapore. Singapore Population Health Studies. Available at: http://blog.nus.edu.sg/sphs/. Accessed on 10 February 2019.

13. Health Promotion Board. Obesity: HPB-MOH Clinical Practice Guidelines 1/2016. Available at: https://www.hpb.gov.sg/docs/default-source/pdf/obesity-cpg_main_for-online-30-aug.pdf?sfvrsn=2288eb72_0. Accessed on 10 February 2019.

14. Sachdeva S. Fitzpatrick skin typing: applications in dermatology. Indian J Dermatol Venereol Leprol 2009;75:93.

15. Poon TS, Barnetson RS. The importance of using broad spectrum SPF 30+ sunscreens in tropical and subtropical climates. Photodermatol Photoimmunol Photomed 2002;18:175–8.

16. Schalka S, Dos Reis VMS, Cucé LC. The influence of the amount of sunscreen applied and its sun protection factor (SPF): evaluation of two sunscreens including the same ingredients at different concentrations. Photodermatol Photoimmunol Photomed 2009;25:175–80.

17. Ou-Yang H, Stanfield J, Cole C, Appa Y, Rigel D. High-SPF sunscreens (SPF≥70) may provide ultraviolet protection above minimal recommended levels by adequately compensating for lower sunscreen user application amounts. J Am Acad Dermatol 2012;67:1220–7.

18. Robinson JK, Rigel DS, Amonette RA. Trends in sun exposure knowledge, attitudes, and behaviors: 1986 to 1996. J Am Acad Dermatol 1997;37:179–86.

19. Johnson EY, Lookingbill DP. Sunscreen use and sun exposure: trends in a white population. Arch Dermatol 1984;120:727–31.

20. Cheng S, Lian S, Hao Y, Kang N, Li S, Nie Y, et al. Sun-exposure knowledge and protection behavior in a North Chinese population: a questionnaire-based study. Photodermatol Photoimmunol Photomed 2010;26:177–81.

21. Tadokoro T, Kobayashi N, Zmudzka BZ, Ito S, Wakamatsu K, Yamaguchi Y, et al. UV-induced DNA damage and melanin content in human skin differing in racial/ethnic origin. FASEB J 2003;17:1177–9.

22. Nyiri P. Sun protection in Singapore's schools. Singapore Med J 2005;46:471–5.

23. Agbai ON, Buster K, Sanchez M, Hernandez C, Kundu RV, Chiu M, et al. Skin cancer and photoprotection in people of color: a review and recommendations for physicians and the public. J Am Acad Dermatol 2014;70:748–62.

24. Cormier JN, Xing Y, Ding M, Lee JE, Mansfield PF, Gershenwald JE, et al. Ethnic differences among patients with cutaneous melanoma. Arch Intern Med 2006;166:1907–14.

25. Koh HK, Bak SM, Geller AC, Mangione TW, Hingson RW, Levenson SM, et al. Sunbathing habits and sunscreen use among white adults: results of a national survey. Am J Public Health 1997;87:1214–7.

26. Berwick M, Fine JA, Bolognia JL. Sun exposure and sunscreen use following a community skin cancer screening. Prev Med 1992;21:302–10.

27. Fartasch M, Diepgen TL, Schmitt J, Drexler H. The relationship between occupational sun exposure and non-melanoma skin cancer: clinical basics, epidemiology, occupational disease evaluation, and prevention. Dtsch Arztebl Int 2012;109:715–20.

28. Autier P, Boniol M, Doré JF. Sunscreen use and increased duration of intentional sun exposure: still a burning issue. Int J Cancer 2007;121:1–5.

29. Xie Q, Zhang M. White or tan? A cross-cultural analysis of skin beauty advertisements between China and the United States. Asian J Commun 2013;23:538–54.

30. Matsumura Y, Ananthaswamy HN. Toxic effects of ultraviolet radiation on the skin. Toxicol Appl Pharmacol 2004;195:298–308.

31. Nimitphong H, Holick MF. Vitamin D status and sun exposure in Southeast Asia. Dermatoendocrinol 2013;5:34–7.

32. Bi X, Tey SL, Leong C, Quek R, Henry CJ. Prevalence of vitamin D deficiency in Singapore: its implications to cardiovascular risk factors. PLoS One 2016;11:e0147616.

33. Ramason R, Selvaganapathi N, Ismail NH, Wong WC, Rajamoney GN, Chong MS. Prevalence of vitamin D deficiency in patients with hip fracture seen in an orthogeriatric service in sunny singapore. Geriatr Orthop Surg Rehabil 2014;5:82–6.

34. Fernandes MR, Barreto WDRJ. Association between physical activity and vitamin D: a narrative literature review. Rev Assoc Med Bras (1992) 2017;63:550–6.

35. Lee SX, Chong WS, Lauw XT, Tan SK, Oon HH. The effectiveness of a pharmacist-led sun protection counselling service: results from a tertiary dermatology centre in Singapore. Ann Acad Med Singapore 2018;47:196–200.

Supplementary Table 1. Logistic Regression Model With Breakdown Analysis of the Wearing of Protective Upper and Lower Body Attire as Dichotomous Dependent Variables

Variable	Wearing of Protective Upper Body Attire at Any Time						Wearing of Protective Lower Body Attire at Any Time					
	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value
Age (years)	-	-	1.02	1.01	1.03	<0.001	-	-	0.95	0.94	0.96	<0.001
Gender												
Male	387	570	0.99	0.78	1.27	0.95	609	243	2.89	2.11	3.96	<0.001
Female	515	511	1.00	-	-	-	382	487	1.00	-	-	-
Race						<0.001						<0.001
Chinese	248	446	1.00	-	-	-	467	114	1.00	-	-	-
Malay	287	233	2.91	2.13	3.99	<0.001	186	278	0.14	0.09	0.21	<0.001
Indian	200	234	2.18	1.56	3.05	<0.001	181	194	0.14	0.09	0.22	<0.001
Fitzpatrick skin type						<0.001						0.64
1	21	13	1.00	-	-	-	12	13	1.00	-	-	-
2	57	63	0.51	0.20	1.31	0.16	64	37	1.64	0.48	5.60	0.43
3	604	638	0.42	0.18	0.99	0.05	633	441	1.91	0.63	4.82	0.25
4	161	283	0.21	0.08	0.50	0.01	214	187	2.22	0.71	6.99	0.17
5	56	81	0.22	0.08	0.60	0.02	64	52	2.58	0.77	8.66	0.13
6	3	3	0.29	0.04	2.30	0.24	4	0	0	-	-	0.99
Marital status												
Married	642	707	0.84	0.66	1.09	0.16	281	883	0.73	0.53	1.02	0.07
Single/divorced/widowed	257	369	1.00	-	-	-	130	420	1.00	-	-	-
Employment status												
Employed	645	750	1.49	1.17	1.91	0.02	286	928	1.15	0.85	1.55	0.38
Unemployed	254	325	1.00	-	-	-	125	374	1.00	-	-	-
Ever smoked												
Yes	262	441	0.68	0.53	0.88	0.03	415	211	1.05	0.76	1.45	0.78
No	637	636	1.00	-	-	-	574	515	1.00	-	-	-
Ever drank alcohol												
Yes	400	661	0.70	0.55	0.90	0.03	683	245	2.13	1.61	2.83	<0.001
No	499	416	1.00	-	-	-	306	481	1.00	-	-	-
Body mass index (>23)												
Yes	561	598	1.15	0.92	1.42	0.22	551	446	1.06	0.81	1.39	0.68
No	338	479	1.00	-	-	-	438	280	1.00	-	-	-

CI: Confidence interval; GCE: General Certificate of Education; OR: Odds ratio; PSLE: Primary School Leaving Examination
The variance inflation factors ranged from 1.138–2.318.

Supplementary Table 1. Logistic Regression Model With Breakdown Analysis of the Wearing of Protective Upper and Lower Body Attire as Dichotomous Dependent Variables (Cont'd)

Variable	Wearing of Protective Upper Body Attire at Any Time						Wearing of Protective Lower Body Attire at Any Time					
	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value	Yes	No	Adjusted OR	95% Lower CI	95% Upper CI	P Value
Hypertension												
Yes	181	172	1.21	0.90	1.63	0.20	144	148	1.01	0.69	1.48	0.96
No	712	891	1.00	-	-	-	837	568	1.00	-	-	-
Diabetes mellitus												
Yes	93	95	0.90	0.62	1.31	0.59	61	92	0.73	0.45	1.17	0.19
No	800	970	1.00	-	-	-	921	624	1.00	-	-	-
Hyperlipidaemia												
Yes	253	240	1.07	0.83	1.40	0.59	205	200	1.00	0.72	1.40	0.98
No	617	796	1.00	-	-	-	756	499	1.00	-	-	-
Education						0.05						0.11
PSLE or below	179	166	1.00	-	-	-	85	184	1.00	-	-	-
GCE Ordinary or Normal level	318	421	1.01	0.73	1.39	0.98	259	297	1.65	1.10	2.49	0.02
GCE Advanced level or diploma	178	269	0.97	0.66	1.42	0.86	273	128	1.49	0.92	2.41	0.10
University degree and above	223	220	1.45	0.96	2.19	0.08	271	117	1.66	0.98	2.78	0.06
Household income per month						0.97						0.03
<$2000	156	185	1.00	-	-	-	128	157	1.00			-
$2000 – 3999	260	319	1.01	0.40	1.36	0.80	263	236	1.05	0.72	1.53	0.81
$4000 – 5999	176	228	1.05	0.75	1.47	0.61	217	144	1.19	0.79	1.79	0.42
≥$6000	223	252	1.10	0.77	1.56	0.21	300	121	1.77	1.14	2.74	0.01
Total, n (%)	902 (45.4)	1081 (54.6)					730 (42.4)	991 (57.6)				

CI: Confidence interval; GCE: General Certificate of Education; OR: Odds ratio; PSLE: Primary School Leaving Examination
The variance inflation factor values ranged from 1.138–2.318.

Supplementary Table 2. Linear Regression Model With Breakdown Analysis of the Average Number of Hours Spent Under the Sun at Work and on Rest Days as Dependent Variables

Variable	Average Number of Hours Spent Under the Sun at Work					Average Number of Hours Spent Under the Sun on Rest Days				
	Mean Hours	β	95% Lower CI	95% Upper CI	P Value	Mean Hours	β	95% Lower CI	95% Upper CI	P Value
Age (years)	-	-0.02	-0.04	-0.02	<0.001	-	-0.23	-0.03	-0.02	<0.001
Gender										
Male	1.91	1.05	0.81	1.30	<0.001	1.76	0.42	0.24	0.60	<0.001
Female	0.72	-	-	-	-	1.38	-	-	-	-
Race										
Chinese	1.08	-0.27	-0.57	0.04	0.08	1.37	-0.19	-0.41	0.03	0.10
Malay	1.90	0.24	-0.09	0.56	0.14	1.57	0.02	0.21	0.25	0.89
Indian	1.35	-0.41	-0.75	-0.07	0.02	1.66	-0.002	-0.24	0.24	0.90
Fitzpatrick skin type	-	0.35	0.20	0.50	<0.001	-	0.04	-0.07	0.15	0.50
Marital status										
Married	1.36	0.08	-0.18	0.33	0.56	1.34	-0.31	-0.48	-0.13	0.001
Single/divorced/widowed	1.47	-	-	-	-	1.92	-	-	-	-
Employment status										
Employed	-	-	-	-	-	1.60	0.05	-0.12	0.24	0.54
Unemployed	-	-	-	-	-	1.34	-	-	-	-
Ever smoked										
Yes	1.93	0.15	-0.10	0.40	0.24	1.73	-0.09	-0.27	0.09	0.33
No	1.03	-	-	-	-	1.48	-	-	-	-
Ever drank alcohol										
Yes	1.41	-0.01	-0.24	0.23	0.96	1.64	0.09	-0.10	0.25	0.38
No	1.36	-	-	-	-	1.45	-	-	-	-
Body mass index (>23)										
Yes	1.49	0.01	-0.21	0.23	0.93	1.54	0.08	-0.06	0.25	0.22
No	1.23	-	-	-	-	1.49	-	-	-	-

β: Beta coefficient; CI: Confidence interval
The variance inflation factor values ranged from 1.132–2.317.

Supplementary Table 2. Linear Regression Model With Breakdown Analysis of the Average Number of Hours Spent Under the Sun at Work and on Rest Days as Dependent Variables (Cont'd)

Variable	Average Number of Hours Spent Under the Sun at Work					Average Number of Hours Spent Under the Sun on Rest Days				
	Mean Hours	β	95% Lower CI	95% Upper CI	P Value	Mean Hours	β	95% Lower CI	95% Upper CI	P Value
Hypertension										
Yes	1.32	0.008	-0.28	0.30	0.96	1.22	-0.07	-0.27	0.14	0.54
No	1.40	-	-	-	-	1.59	-	-	-	-
Diabetes mellitus										
Yes	1.48	0.07	-0.33	0.46	0.74	1.23	0.06	-0.21	0.32	0.67
No	1.38	-	-	-	-	1.56	-	-	-	-
Hyperlipidaemia										
Yes	1.47	-0.08	-0.34	0.17	0.52	1.24	-0.001	-0.19	0.19	0.90
No	1.38	-	-	-	-	1.63	-	-	-	-
Education	-	-0.26	-0.39	-0.13	<0.001	-	0.04	-0.05	0.13	0.36
Household income	-	-0.03	-0.15	0.08	0.59	-	0.05	-0.02	0.13	0.17

β: Beta coefficient; CI: Confidence interval
The variance inflation factor values ranged from 1.132–2.317.