

Correlates of sun exposure in people aged 45 and older in NSW

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Abstract. Sun exposure is often measured in studies of health outcomes by asking people with a cancer diagnosis and people without this diagnosis about their past behaviour. Rarely do we ask large numbers of 'healthy' people how much time they spent in the sun recently and at the same time, collect a lot of information about their personal characteristics and their behaviour. The 45 and Up Study in NSW has done that: it is a population-based cohort study of NSW people aged 45 and over who were randomly sampled from Medicare Australia, Australia's universal health insurance system, which includes all Australian citizens and permanent residents (Banks 2008). People in regional and remote areas and people aged 80+ years were over-sampled by a factor of two. Participants completed a mailed self-administered questionnaire and consent form (see <http://www.45andUp.org.au>). The participation rate was 18%. We examined data from 78,223 people of European ancestry who were aged 45-74 years and who completed the questionnaire between February 2006 and June 2006. We included people to 74 years of age to reduce the range of lifestyle changes over time, such as clothing and sun-related behaviour that may have influenced their sun exposure. The 45 and Up Study has been approved by the University of New South Wales Human Research Ethics Committee and the Cancer Council New South Wales Ethics Committee.

The 45 and Up study questionnaire

The information in this report was taken from direct questions about outdoor hours, about behaviour considered to be sun-related, and about other factors that might influence sun-related behaviour or cancer risk. For clarity of interpretation, the report excludes participants who reported a personal history of skin cancer of any kind (they answered yes to the question 'has a doctor ever told you that you have a skin cancer' or to the question about any operation to remove a skin cancer, or gave an age at which either of these 2 events occurred).

Sun exposure and related information

The items selected as relevant in the 45 and Up Study questionnaire are listed here in groups of related variables.

- Personal: Age, sex, height and weight, education (highest qualification), country of birth (COB), ancestry, year arrived in Australia, SES index of residence, language other than English, marital status, household income, work status, age retired, hours paid and unpaid work, being a carer.
- Sun related: Skin colour of inner upper arm, skin reaction on repeated exposure to bright sunlight, UV value taken from current residence.
- Lifestyle related to sun: Current housing, and in last week, times walked, times moderate activity and also times vigorous activity (examples given).

- Lifestyle factors known to cause cancer or modify cancer risk: Smoking, alcohol, multivitamins or minerals, aspirin; dietary fish or taking fish oil.
- Health-related factors: Conditions treated in last month, needing help with daily tasks, activities limited due to health, overall health, number of teeth left, falls in last 12 months, bone fracture in last 5 years, incontinence.

The direct question about outdoor hours asked: 'About how many hours a day would you usually spend outdoors on a weekday and on the weekend?'

53. About how many hours a DAY would you usually spend outdoors on a weekday and on the weekend?

hours per day	hours per day
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> weekday	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> weekend

Statistical analysis

The outcome measure was weekly sun exposure hours estimated from responses to the question about number of hours spent outdoors on weekdays and weekend days. Mean ratios (MR) and geometric means (GM) for total hours spent outdoors a week were estimated by fitting sums of squares regression models with log of weekly outdoor hours as outcome, adjusted for age (5 year groups) and sex, using Proc GLM in SAS.

In a first stage, we examined each variable individually, adjusted for age in 5 year age groups and sex only and then entered all variables within each group of related variables in an individual forward stepping model. In a second stage, we derived a final model by entering all variables that were statistically significant within each group in one forward stepping model. A separate process was used to identify the strongest variable among COB, age at arrival and year of arrival for the model fitting: these 3 related variables were examined in together in one model excluding Australian born people. COB was the strongest predictor of skin cancer and was used in these analyses of correlates of sun exposure. Data items or variables of interest as potential correlates of sun exposure were analysed in groups as: personal; lifestyle; sun sensitivity; health. Information on hormonal factors for women was available but is not included in this report.

Total sun exposure

Of the personal, health and lifestyle factors, the independent correlates of sun exposure were:

- being male (more outdoor hours);
- 10 or more times a week of walking or taking moderate activity (more outdoor hours);
- education - a degree meant less sun exposure hours and no school certificate or a trade meant more hours;
- residence in a non-metropolitan area in NSW at time of questionnaire response (more outdoor hours);
- the type of housing (more hours for living on a farm),
- the type of work (unpaid work meant more hours);
- reporting excellent health (more outdoor hours);

- having 10 or more alcohol drinks a week (more outdoor hours); and
- sun sensitivity: outdoors hours increased with increasing tanning ability and decreased with fairer skin colour (Table 1).

Skin colour	N	MR (95% CI)*
Males		
Dark	763	1.0
Light olive	6361	0.87 (0.82-0.92)
Fair	11947	0.80 (0.75-0.84)
Very fair	2329	0.66 (0.62-0.70)
P<0.001		
Females		
Dark	572	1.0
Light olive	8743	0.91 (0.84-0.98)
Fair	15164	0.83 (0.77-0.89)
Very fair	3842	0.67 (0.62-0.72)
P<0.001		
Both		
Dark	1335	1.0
Light olive	15104	0.89 (0.85-0.93)
Fair	27111	0.81 (0.77-0.85)
Very fair	6171	0.66 (0.63-0.69)
P<0.001		

* Adjusted for age (5 year groups), and for sex when M & F analysed together

Table 1. Association of self-reported skin colour with reported hours of sun exposure in people with no history of skin cancer (self-reported).

The final set of the strongest correlates (those associated with a 10% or more adjusted increase in MR) for all men and women included male sex, 10 or more times a week of walking or moderate activity, education (as above), housing type (farm meant more hours), overall health, sun sensitivity (each of excellent health and being a good tanner meant more hours). Other variables were included in this final model and were significant, independent correlates of sun exposure hours but the increase or decrease in MR for any category of any of these variables was <10%. These were items such as being in the middle income category (a high income meant fewer hours), older age, doing unpaid work, being a current smoker.

Men and women separately

The main difference between the patterns of correlates when responses for men and women were examined in separate analyses was related to the type of work (Table 2). The MR for sun exposure was increased for men for any work, whether paid or unpaid. Women, however, had fewer sun exposure hours when they reported 25 or more hours of paid work - perhaps an indicator that women in paid employment have busy lives with less time for outdoor activities.

Men	Women
Strong correlates - MR increased by 10+%	
Activity	Activity
Education	Education
Housing- farm	Housing - farm
Tanning	Skin colour
Excellent health	Excellent health
<10% increase in MR:	
Non-metro residence	Same as men
Mid-income	Not seen for women
(reduced sun with high income)	(Same as men)
Alcohol - 20+ drinks a week	Any drinks a week
Any paid WORK - increased	25+ hours paid MR=0.91
Age retired 55-59 years	n/a
Smoking - current	n/a
No vitamins or minerals	n/a
n/a	Ancestry: southern Europe MR=0.89
n/a	Weight: 90 kg MR=0.94

Table 2. Summary of correlates of total sun exposure in men and women separately.

Weekday and weekend sun exposure

We also examined weekday and weekend hours separately. As might be expected, there were no strong differences between items related to total sun exposure and to weekday sun exposure. Weekend sun exposure, however, was greater in people who had 30 or more hours of paid work - perhaps suggesting that active and busy people continue this lifestyle across all days of the week.

Conclusion

The large number of variables measured in the 45 and Up study have allowed us to identify components of lifestyle and social class that contribute to higher levels of sun exposure. It is clear that sun sensitivity is important: people who are less sun sensitive have more hours in the sun in this population of people who have no history of skin cancer. This is consistent with the possibility that people with sun-sensitive phenotypes adapt their behavior to make greater use of sun protection (Lucas 2010).

Being male, being a reasonably active walker or exerciser, having excellent health and living on a farm each correlate with more hours in the sun, while having a tertiary education at degree level or a high income correlate with fewer hours. Being more active had the strongest correlation with increased sun exposure, supporting an activity-based approach over time-based questions to better measure sun exposure (Yu 2009).

Banks E, Redman S et al Cohort profile: the 45 and up study. *Int J Epidemiol* 2008, 37:941-7.

Lucas RM, Ponsonby AL, Dear K et al. Associations between silicone skin cast score, cumulative sun exposure, and other factors. *CEBP* 2009;18:2887-94.

Yu C-L et al Assessment of lifetime cumulative sun exposure using self-administered questionnaire. *CEBP* 2009; 18: 464-71.