

SUPPLEMENTARY METHODS

Calculation of polygenic risk score

We calculated a polygenic risk score (PRS) for 15,373 participants who were eligible for these analyses (39.6%) and had GWAS data available. The PRS was calculated using summary statistics from a melanoma GWAS meta-analysis for 12,874 cases and 23,203 controls.¹

Consistent with the meta-analysis,¹ the PRS included only SNPs with an imputation quality score (RSQ or INFO) 0.8, MAF > 0.001 and present in 2 or more studies; the QSkin cohort was not included in the meta-analysis.

Linkage Disequilibrium (LD) between the meta-analysis SNPs was determined using a reference panel generated from 5,000 White British individuals from the UK Biobank (Application ID 25331). UK Biobank samples' HRC v1 imputed data was filtered to those with an imputation quality RSQ > 0.3, a Hardy-Weinberg P-value > 1×10^{-6} and missingness < 0.03, and then converted to best guess genotypes.

Using the intersection of the available, cleaned SNPs for the QSkin GWAS data, the melanoma meta-analysis, and the UK Biobank LD panel, this overlapping set of SNPs was pruned (LD r^2 threshold < 0.025 over a 10 megabase window) to 123,038 independent SNPs unselected for melanoma P-value using PLINK v1.90b6.6.² Due to the strong cutaneous melanoma association at the *MC1R* on chromosome 16, even at the very strict LD r^2 threshold of 0.025 multiple additional SNPs were present post pruning near *MC1R*, each with LD r^2 0.01-0.02 with *MC1R* red hair alleles. To address this, the terminal 5 megabases of chromosome 16 was removed from

the pruned set of SNPs, and instead the 7 *MC1R* missense alleles passing QC across all sets (those strongly associated with melanoma, red hair and pigmentation³ termed 'R' alleles rs1805006 ASP84GLU, rs1805007 ARG151CYS, rs1110400 I155T, rs1805008 ARG160TRP, and less strongly associated 'r' allele rs1805005 VAL60LEU, rs2228479 VAL92MET, rs885479 R163Q were retained for this region.

PRS scores were generated by the --score function of PLINK v1.9, which sums the log(OR) of the fixed effects meta-analysis for each copy of the effect allele, with the non-effect allele scored 0. To determine the most powerful set of SNPs 10 scores were constructed using different fixed effects meta-analysis p-value bins (S1 $0-5 \times 10^{-8}$; S2 $0-5 \times 10^{-7}$; S3 $0-5 \times 10^{-6}$; S4 $0-5 \times 10^{-5}$; S5 0.5×10^{-4} ; S6 $0-5 \times 10^{-3}$; S7 0-0.01; S8 0-0.05; S9 0-0.10; S10 0-1). PRS P-value bins were assessed by their goodness of fit using nagelkerke psuedo-R2 when regressed onto QSkin melanoma status using logistic regression together with the first 10 principal components from the PCA analysis used to exclude population outliers in R v3.5.1.⁴ Bin 2 ($0 < P < 5 \times 10^{-7}$) achieved the highest goodness of fit, and included 28 independent SNPs (Appendix 1).

Appendix 1. SNPs used in calculation of polygenic risk for melanoma.

CHR	BP	SNP	EA	NEA	BETA	P	AF_HRC
1	150856153	rs12410869	T	G	-0.13045	5.21E-013	0.380259
1	226608104	rs1858550	A	C	-0.142601	1.68E-013	0.370034
					-		
2	38276549	rs6750047	G	A	0.0883942	2.92E-007	0.541099
2	202176294	rs7582362	G	A	-0.113169	8.88E-009	0.719002
5	1320247	rs380286	A	G	0.151519	1.66E-017	0.446628
5	33952378	rs250417	C	G	0.890645	2.30E-012	0.926748
6	21163919	rs6914598	C	T	0.108226	2.56E-008	0.317324
7	16984280	rs1636744	T	C	0.105441	1.84E-009	0.382676
7	130754812	rs4731742	C	G	0.11805	4.29E-007	0.752587
8	37482669	rs56122426	A	G	-0.156186	2.04E-007	0.160132
9	21803183	rs935055	C	G	-0.213812	2.65E-032	0.523576
9	22060833	rs77283072	A	G	0.136714	3.75E-009	0.171928
9	109060830	rs10739221	C	T	-0.119798	9.58E-009	0.740838
					-		
9	110698716	rs7041168	T	G	0.0957403	1.31E-007	0.512766
11	68919649	rs2290419	G	A	-0.201382	4.20E-007	0.0576378
11	69367118	rs498136	C	A	-0.115748	1.01E-010	0.640407
11	89028043	rs10830253	G	T	0.194003	1.01E-026	0.295981
11	108187689	rs73008229	A	G	-0.188259	1.38E-012	0.144472
12	13075202	rs2111398	G	A	0.097036	3.68E-007	0.437512
14	91185865	rs184628474	A	G	-1.03282	4.63E-014	0.03919
15	28335820	rs4778138	G	A	-0.177692	3.11E-009	0.180582
16	54115829	rs12596638	A	G	0.142887	1.81E-009	0.178596
16	68796746	rs35158985	G	A	0.101383	1.31E-007	0.327903
16	89986117	rs1805007	T	C	0.615186	4.68E-083	0.0634586
16	89986144	rs1805008	T	C	0.316707	6.26E-025	0.0663536
20	32538391	rs62211989	C	G	0.350446	1.63E-030	0.0576994
21	42743496	rs408825	T	C	0.140718	3.21E-015	0.586834
22	38545942	rs132941	C	T	-0.123072	1.61E-012	0.451078

Melanoma risk effect size from a melanoma GWAS meta-analysis,¹ and are the log of the odds ratio (BETA) for the effect allele (EA). For reference we also report the hg19 chromosome (CHR) and base pair (BP) position, the non-effect allele (NEA), the fixed effects meta-analysis p-value (P), and the effect allele frequency from the Haplotype Reference Consortium.⁵

Table S1. Measures of sun exposure and risk of invasive melanoma (*in situ* melanomas occurring during follow-up are censored).

Variables	Invasive melanoma		HR (95%CI) ¹
	No (n=38,529) n (%)	Yes (n=303) n (%)	
Born in Australia			
No	6783 (17.6)	40 (13.2)	Reference
Yes	31,746 (82.4)	263 (86.8)	1.50 (1.08-2.10)
Latitude of birth			
≥45° S/N	4504 (11.7)	25 (8.3)	Reference
<45° S/N	34,025 (88.3)	278 (91.8)	1.62 (1.07-2.43)
Region of Australia lived longest up to age 20 years			
Southern region	11,651 (33.7)	96 (33.9)	Reference
Central region	17,039 (49.4)	153 (54.1)	1.15 (0.89-1.48)
Northern region	5816 (16.8)	34 (12.0)	0.76 (0.51-1.12)
Region of Australia lived longest over lifetime			
Southern region	8779 (22.8)	71 (23.4)	Reference
Central region	22,907 (55.5)	194 (64.0)	1.06 (0.81-1.39)
Northern region	6843 (17.8)	38 (12.5)	0.70 (0.47-1.03)
Age moved to Australia			
Born in Australia	31,786 (82.5)	263 (86.8)	Reference
1-10 years	1875 (4.9)	11 (3.6)	0.70 (0.38-1.27)
11-20 years	1092 (2.8)	12 (4.0)	1.24 (0.69-2.21)
20+ years	3776 (9.8)	17 (5.6)	0.50 (0.30-0.81)
Sunburns as a child (less than 10 years)			
Never	8082 (21.0)	57 (18.8)	Reference
1-5 times	17,588 (45.6)	143 (47.2)	1.02 (0.74-1.40)
6-10 times	6733 (17.5)	53 (17.5)	0.92 (0.62-1.38)
11-20 times	3643 (9.5)	22 (7.3)	0.79 (0.47-1.31)
21-50 times	1748 (4.5)	15 (5.0)	1.01 (0.57-1.81)
>50 times	735 (1.9)	13 (4.3)	1.83 (0.96-3.48)
Sunburns as a youth (10-20 years old)			
Never	1788 (4.6)	9 (3.0)	Reference
1-5 times	16,799 (43.6)	127 (41.9)	1.55 (0.77-3.14)
6-10 times	9582 (24.9)	80 (26.4)	1.73 (0.85-3.55)
11-20 times	6420 (16.7)	49 (16.2)	1.55 (0.74-3.23)
21-50 times	2887 (7.5)	20 (6.6)	1.42 (0.63-3.21)
>50 times	1053 (2.7)	18 (5.9)	3.13 (1.35-7.25)
Sunburns as an adult (more than 20 years old)			
Never	6231 (16.2)	40 (13.2)	Reference
1-5 times	20,465 (53.1)	160 (52.8)	1.39 (0.97-1.99)
6-10 times	6398 (16.6)	55 (18.2)	1.50 (0.98-2.28)
11-20 times	3415 (8.9)	20 (6.6)	1.03 (0.59-1.77)
21-50 times	1462 (3.8)	22 (7.3)	2.45 (1.44-4.17)

Variables	Invasive melanoma		HR (95%CI) ¹
	No (n=38,529)	Yes (n=303)	
	n (%)	n (%)	
>50 times	558 (1.5)	6 (2.0)	1.70 (0.71-4.06)
Cumulative sun exposure²			
Q1	9344 (24.3)	69 (22.8)	Reference
Q2	9676 (25.1)	66 (21.8)	0.87 (0.62-1.23)
Q3	9729 (25.3)	84 (27.7)	0.97 (0.69-1.35)
Q4	9781 (25.4)	84 (27.7)	0.83 (0.59-1.18)
Average number of hours in the sun on weekdays²			
Q1	9033 (23.4)	71 (23.4)	Reference
Q2	9446 (24.5)	73 (24.1)	1.00 (0.71-1.40)
Q3	10,156 (26.4)	80 (26.4)	0.93 (0.67-1.29)
Q4	9894 (25.7)	79 (26.1)	0.86 (0.61-1.20)
Average number of hours in the sun on weekend days²			
Q1	9695 (25.2)	76 (25.1)	Reference
Q2	9860 (25.6)	81 (26.7)	1.04 (0.74-1.45)
Q3	9780 (25.4)	69 (22.8)	0.91 (0.65-1.27)
Q4	9194 (23.9)	77 (25.4)	1.02 (0.72-1.44)
Sunbed use			
Never	34,413 (89.3)	273 (90.1)	Reference
Ever	4116 (10.7)	30 (9.9)	1.31 (0.89-1.92)
Number of skin cancers excised			
None	23,540 (61.1)	118 (38.9)	Reference
1	5368 (13.9)	45 (14.9)	1.48 (1.04-2.10)
2-10	8055 (20.9)	106 (25.0)	2.03 (1.54-2.68)
10-20	942 (2.4)	21 (6.9)	2.86 (1.75-4.67)
20+	624 (1.6)	13 (4.3)	2.40 (1.33-4.34)
Number of actinic lesions burnt/frozen off			
None	17,311 (44.9)	68 (22.4)	Reference
1-5	10,429 (27.1)	80 (26.4)	1.76 (1.27-2.43)
6-10	3672 (9.5)	37 (12.2)	2.02 (1.34-3.05)
11-20	2963 (7.7)	39 (12.9)	2.46 (1.64-3.68)
21-50	2263 (5.9)	41 (13.5)	3.10 (2.08-4.64)
50+	1891 (4.9)	38 (12.5)	3.05 (1.97-4.71)

¹Born in Australia, latitude of birth, region of Australia lived longest (as a child; lifetime) adjusted for age and sex.

All other variables adjusted for age, sex, hair colour and tanning ability.

²Q - Quartile

Table S2. Measures of sun exposure and risk of invasive melanoma (*in situ* melanomas treated as a time-varying covariate).

Variables	Invasive melanoma		HR (95%CI) ¹
	No (n=39,816) n (%)	Yes (n=346) n (%)	
Born in Australia			
No	6942 (17.5)	43 (12.4)	Reference
Yes	32,836 (82.6)	303 (87.6)	1.59 (1.16-2.20)
Latitude of birth			
≥45° S/N	4591 (11.5)	27 (7.8)	Reference
<45° S/N	35,174 (88.5)	319 (92.2)	1.69 (1.14-2.51)
Region of Australia lived longest up to age 20 years			
Southern region	11,773 (34.2)	105 (33.1)	Reference
Central region	16,944 (49.1)	173 (54.6)	1.19 (0.93-1.51)
Northern region	5757 (16.7)	39 (12.3)	0.80 (0.56-1.16)
Region of Australia lived longest over lifetime			
Southern region	8602 (22.2)	74 (21.9)	Reference
Central region	23,206 (60.0)	218 (64.5)	1.12 (0.86-1.45)
Northern region	6905 (17.8)	46 (13.6)	0.79 (0.54-1.14)
Age moved to Australia			
Born in Australia	32,836 (82.8)	303 (87.6)	Reference
1-10 years	1877 (4.7)	13 (3.8)	0.74 (0.42-1.28)
11-20 years	1111 (2.8)	12 (3.5)	1.10 (0.62-1.96)
20+ years	3834 (9.7)	18 (5.2)	0.47 (0.29-0.75)
Sunburns as a child (less than 10 years)			
Never	7417 (20.6)	57 (18.2)	Reference
1-5 times	16,401 (45.5)	147 (46.8)	1.10 (0.82-1.51)
6-10 times	6445 (17.9)	52 (16.6)	1.00 (0.68-1.47)
11-20 times	3551 (9.9)	30 (9.6)	1.02 (0.65-1.61)
21-50 times	1594 (4.4)	17 (5.4)	1.23 (0.71-2.15)
>50 times	1058 (2.8)	11 (3.5)	1.67 (0.84-3.32)
Sunburns as a youth (10-20 years old)			
Never	1679 (4.4)	8 (3.4)	Reference
1-5 times	16,677 (43.3)	144 (42.9)	1.80 (0.88-3.67)
6-10 times	9671 (25.1)	83 (24.7)	1.85 (0.89-3.84)
11-20 times	6513 (16.9)	56 (16.7)	1.86 (0.88-3.91)
21-50 times	2895 (7.5)	24 (7.1)	1.73 (0.77-3.90)
>50 times	1054 (2.7)	21 (6.3)	4.19 (1.84-9.55)
Sunburns as an adult (more than 20 years old)²			
Never	6086 (16.0)	44 (13.3)	Reference
1-5 times	20,106 (52.9)	166 (50.0)	1.28 (0.91-1.79)
6-10 times	6415 (16.9)	61 (18.4)	1.55 (1.05-2.29)
11-20 times	3446 (9.1)	30 (9.0)	1.41 (0.89-2.25)
21-50 times	1433 (3.8)	24 (7.2)	2.65 (1.61-4.38)

Variables	Invasive melanoma		HR (95%CI) ¹
	No (n=39,816)	Yes (n=346)	
	n (%)	n (%)	
>50 times	537 (1.4)	7 (2.1)	2.07 (0.93-4.62)
Cumulative sun exposure			
Q1	8495 (24.7)	68 (23.6)	Reference
Q2	8641 (25.1)	60 (20.8)	0.88 (0.62-1.24)
Q3	8582 (25.0)	72 (25.0)	0.99 (0.70-1.39)
Q4	8659 (25.2)	88 (30.6)	1.16 (0.84-1.61)
Average number of hours in the sun on weekdays²			
Q1	8500 (23.8)	68 (23.1)	Reference
Q2	8775 (24.6)	74 (25.1)	1.09 (0.78-1.52)
Q3	9389 (26.3)	72 (24.4)	0.99 (0.71-1.38)
Q4	9055 (25.4)	81 (27.5)	1.19 (0.86-1.65)
Average number of hours in the sun on weekend days²			
Q1	8853 (24.7)	74 (24.3)	Reference
Q2	9092 (25.4)	73 (23.9)	1.07 (0.77-1.48)
Q3	9223 (25.7)	81 (26.6)	1.23 (0.90-1.69)
Q4	8699 (24.3)	77 (25.3)	1.32 (0.95-1.82)
Sunbed use			
Never	35,360 (89.4)	312 (90.7)	Reference
Ever	4200 (10.6)	32 (9.3)	1.12 (0.78-1.62)
Number of skin cancers excised			
None	23,637 (59.8)	123 (35.8)	Reference
1	5607 (14.2)	51 (14.8)	1.57 (1.13-2.19)
2-10	8565 (21.7)	127 (36.9)	2.27 (1.75-2.95)
10-20	1029 (2.6)	24 (7.0)	2.91 (1.81-4.69)
20+	677 (1.7)	19 (5.5)	3.34 (2.00-5.59)
Number of actinic lesions burnt/frozen off			
None	17,500 (44.2)	73 (21.2)	Reference
1-5	10,708 (27.0)	84 (24.4)	1.65 (1.20-2.26)
6-10	3820 (9.6)	44 (12.8)	2.18 (1.48-3.20)
11-20	3114 (7.9)	46 (13.3)	2.63 (1.81-3.84)
21-50	2440 (6.2)	48 (13.9)	3.16 (2.16-4.64)
50+	2032 (5.1)	50 (14.5)	3.64 (2.45-5.41)

¹Born in Australia, latitude of birth, region of Australia lived longest (as a child; lifetime) adjusted for age and sex.

All other variables adjusted for age, sex, hair colour and tanning ability.

²Q - Quartile

Table S3. Characteristics of entire cohort (n=38,832) and stratified by PRS availability.

Characteristic	Whole cohort (n=38,832) N (%)^a	Without PRS (n=23,459) N (%)^a	With PRS (n=15,373) N (%)^a	Chi-Square P- value
Age				
40-49	10,278 (26.5)	6928 (29.5)	3350 (21.8)	
50-59	14,724 (37.9)	8698 (37.1)	6026 (39.2)	
≥60	13,830 (35.6)	7833 (33.4)	5997 (39.0)	<0.001
Mean age (SD)	56.0 (8.2)	56.9 (7.9)	55.5 (8.3)	<0.001 ¹
Sex				
Female	21,067 (54.3)	12,632 (53.8)	8435 (54.9)	
Male	17,765 (45.7)	10,827 (46.2)	6938 (45.1)	0.05
Education				
No school	3286 (8.5)	2313 (9.9)	973 (6.3)	
School or intermediate	6532 (16.8)	4148 (17.7)	2384 (15.5)	
High school	7641 (19.7)	4775 (20.4)	2866 (18.6)	
Trade/apprenticeship	4007 (10.3)	2564 (10.9)	1443 (9.4)	
Certificate/diploma	7730 (19.9)	4482 (19.1)	3248 (21.1)	
University	9636 (24.8)	5177 (22.1)	4459 (29.0)	<0.001
Private health insurance				
Yes	26,176 (67.4)	15,138 (64.5)	11,038 (71.8)	
No	12,656 (32.6)	8321 (35.5)	4335 (28.2)	<0.001
Native born				
Yes	32,009 (82.4)	19,302 (82.3)	12,707 (82.7)	
No	6823 (17.6)	4157 (17.7)	2666 (17.3)	0.34
Skin colour				
Fair	23,695 (61.0)	13,963 (59.5)	9732 (63.3)	
Medium	12,554 (32.3)	7777 (33.2)	4777 (31.1)	
Olive/dark	2583 (6.7)	1719 (7.3)	864 (5.6)	<0.001
Skin tanning ability				
Not tan	2536 (6.5)	1519 (6.5)	1017 (6.6)	
Tan a little	8187 (21.1)	4762 (20.3)	3425 (22.3)	
Tan moderately	19,448 (50.1)	11,752 (50.1)	7696 (50.1)	
Tan deeply	8661 (22.3)	5426 (23.1)	3235 (21.0)	<0.001
Hair colour				
Red/Auburn	2263 (5.8)	1361 (5.8)	902 (5.9)	
Dark brown	13,071 (33.7)	7890 (33.6)	5181 (33.7)	
Blond	5602 (14.4)	3456 (14.7)	2146 (14.0)	
Black	3044 (7.8)	1854 (7.9)	1190 (7.7)	
Light brown	14,852 (38.2)	8898 (37.9)	5954 (38.7)	0.22
Freckling on face at age 21				
None	18,039 (46.5)	11,122 (47.4)	6917 (45.0)	
A few	12,276 (31.6)	7360 (31.4)	4916 (32.0)	
Some	6136 (15.8)	3598 (15.3)	2538 (16.5)	
Many	2381 (6.1)	1379 (5.9)	1002 (6.5)	<0.001
Moles at age 21				
None	11,100 (28.6)	6902 (29.4)	4198 (27.3)	
A few	20,709 (53.3)	12,338 (52.6)	8371 (54.5)	

Characteristic	Whole cohort (n=38,832) N (%)^a	Without PRS (n=23,459) N (%)^a	With PRS (n=15,373) N (%)^a	Chi-Square P-value
Some	5846 (15.1)	3546 (15.1)	2300 (15.0)	<0.001
Many	1177 (3.0)	673 (2.9)	504 (3.3)	
Sunburns as an adult				
Never	6271 (16.1)	3800 (16.2)	2471 (16.1)	0.09
1-5 times	20,625 (53.1)	12,361 (52.7)	8264 (53.8)	
6-10 times	6453 (16.6)	3910 (16.7)	2543 (16.5)	
11-20 times	3435 (8.8)	2094 (8.9)	1341 (8.7)	
21-50 times	1484 (3.8)	932 (4.0)	552 (3.6)	
>50 times	564 (1.5)	362 (1.5)	202 (1.3)	
Number of skin cancers excised				
None	23,658 (60.9)	14,742 (62.8)	8916 (58.0)	<0.001
1	5413 (13.9)	2161 (13.7)	3252 (14.1)	
2-10	8161 (21.0)	4553 (19.4)	3608 (23.5)	
11-20	963 (2.5)	518 (2.2)	445 (2.9)	
20+	637 (1.6)	336 (1.4)	301 (2.0)	
Number of actinic lesions burnt/frozen off				
None	17,379 (44.8)	11,252 (48.0)	6127 (39.9)	<0.001
1-5	10,509 (27.1)	6270 (26.7)	4239 (27.6)	
6-10	3709 (9.6)	2129 (9.1)	1580 (10.3)	
11-20	3002 (7.7)	1659 (7.1)	1343 (8.7)	
21-50	2304 (5.9)	1188 (5.1)	1116 (7.3)	
50+	1929 (5.0)	961 (4.1)	968 (6.3)	
Physician skin checks in past 3 years				
Never	10,598 (27.3)	6909 (29.5)	3689 (24.0)	<0.001
Once	11,798 (30.4)	7208 (30.7)	4590 (29.9)	
2-5 times	13,943 (35.9)	7957 (33.9)	5986 (38.9)	
More than 5 times	2493 (6.4)	1385 (5.9)	1108 (7.2)	

¹P-value for significant difference in mean values (Ryan-Einot-Gabriel-Welsch multiple range test).

Table S4. Measures of sun exposure and risk of first invasive melanoma, stratified by body site of melanoma¹.

Variables	HR (95% CI) ²				P-interaction
	Trunk (n=110)	Head/neck (n=48)	Upper limbs (n=83)	Lower limbs (n=64)	
Born in Australia					
No	Reference	Reference	Reference	Reference	
Yes	1.48 (0.86-2.54)	1.15 (0.54-2.48)	1.14 (0.64-2.02)	3.27 (1.19-8.99)	0.04
Latitude of birth					
≥45° S/N	Reference	Reference	Reference	Reference	
<45° S/N	1.91 (0.93-3.92)	1.62 (0.58-4.56)	1.07 (0.56-2.07)	2.04 (0.74-5.61)	0.008
Region of Australia lived longest up to age 20 years					
Southern region	Reference	Reference	Reference	Reference	
Central region	0.89 (0.59-1.35)	1.18 (0.57-2.43)	1.45 (0.87-2.41)	1.31 (0.77-2.26)	
Northern region	0.59 (0.30-1.14)	1.76 (0.76-4.07)	0.96 (0.45-2.03)	0.51 (0.19-1.36)	<0.001
Region of Australia lived longest over lifetime					
Southern region	Reference	Reference	Reference	Reference	
Central region	0.84 (0.55-1.30)	1.09 (0.54-2.18)	1.38 (0.79-2.41)	1.30 (0.70-2.42)	
Northern region	0.61 (0.32-1.15)	0.83 (0.32-2.15)	0.91 (0.42-1.97)	0.69 (0.28-1.73)	<0.001
Age moved to Australia					
Born in Australia	Reference	Reference	Reference	Reference	
1-10 years	0.86 (0.35-2.11)	0.41 (0.06-3.00)	1.45 (0.63-3.33)	-	
11-20 years	1.14 (0.42-3.11)	1.35 (0.33-5.60)	1.16 (0.36-3.69)	1.40 (0.44-4.48)	
20+ years	0.47 (0.21-1.08)	0.95 (0.37-2.46)	0.55 (0.22-1.36)	0.14 (0.02-0.98)	<0.001
Sunburns as a child (less than 10 years)					
Never	Reference	Reference	Reference	Reference	
1-5 times	1.16 (0.66-2.03)	1.04 (0.45-2.42)	1.25 (0.65-2.38)	0.89 (0.47-1.69)	
6-10 times	1.06 (0.53-2.11)	1.18 (0.45-3.12)	1.01 (0.43-2.34)	0.53 (0.21-1.33)	
11-20 times	1.39 (0.65-2.97)	0.41 (0.09-2.00)	1.60 (0.68-3.75)	0.38 (0.11-1.37)	
21-50 times	1.18 (0.42-3.26)	0.78 (0.16-3.72)	1.53 (0.53-4.49)	0.73 (0.21-2.58)	
>50 times	1.08 (0.24-4.78)	1.76 (0.36-8.66)	3.36 (1.16-9.71)	1.13 (0.25-5.18)	0.007
Sunburns as a youth (10-20 years old)					
Never	Reference	Reference ³	Reference	Reference	
1-5 times	2.21 (0.54-9.07)	-	0.91 (0.29-2.86)	1.44 (0.35-6.01)	

Variables	HR (95% CI) ²				P-interaction
	Trunk (n=110)	Head/neck (n=48)	Upper limbs (n=83)	Lower limbs (n=64)	
6-10 times	2.69 (0.64-11.27)	-	1.20 (0.38-3.85)	1.33 (0.31-5.69)	
11-20 times	3.58 (0.85-15.07)	-	0.90 (0.26-3.12)	0.57 (0.11-2.89)	
21-50 times	1.65 (0.32-8.59)	-	1.80 (0.52-6.29)	1.00 (0.18-5.49)	
>50 times	3.32 (0.60-18.49)	-	3.26 (0.87-12.22)	2.02 (0.33-12.31)	<0.001
Sunburns as an adult (more than 20 years old)					
Never	Reference	Reference	Reference	Reference	
1-5 times	2.59 (1.18-5.66)	1.12 (0.47-2.66)	1.12 (0.58-2.17)	1.07 (0.53-2.20)	
6-10 times	3.42 (1.48-7.89)	1.84 (0.71-4.81)	0.66 (0.26-1.68)	0.93 (0.38-2.26)	
11-20 times	2.17 (0.81-5.82)	0.57 (0.07-4.83)	1.51 (0.63-3.62)	0.98 (0.33-2.87)	
21-50 times	3.26 (1.09-9.76)	0.53 (0.06-4.51)	3.68 (1.58-8.57)	1.71 (0.51-5.69)	
>50 times	3.97 (1.01-15.56)	-	1.90 (0.42-8.58)	1.18 (0.15-9.31)	<0.001
Cumulative sun exposure⁴					
Q1	Reference	Reference	Reference	Reference	
Q2	1.38 (0.71-2.70)	1.14 (0.40-3.24)	0.63 (0.34-1.15)	0.68 (0.33-1.40)	
Q3	1.45 (0.76-2.78)	1.81 (0.70-4.71)	0.58 (0.31-1.09)	0.53 (0.24-1.18)	
Q4	1.13 (0.59-2.17)	1.38 (0.51-3.68)	0.50 (0.26-0.93)	1.26 (0.64-2.47)	0.89
Average number of hours in the sun on weekdays¹					
Q1	Reference	Reference	Reference	Reference	
Q2	1.49 (0.79-2.83)	1.78 (0.62-5.12)	0.70 (0.39-1.26)	0.93 (0.47-1.86)	
Q3	1.46 (0.78-2.73)	1.98 (0.73-5.41)	0.51 (0.27-0.97)	0.67 (0.32-1.39)	
Q4	1.23 (0.66-2.27)	2.01 (0.74-5.41)	0.53 (0.28-0.99)	0.89 (0.43-1.83)	0.43
Average number of hours in the sun on weekend days⁴					
Q1	Reference	Reference	Reference	Reference	
Q2	1.99 (1.10-3.62)	0.89 (0.34-2.32)	0.73 (0.39-1.37)	0.92 (0.45-1.88)	
Q3	1.17 (0.62-2.22)	1.02 (0.43-2.40)	0.79 (0.43-1.44)	1.01 (0.50-2.03)	
Q4	1.49 (0.80-2.79)	1.30 (0.55-3.11)	0.76 (0.39-1.49)	1.05 (0.49-2.24)	0.22
Sunbed use					
Never	Reference	Reference	Reference	Reference	
Ever	1.28 (0.63-2.57)	1.30 (0.47-3.57)	1.74 (0.90-3.37)	1.15 (0.53-2.51)	0.65
Number of skin cancers excised					
None	Reference	Reference	Reference	Reference	
1	1.17 (0.63-2.19)	2.22 (1.01-4.85)	2.89 (1.51-5.53)	0.57 (0.23-1.45)	
2-10	1.97 (1.26-3.07)	1.86 (0.89-3.88)	3.31 (1.87-5.86)	1.19 (0.66-2.15)	
10-20	2.42 (1.05-5.56)	1.46 (0.30-7.13)	5.60 (2.36-13.26)	1.62 (0.49-5.39)	
20+	3.40 (1.50-7.69)	1.82 (0.41-8.02)	0.95 (0.12-7.52)	3.10 (1.06-9.08)	<0.001

Variables	HR (95% CI) ²				P-interaction
	Trunk (n=110)	Head/neck (n=48)	Upper limbs (n=83)	Lower limbs (n=64)	
Number of actinic lesions burnt/frozen off					
None	Reference	Reference	Reference	Reference	
1-5	1.44 (0.84-2.45)	1.78 (0.78-4.09)	3.21 (1.52-6.80)	1.13 (0.57-2.21)	
6-10	2.13 (1.15-5.41)	1.74 (0.60-5.07)	4.46 (1.90-10.47)	1.06 (0.40-2.80)	
11-20	1.56 (0.76-3.18)	1.30 (0.39-4.37)	6.49 (2.89-14.56)	2.59 (1.25-5.36)	
21-50	2.19 (1.13-4.24)	2.24 (0.71-7.02)	6.38 (2.73-14.89)	3.52 (1.67-7.40)	
50+	2.40 (1.15-3.98)	2.44 (0.82-7.27)	6.60 (2.70-16.13)	1.77 (0.62-5.06)	<0.001

¹11 melanoma cases had missing information on site.

²Born in Australia, latitude of birth, region of Australia lived longest (as a child; lifetime) adjusted for age and sex.

All other variables adjusted for age, sex, hair colour and tanning ability.

³Zero cells in referent category.

⁴Q - Quartile

Table S5. Measures of sun exposure and risk of invasive melanoma, stratified by sex.

Variables	HR (95% CI) ¹		P-interaction
	Women (n=136)	Men (n=180)	
Born in Australia			
No	Reference	Reference	
Yes	2.06 (1.17-3.63)	1.29 (0.86-1.93)	0.17
Latitude of birth			
≥45° S/N	Reference	Reference	
<45° S/N	1.89 (0.97-3.70)	1.48 (0.90-2.44)	0.54
Region of Australia lived longest up to age 20 years			
Southern region	Reference	Reference	
Central region	1.15 (0.78-1.69)	1.12 (0.80-1.56)	
Northern region	0.62 (0.33-1.15)	0.88 (0.54-1.43)	0.76
Region of Australia lived longest over lifetime			
Southern region	Reference	Reference	
Central region	1.07 (0.71-1.61)	1.05 (0.74-1.50)	
Northern region	0.63 (0.34-1.16)	0.76 (0.47-1.25)	0.79
Age moved to Australia			
Born in Australia	Reference	Reference	
1-10 years	0.42 (0.13-1.33)	0.95 (0.49-1.86)	
11-20 years	0.66 (0.21-2.08)	1.60 (0.81-3.15)	
20+ years	0.47 (0.22-1.00)	0.48 (0.26-0.92)	0.37
Sunburns as a child (less than 10 years)			
Never	Reference	Reference	
1-5 times	1.21 (0.77-1.913)	0.93 (0.60-1.43)	
6-10 times	1.05 (0.59-1.88)	0.84 (0.49-1.44)	
11-20 times	0.91 (0.43-1.92)	0.95 (0.51-1.75)	
21-50 times	0.38 (0.09-1.63)	1.35 (0.69-2.65)	
>50 times	1.83 (0.70-4.82)	1.78 (0.76-4.19)	0.40
Sunburns as a youth (10-20 years old)			
Never	Reference	Reference	
1-5 times	1.56 (0.52-4.71)	1.64 (0.66-4.08)	
6-10 times	2.05 (0.67-6.28)	1.58 (0.62-4.01)	
11-20 times	1.18 (0.36-3.84)	1.96 (0.76-5.04)	
21-50 times	1.21 (0.33-4.46)	1.71 (0.60-4.84)	
>50 times	2.36 (0.59-9.46)	3.74 (1.29-10.87)	0.43
Sunburns as an adult (more than 20 years old)			
Never	Reference	Reference	
1-5 times	1.41 (0.85-2.33)	1.35 (0.81-2.23)	
6-10 times	1.17 (0.61-2.24)	1.70 (0.97-2.979)	
11-20 times	1.08 (0.47-2.45)	1.41 (0.74-2.70)	
21-50 times	2.00 (0.80-5.01)	2.62 (1.33-5.13)	
>50 times	2.09 (0.49-8.98)	1.56 (0.52-4.62)	0.67
Cumulative sun exposure²			
Q1	Reference	Reference	
Q2	0.76 (0.49-1.18)	1.13 (0.62-2.04)	
Q3	0.78 (0.49-1.25)	1.34 (0.77-2.33)	

Variables	HR (95% CI) ¹		P-interaction
	Women (n=136)	Men (n=180)	
Q4	0.62 (0.32-1.18)	1.20 (0.70-2.03)	0.20
Average number of hours in the sun on weekdays²			
Q1	Reference	Reference	
Q2	0.86 (0.56-1.32)	1.38 (0.79-2.42)	
Q3	0.74 (0.47-1.18)	1.36 (0.80-2.29)	
Q4	0.55 (0.27-1.09)	1.32 (0.80-2.17)	0.12
Average number of hours in the sun on weekend days²			
Q1	Reference	Reference	
Q2	1.05 (0.68-1.61)	1.21 (0.70-2.07)	
Q3	0.67 (0.39-1.14)	1.28 (0.77-2.13)	
Q4	1.01 (0.57-1.80)	1.22 (0.74-2.02)	0.37
Sunbed use			
Never	Reference	Reference	
Ever	1.47 (0.93-2.34)	1.02 (0.50-2.08)	0.36
Number of skin cancers excised			
None	Reference	Reference	
1	1.67 (1.04-2.67)	1.24 (0.75-2.06)	
2-10	1.86 (1.23-2.82)	2.16 (1.52-3.08)	
10-20	3.35 (1.56-7.20)	2.85 (1.56-5.20)	
20+	0.74 (0.11-5.28)	3.20 (1.71-6.00)	0.49
Number of actinic lesions burnt/frozen off			
None	Reference	Reference	
1-5	1.97 (1.22-3.20)	1.56 (1.01-2.41)	
6-10	2.33 (1.25-4.34)	1.96 (1.17-3.29)	
11-20	3.35 (1.85-6.06)	2.00 (1.18-3.28)	
21-50	3.74 (1.97-7.10)	2.76 (1.68-4.52)	
50+	3.73 (1.85-7.50)	2.86 (1.70-4.82)	0.92

¹Born in Australia, latitude of birth, region of Australia lived longest (as a child; lifetime) adjusted for age and sex.

All other variables adjusted for age, sex, hair colour and tanning ability.

²Q - Quartile

Table S6. Measures of sun exposure and risk of first melanoma (invasive or *in situ*).

Variables	Melanoma (invasive or <i>in situ</i>)		HR (95%CI) ¹
	No (n=38,050)	Yes (n=782)	
	n (%)	n (%)	
Born in Australia			
No	31,334 (82.4)	675 (86.3)	Reference
Yes	6716 (17.7)	107 (11.7)	1.43 (1.17-1.76)
Latitude of birth			
≥45° S/N	4462 (11.7)	67 (8.6)	Reference
<45° S/N	33,588 (88.3)	715 (91.4)	1.54 (1.20-1.98)
Region of Australia lived longest up to age 20 years			
Southern region	11,502 (33.8)	245 (33.8)	Reference
Central region	16,813 (49.4)	379 (52.3)	1.10 (0.93-1.29)
Northern region	5749 (16.9)	101 (13.9)	0.87 (0.69-1.10)
Region of Australia lived longest over lifetime			
Southern region	8677 (22.8)	173 (22.1)	Reference
Central region	22,602 (59.4)	499 (63.8)	1.12 (0.95-1.34)
Northern region	6771 (17.8)	110 (14.1)	0.83 (0.65-1.05)
Age moved to Australia			
Born in Australia	31,374 (82.5)	675 (86.3)	Reference
1-10 years	1856 (4.9)	30 (3.8)	0.74 (0.51-1.07)
11-20 years	1079 (2.8)	25 (3.2)	1.02 (0.68-1.52)
20+ years	3741 (9.8)	52 (6.7)	0.60 (0.45-0.79)
Sunburns as a child (less than 10 years)			
Never	8006 (21.0)	133 (17.0)	Reference
1-5 times	17,380 (45.7)	351 (44.9)	1.08 (0.88-1.33)
6-10 times	6635 (17.4)	151 (19.3)	1.18 (0.92-1.51)
11-20 times	3585 (9.4)	80 (10.2)	1.22 (0.91-1.63)
21-50 times	1720 (4.5)	43 (5.5)	1.25 (0.88-1.78)
>50 times	724 (1.9)	24 (3.1)	1.64 (1.05-2.57)
Sunburns as a youth (10-20 years old)			
Never	1775 (2.7)	22 (2.8)	Reference
1-5 times	16,615 (43.7)	311 (39.8)	1.56 (1.01-2.42)
6-10 times	9446 (24.8)	216 (27.6)	1.96 (1.26-3.04)
11-20 times	6329 (16.6)	140 (17.9)	1.85 (1.17-2.91)
21-50 times	2849 (7.5)	58 (7.4)	1.67 (1.01-2.74)
>50 times	1036 (2.7)	35 (4.5)	2.68 (1.56-4.59)
Sunburns as an adult (more than 20 years old)			
Never	6160 (16.2)	111 (14.2)	Reference
1-5 times	20,236 (53.2)	389 (49.7)	1.21 (0.97-1.52)
6-10 times	6293 (16.5)	160 (20.5)	1.56 (1.21-2.00)
11-20 times	3374 (8.9)	63 (8.1)	1.12 (0.81-1.54)
21-50 times	1438 (3.8)	46 (5.9)	1.81 (1.27-2.58)
>50 times	551 (1.5)	13 (1.7)	1.32 (0.74-2.35)
Cumulative sun exposure²			

Variables	Melanoma (invasive or <i>in situ</i>)		HR (95%CI) ¹
	No (n=38,050)	Yes (n=782)	
	n (%)	n (%)	
Q1	9228 (24.3)	185 (23.7)	Reference
Q2	9569 (25.2)	172 (22.0)	0.82 (0.66-1.02)
Q3	9617 (25.3)	196 (25.1)	0.82 (0.66-1.01)
Q4	9636 (25.3)	229 (29.3)	0.81 (0.65-1.00)
Average number of hours in the sun on weekdays²			
Q1	8920 (23.4)	184 (23.5)	Reference
Q2	9333 (24.5)	186 (23.8)	0.96 (0.77-1.19)
Q3	10,032 (26.4)	204 (26.1)	0.89 (0.72-1.10)
Q4	9765 (25.7)	208 (26.6)	0.83 (0.67-1.02)
Average number of hours in the sun on weekend days²			
Q1	9589 (25.2)	182 (23.3)	Reference
Q2	9724 (24.2)	217 (27.8)	1.17 (0.95-1.44)
Q3	9652 (25.4)	197 (25.2)	1.00 (0.81-1.24)
Q4	9085 (23.9)	186 (23.8)	0.97 (0.78-1.22)
Sunbed use			
Never	33,976 (89.3)	710 (90.8)	Reference
Ever	4074 (10.7)	72 (9.2)	1.18 (0.92-1.51)
Number of skin cancers excised			
None	23,366 (61.4)	292 (37.3)	Reference
1	5291 (13.9)	122 (15.6)	1.71 (1.38-2.11)
2-10	7875 (20.7)	286 (36.6)	2.38 (2.00-2.82)
10-20	917 (2.4)	46 (5.9)	2.84 (2.07-3.91)
20+	601 (1.6)	36 (4.6)	3.11 (2.16-4.47)
Number of actinic lesions burnt/frozen off			
None	17,187 (45.2)	192 (24.6)	Reference
1-5	10,317 (27.1)	192 (24.6)	1.55 (1.27-1.90)
6-10	3595 (9.5)	114 (14.6)	2.37 (1.87-3.019)
11-20	2904 (9.5)	98 (12.5)	2.39 (1.87-3.07)
21-50	2215 (5.8)	89 (11.4)	2.69 (2.08-3.49)
50+	1832 (4.8)	97 (12.4)	3.23 (2.48-4.21)

¹Born in Australia, latitude of birth, region of Australia lived longest (as a child; lifetime) adjusted for age.

All other variables adjusted for age, hair colour and tanning ability.

²Q - Quartile

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