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Article:

Hardie, CM, Elliott, F, Chan, M et al. (3 more authors) (2020) Environmental exposures such as smoking and low vitamin D are predictive of poor outcome in cutaneous melanoma rather than other deprivation measures. *Journal of Investigative Dermatology*, 140 (2). pp. 327-337. ISSN 0022-202X

<https://doi.org/10.1016/j.jid.2019.05.033>

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SUPPLEMENTARY INFORMATION

Supplementary table 1. Association of variables of interest with stage (high versus low) from univariable and multivariable Generalized linear models to estimate risk ratios

Factor	statistic	Stage 0 – II (n=1864)	Stage III-IV (n=289)	Univariable		Multivariable n=1517	
				Risk ratio (95% CI)	p	Risk ratio (95% CI)	p
Age (years)	mean, SD	54.19 (13.68)	56.80 (13.09)	1.01 (1.00-1.02)	0.002	1.01 (1.00-1.02)	0.07
Sex							
Female	n(%)	1073 (89)	139 (11)	1	-	1	-
Male		791 (84)	150 (16)	1.39 (1.12-1.72)	0.003	1.23 (0.99-1.53)	0.07
Site							
Limbs	n(%)	905 (90)	103 (10)	1	-	1	-
Back		457 (84)	85 (16)	1.53 (1.17-2.01)	0.002	1.52 (1.06-2.16)	0.02
Trunk		189 (89)	23 (11)	1.06 (0.69-1.63)	0.78	1.19 (0.71-2.00)	0.50
Head/neck		191 (92)	16 (8)	0.76 (0.46-1.25)	0.28	0.80 (0.45-1.42)	0.44
Acral/sun protected		122 (66)	62 (34)	3.30 (2.51-4.33)	<0.001	3.23 (2.29-4.54)	<0.001
Vitamin D¹ nmol/L							
20-60	n(%)	1032 (87)	149 (13)	1	-	1	-
<20		81 (76)	25 (24)	1.87 (1.29-2.72)	0.001	2.21 (1.61-3.02)	<0.001
>60		434 (91)	41 (9)	0.68 (0.49-0.95)	0.02	0.71 (0.50-1.02)	0.07
Townsend score							
Least deprived	n(%)	607 (87)	88 (13)	1	-	1	-
Moderate		618 (87)	95 (13)	1.05 (0.80-1.38)	0.71	0.87 (0.64-1.19)	0.40
Most deprived		606 (86)	97 (14)	1.09 (0.83-1.43)	0.53	1.04 (0.83-1.31)	0.73
Smoking							
Never	n(%)	998 (87)	144 (13)	1	-	1	-
Ex smoker		587 (85)	103 (15)	1.18 (0.94-1.50)	0.16	0.95 (0.73-1.25)	0.71
Smoker		208 (87)	31 (13)	1.03 (0.72-1.48)	0.88	0.71 (0.43-1.18)	0.19
BMI	Mean/SD	26.79 (4.59)	27.09 (3.97)	1.01 (0.99-1.04)	0.30	1.01 (0.98-1.03)	0.50
Alcohol units/week							
0	n(%)	341 (85)	61 (15)	0.98 (0.72-1.32)	0.88	1.16 (0.83-1.61)	0.38
>0 ≤7		468 (84)	86 (16)	1	-	1	-
>7 ≤14		371 (87)	54 (13)	0.82 (0.60-1.12)	0.21	0.70 (0.47-1.06)	0.09
>14		604 (89)	71 (11)	0.68 (0.51-0.91)	0.009	0.58 (0.40-0.85)	0.005
Exercise MET² hrs/week							
0	n(%)	455 (86)	74 (14)	1	-	1	-
0.1 – 10		415 (88)	59 (12)	0.89 (0.65-1.22)	0.47	0.94 (0.64-1.37)	0.74
10.1 – 20		499 (87)	75 (13)	0.93 (0.69-1.26)	0.65	1.09 (0.80-1.48)	0.61
>20		408 (86)	65 (14)	0.98 (0.72-1.34)	0.91	1.17 (0.80-1.71)	0.41
Financial hardship							
0	n(%)	181 (92)	15 (8)	1	-	1	-
1		386 (88)	53 (12)	1.58 (0.91-2.73)	0.10	1.35 (0.72-2.55)	0.35
>1		1124 (86)	189 (14)	1.88 (1.14-3.11)	0.01	1.66 (0.92-2.98)	0.09
Chance HLOC							

Low	n(%)	562 (87)	81 (13)	1	-	1	-
Moderate		569 (87)	82 (13)	1.00 (0.75-1.33)	0.99	0.92 (0.66-1.28)	0.64
High		642 (86)	106 (14)	1.12 (0.86-1.47)	0.39	0.99 (0.72-1.35)	0.93

¹ Vitamin D adjusted for season and batch.

² Metabolic Equivalence of Task

Supplementary table 2. Association of variables of interest with Townsend deprivation score from univariable and multivariable linear regression models.

Factor	Univariable		Multivariable (n = 1648)	
	Coefficient (95% CI)	p	Coefficient (95% CI)	p
Vitamin D¹ nmol/L				
20-60	Reference	-	Reference	-
<20	0.38 (-0.72, -0.08)	0.21	0.05 (-0.58, 0.68)	0.87
>60	-0.40 (-0.72, -0.08)	0.02	-0.30 (-0.63, 0.03)	0.07
Smoking				
Never	Reference	-	Reference	-
Ex smoker	0.38 (0.1, 0.65)	0.09	0.17 (-0.15, 0.50)	0.28
Smoker	1.25 (0.84, 1.66)	<0.001	1.05 (0.57, 1.52)	<0.001
BMI	0.06 (0.03, 0.09)	<0.001	0.06 (0.03, 0.09)	0.001
Alcohol units/week				
0	0.28 (-0.10, 0.66)	0.14	0.12 (-0.32, 0.56)	0.60
>0 ≤7	Reference	-	Reference	-
>7 ≤14	-0.33 (-0.71, 0.04)	0.08	-0.44 (-0.87, -0.01)	0.05
>14	-0.19 (-0.52, 0.15)	0.27	-0.32 (-0.71, 0.06)	0.10
Financial hardship				
0	Reference	-	Reference	-
1	-0.40 (-0.89, 0.10)	0.11	-0.52 (-1.06, 0.01)	0.06
>1	0.29 (-0.15, 0.73)	0.20	0.01 (-0.38, 0.58)	0.68
Chance HLOC				
Low	Reference	-	Reference	-
Moderate	0.009 (-0.32, 0.34)	0.96	0.01 (-0.38, 0.35)	0.94
High	-0.008 (-0.32, 0.31)	0.96	-0.11 (-0.46, 0.25)	0.56

¹ Vitamin D adjusted for season and batch.

Supplementary table 3. Questions used to create psychosocial variables.

Variable		
Financial Hardship	Housing problems	Negative life events (within the past 2 years)
Have you ever been forced to give up work due to redundancy, enforced early retirement or illness?	Is there objective overcrowding? (calculated by person per room)	Have you or a loved one ever been seriously ill?
Do you feel that your income now is enough to support you and your family?	Is your housing adequate in terms of space for you and your family?	Has a loved one or yourself been in a serious accident?
Have you earned more in the past?	Is your housing too cold in the winter or damp?	Have you or your partner miscarried or had an abortion
Do you have any unpaid credit card bills?	Do you feel safe in your neighborhood?	Have you been separated or divorced?
Do you have any difficulty paying your mortgage?	Do you have good neighbors overall?	Have you been worried about any important relationship with someone?
Do you feel financially secure?		Have you or someone very close to you had major money problems?
Can you afford to run a car?		Have you or someone very close to you been convicted of any offence or given a prison sentence?
Can you take holidays where and when you want to?		Have you been burgled or suffered serious loss or damage to any property?
		Has anyone close to you died?