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### **Online supplementary material**

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Online Table 2. Distribution of predictor variables in the development and independent validation studies

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References

| Men  |   |   |
|--|---|---|
| Age  | Melanoma incidence rate (h1*) <sup>1</sup>  | Mortality rate without melanoma (h2) <sup>1, 2</sup>  |
| 0 to 4   | 0   | 117.17  |
| 5 to 9   | 0   | 10.57   |
| 10 to 14   | 1   | 11.91   |
| 15 to 19   | 3   | 49.08   |
| 20 to 24   | 6.9   | 70.56   |
| 25 to 29   | 11.85   | 83.16   |
| 30 to 34   | 20.25   | 98.61   |
| 35 to 39   | 29.48   | 121.53  |
| 40 to 44   | 37.87   | 159.55  |
| 45 to 49   | 52.03   | 233.14  |
| 50 to 54   | 79.01   | 350.8   |
| 55 to 59   | 106.8   | 520.83  |
| 60 to 64   | 140.09  | 824.74  |
| 65 to 69   | 180.62  | 1364.82   |
| 70 to 74   | 222.15  | 2256.97   |
| 75 to 79   | 269.59  | 4056.83   |
| 80 to 84   | 331.62  | 7169.49   |
|  |   |   |
| Women  |   | l   |
| Women<br>Age   | Melanoma incidence rate (h1*) <sup>1</sup>  | Mortality rate without melanoma (h2) <sup>1, 2</sup>  |
| Women<br>Age<br>0 to 4   | Melanoma incidence rate (h1*) <sup>1</sup><br>0   | Mortality rate without melanoma (h2) <sup>1, 2</sup><br>93.42   |
| Women<br>Age<br>0 to 4<br>5 to 9   | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1  | Mortality rate without melanoma (h2) <sup>1, 2</sup><br>93.42<br>8.85   |
| Women     Age     0 to 4     5 to 9     10 to 14   | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4   | Mortality rate without melanoma (h2) <sup>1, 2</sup><br>93.42<br>8.85<br>9.4  |
| Women     Age     0 to 4     5 to 9     10 to 14     15 to 19  | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4<br>3.18   | Mortality rate without melanoma (h2) <sup>1, 2</sup><br>93.42<br>8.85<br>9.4<br>23.27   |
| Women     Age     0 to 4     5 to 9     10 to 14     15 to 19     20 to 24   | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4<br>3.18<br>10.7   | Mortality rate without melanoma (h2) <sup>1, 2</sup><br>93.42<br>8.85<br>9.4<br>23.27<br>26.42  |
| Women     Age     0 to 4     5 to 9     10 to 14     15 to 19     20 to 24     25 to 29  | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4<br>3.18<br>10.7<br>16.1   | Mortality rate without melanoma (h2) <sup>1, 2</sup><br>93.42<br>8.85<br>9.4<br>23.27<br>26.42<br>32.63   |
| Women     Age     0 to 4     5 to 9     10 to 14     15 to 19     20 to 24     25 to 29     30 to 34   | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4<br>3.18<br>10.7<br>16.1<br>24.79  | Mortality rate without melanoma (h2) <sup>1, 2</sup><br>93.42<br>8.85<br>9.4<br>23.27<br>26.42<br>32.63<br>42.51  |
| Women   Age   0 to 4   5 to 9   10 to 14   15 to 19   20 to 24   25 to 29   30 to 34   35 to 39  | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4<br>3.18<br>10.7<br>16.1<br>24.79<br>34.43   | Mortality rate without melanoma (h2) <sup>1, 2</sup><br>93.42<br>8.85<br>9.4<br>23.27<br>26.42<br>32.63<br>42.51<br>61.5  |
| Women   Age   0 to 4   5 to 9   10 to 14   15 to 19   20 to 24   25 to 29   30 to 34   35 to 39   40 to 44   | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4<br>3.18<br>10.7<br>16.1<br>24.79<br>34.43<br>42.4   | Mortality rate without melanoma (h2) <sup>1, 2</sup><br>93.42<br>8.85<br>9.4<br>23.27<br>26.42<br>32.63<br>42.51<br>61.5<br>90.25   |
| Women   Age   0 to 4   5 to 9   10 to 14   15 to 19   20 to 24   25 to 29   30 to 34   35 to 39   40 to 44   45 to 49  | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4<br>3.18<br>10.7<br>16.1<br>24.79<br>34.43<br>42.4<br>53.2   | Mortality rate without melanoma (h2) <sup>1, 2</sup><br>93.42<br>8.85<br>9.4<br>23.27<br>26.42<br>32.63<br>42.51<br>61.5<br>90.25<br>143.89   |
| Women   Age   0 to 4   5 to 9   10 to 14   15 to 19   20 to 24   25 to 29   30 to 34   35 to 39   40 to 44   45 to 49   50 to 54   | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4<br>3.18<br>10.7<br>16.1<br>24.79<br>34.43<br>42.4<br>53.2<br>60.29                                      | Mortality rate without melanoma (h2) <sup>1, 2</sup> 93.42   8.85   9.4   23.27   26.42   32.63   42.51   61.5   90.25   143.89   215.91  |
| Women   Age   0 to 4   5 to 9   10 to 14   15 to 19   20 to 24   25 to 29   30 to 34   35 to 39   40 to 44   45 to 49   50 to 54   55 to 59  | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4<br>3.18<br>10.7<br>16.1<br>24.79<br>34.43<br>42.4<br>53.2<br>60.29<br>74.41                             | Mortality rate without melanoma (h2) <sup>1, 2</sup> 93.42   8.85   9.4   23.27   26.42   32.63   42.51   61.5   90.25   143.89   215.91   318.69                                     |
| Women   Age   0 to 4   5 to 9   10 to 14   15 to 19   20 to 24   25 to 29   30 to 34   35 to 39   40 to 44   45 to 49   50 to 54   55 to 59   60 to 64   | Melanoma incidence rate (h1*) <sup>1</sup> 0   0.1   0.4   3.18   10.7   16.1   24.79   34.43   42.4   53.2   60.29   74.41   85.42                                   | Mortality rate without melanoma (h2) <sup>1, 2</sup> 93.42   8.85   9.4   23.27   26.42   32.63   42.51   61.5   90.25   143.89   215.91   318.69   502.9                             |
| Women   Age   0 to 4   5 to 9   10 to 14   15 to 19   20 to 24   25 to 29   30 to 34   35 to 39   40 to 44   45 to 49   50 to 54   55 to 59   60 to 64   65 to 69  | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4<br>3.18<br>10.7<br>16.1<br>24.79<br>34.43<br>42.4<br>53.2<br>60.29<br>74.41<br>85.42<br>93.39           | Mortality rate without melanoma (h2) <sup>1, 2</sup><br>93.42<br>8.85<br>9.4<br>23.27<br>26.42<br>32.63<br>42.51<br>61.5<br>90.25<br>143.89<br>215.91<br>318.69<br>502.9<br>799.2     |
| Women     Age     0 to 4     5 to 9     10 to 14     15 to 19     20 to 24     25 to 29     30 to 34     35 to 39     40 to 44     45 to 49     50 to 54     55 to 59     60 to 64     65 to 69     70 to 74 | Melanoma incidence rate (h1*) <sup>1</sup><br>0<br>0.1<br>0.4<br>3.18<br>10.7<br>16.1<br>24.79<br>34.43<br>42.4<br>53.2<br>60.29<br>74.41<br>85.42<br>93.39<br>109.02 | Mortality rate without melanoma (h2) <sup>1, 2</sup> 93.42   8.85   9.4   23.27   26.42   32.63   42.51   61.5   90.25   143.89   215.91   318.69   502.9   799.2   1366.44           |
| Women   Age   0 to 4   5 to 9   10 to 14   15 to 19   20 to 24   25 to 29   30 to 34   35 to 39   40 to 44   45 to 49   50 to 54   55 to 59   60 to 64   65 to 69   70 to 74   75 to 79                      | Melanoma incidence rate (h1*) <sup>1</sup> 0   0.1   0.4   3.18   10.7   16.1   24.79   34.43   42.4   53.2   60.29   74.41   85.42   93.39   109.02   123.96         | Mortality rate without melanoma (h2) <sup>1, 2</sup> 93.42   8.85   9.4   23.27   26.42   32.63   42.51   61.5   90.25   143.89   215.91   318.69   502.9   799.2   1366.44   2476.91 |

# Online Table 1. Australian melanoma incidence and mortality without melanoma per 100,000 by age group and sex for 2007-2009

# Online Table 2. Distribution of predictor variables in the development and independent validation studies

|   | Australian Melanoma Family<br>Study <sup>a</sup> |       |         | Leeds Melanoma Case-Control<br>Study <sup>b</sup> |       |       |         |       |
|---|--|-------|---------|---|-------|-------|---------|-------|
| Predictor variable  | Cases  |       | Control |   | Cases |       | Control |       |
|   | n  | %     | n       | %   | n     | %     | n       | %     |
| Age   |  |       |         |   |       |       |         |       |
| 15-19   | 10   | 2.17  | 1       | 0.40  | 7     | 0.7   | 0       | 0.0   |
| 20-24   | 40   | 8.68  | 16      | 6.35  | 21    | 2.2   | 4       | 0.8   |
| 25-29   | 92   | 19.96 | 40      | 15.87   | 35    | 3.6   | 4       | 0.8   |
| 30-34   | 138  | 29.93 | 90      | 35.71   | 68    | 7.1   | 17      | 3.3   |
| 35-39   | 181  | 39.26 | 105     | 41.67   | 80    | 8.3   | 39      | 7.6   |
| 40-44   |  |       |         |   | 97    | 10.1  | 45      | 8.8   |
| 45-49   |  |       |         |   | 104   | 10.8  | 43      | 8.4   |
| 50-54   |  |       |         |   | 115   | 12.0  | 68      | 13.3  |
| 55-59   |  |       |         |   | 117   | 12.2  | 70      | 13.6  |
| 60-64   |  |       |         |   | 109   | 11.4  | 61      | 11.9  |
| 65-69   |  |       |         |   | 113   | 11.8  | 66      | 12.9  |
| 70-74   |  |       |         |   | 87    | 9.1   | 73      | 14.2  |
| 75-79   |  |       |         |   | 6     | 0.6   | 22      | 4.3   |
| Missing   | 0  | 0     | 0       | 0   | 1     | 0.1   | 1       | 0.2   |
| Sex   |  |       |         |   |       |       |         |       |
| Female  | 288  | 62.47 | 146     | 57.94   | 575   | 59.90 | 302     | 58.87 |
| Male  | 173  | 37.53 | 106     | 42.06   | 384   | 40.00 | 211     | 41.13 |
| Missing   | 0  | 0     | 0       | 0   | 1     | 0.10  | 0       | 0     |
| Total number of body<br>nevi greater than or equal<br>to 2mm <sup>c,d</sup> |  |       |         |   |       |       |         |       |
| Less than 28  | 16   | 3.47  | 60      | 23.81   | 322   | 33.54 | 359     | 69.98 |
| 28- 61  | 45   | 9.76  | 64      | 25.40   | 288   | 30.00 | 105     | 20.47 |
| 62-143  | 100  | 21.69 | 65      | 25.79   | 242   | 25.21 | 37      | 7.21  |
| More than 144   | 300  | 65.08 | 63      | 25.00   | 88    | 9.17  | 3       | 0.58  |
| Missing   | 0  | 0     | 0       | 0   | 20    | 2.08  | 9       | 1.75  |
| Solar Lentigines °  |  |       |         |   |       |       |         |       |
| Less than 20  | 21   | 4.56  | 36      | 14.29   | 254   | 26.46 | 178     | 34.70 |
| 20  | 83   | 18.00 | 79      | 31.35   | 250   | 26.04 | 134     | 26.12 |
| 40  | 94   | 20.39 | 53      | 21.03   | 200   | 20.83 | 93      | 18.13 |
| 60  | 83   | 18.00 | 34      | 13.49   | 156   | 16.25 | 60      | 11.70 |
| 80  | 133  | 28.85 | 39      | 15.48   | 36    | 3.75  | 26      | 5.07  |
| 100   | 47   | 10.20 | 11      | 4.37  | 3     | 0.31  | 5       | 0.97  |
| Missing   | 0  | 0     | 0       | 0   | 61    | 6.35  | 17      | 3.31  |

|  | Australian Melanoma Family<br>Study <sup>a</sup> |       |         |       | Leeds Melanoma Case-Control<br>Study <sup>b</sup> |       |         |       |
|--|--|-------|---------|-------|---|-------|---------|-------|
| Predictor variable                               | Cases  |       | Control |       | Cases   |       | Control |       |
|  | n  | %     | n       | %     | n   | %     | n       | %     |
| Hair colour at age 18                            |  |       |         |       |   |       |         |       |
| years  |  |       |         |       |   |       |         |       |
|  |  |       |         |       |   |       |         |       |
| Black/dark brown                                 | 124  | 26.90 | 104     | 41.27 | 169   | 17.60 | 149     | 29.04 |
| Light brown                                      | 178  | 38.61 | 103     | 40.87 | 454   | 47.29 | 258     | 50.29 |
| Blonde   | 103  | 22.34 | 31      | 12.30 | 182   | 18.96 | 68      | 13.26 |
| Red  | 50   | 10.85 | 11      | 4.37  | 121   | 12.60 | 29      | 5.65  |
| Missing  | 6  | 1.30  | 3       | 1.19  | 34  | 3.54  | 9       | 1.75  |
| Personal history of non-<br>melanoma skin cancer |  |       |         |       |   |       |         |       |
| No   | 423  | 91.76 | 248     | 98.41 | 899   | 93.65 | 503     | 98.05 |
| Yes  | 35   | 7.59  | 2       | 0.79  | 51  | 5.31  | 10      | 1.95  |
| Missing  | 3  | 0.65  | 2       | 0.79  | 10  | 1.04  | 0       | 0.00  |
| Total participants                               |  |       |         |       |   |       |         |       |
| included in the analyses                         | 461  | 100   | 252     | 100   | 865   | 90.10 | 492     | 95.91 |

<sup>a</sup> In the Australian Melanoma Family Study,<sup>3</sup> those participants aged over 40 years or who did not undergo a study skin examination were excluded from the analyses.

<sup>b</sup> In the Leeds Melanoma Case-Control Study<sup>4</sup> freckle density, categorized as <20%, 20%, 40%, 60%, 80%, 100%, was used as a proxy for solar lentigines (Spearman correlation coefficient =0.28, 95% CI 0.21-0.35, p<0.0001).

<sup>c</sup> Assessed from clinical examinations in dermatology clinics.

<sup>d</sup> Based on quartile cut-points in the Australian Melanoma Family Study controls.

## Online Method 1. Procedure for reweighting the age and sex distribution of the Leeds Melanoma Case-Control Study controls to the general population

In the Leeds Melanoma Case-Control Study,<sup>4</sup> where the age and sex distribution of the study controls were matched (within 5 years) to the study cases, the distributions of risk factors among controls are more similar to cases than to the general population. To correct for potential biases in area under the curve (AUC) estimates, we reweighted the age and sex distribution of the study controls to the general population (eTable3) using methods proposed by Pepe and colleagues.<sup>5</sup>

We created 23 age and sex specific strata and subsequently reweighted each stratum based on the proportion of the general population to the study controls. For example, the AUC weight of 6.64 for stratum 1 was estimated by dividing the proportion of Leeds population, 9.10%, with the proportion of study controls, 1.37%.

### Online Table 3. Area under the curve (AUC) weights in the Leeds Melanoma Case-Control

| Strata | Age<br>group<br>(years) | Sex    | Yorkshire<br>population<br>2000-2005<br>(n) | Yorkshire<br>population<br>2000-2005<br>(%) | Leeds Melanoma<br>Case-Control<br>Study controls (n) | Leeds Melanoma<br>Case-Control<br>Study controls<br>(%) | AUC weight |
|--------|-------------------------|--------|---|---|--|---|------------|
| 1      | 20-24                   | Female | 988833                                      | 9.1   | 4  | 1.37  | 6.64       |
| 2      | 25-29                   | Female | 912911                                      | 8.4   | 1  | 0.34  | 24.71      |
| 3      | 30-34                   | Female | 1093420                                     | 10.06                                       | 15   | 5.14  | 1.96       |
| 4      | 35-39                   | Female | 1157162                                     | 10.65                                       | 22   | 7.53  | 1.41       |
| 5      | 40-44                   | Female | 1092773                                     | 10.06                                       | 33   | 11.3  | 0.89       |
| 6      | 45-49                   | Female | 977603                                      | 9   | 31   | 10.62   | 0.85       |
| 7      | 50-54                   | Female | 981023                                      | 9.03  | 43   | 14.73   | 0.61       |
| 8      | 55-59                   | Female | 935492                                      | 8.61  | 44   | 15.07   | 0.57       |
| 9      | 60-64                   | Female | 770520                                      | 7.09  | 33   | 11.3  | 0.63       |
| 10     | 65-69                   | Female | 718552                                      | 6.61  | 24   | 8.22  | 0.8        |
| 11     | 70-74                   | Female | 655924                                      | 6.04  | 32   | 10.96   | 0.55       |
| 12     | 75-79                   | Female | 579585                                      | 5.34  | 10   | 3.42  | 1.56       |
| 13ª    | 20-29                   | Male   | 1884685                                     | 18.15                                       | 1  | 0.49  | 37.04      |
| 14     | 30-34                   | Male   | 1058589                                     | 10.2  | 2  | 0.98  | 10.41      |
| 15     | 35-39                   | Male   | 1131577                                     | 10.9  | 16   | 7.84  | 1.39       |
| 16     | 40-44                   | Male   | 1078801                                     | 10.39                                       | 11   | 5.39  | 1.93       |
| 17     | 45-49                   | Male   | 972114                                      | 9.36  | 11   | 5.39  | 1.74       |
| 18     | 50-54                   | Male   | 973834                                      | 9.38  | 24   | 11.76   | 0.8        |
| 19     | 55-59                   | Male   | 923894                                      | 8.9   | 24   | 11.76   | 0.76       |
| 20     | 60-64                   | Male   | 740763                                      | 7.13  | 28   | 13.73   | 0.52       |
| 21     | 65-69                   | Male   | 654917                                      | 6.31  | 40   | 19.61   | 0.32       |
| 22     | 70-74                   | Male   | 541474                                      | 5.21  | 37   | 18.14   | 0.29       |
| 23     | 75-79                   | Male   | 422556                                      | 4.07  | 10   | 4.9   | 0.83       |

<sup>a</sup> The 20-24 and 25-29 age groups for males were combined to form stratum 13 due as there were zero Leeds Melanoma Case-Control study controls in the 20-24 age group.

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