Self-reported naevus density may lead to misclassification of melanoma risk

DOI: 10.1111/bjd.18802

DEAR EDITOR, The incidence of cutaneous melanoma continues to rise, imposing a sizeable burden on health services and society.¹ The strongest known risk factor for melanoma is the presence of many melanocytic naevi.²

Naevus prevalence studies use a variety of counting methods from objective counts by dermatologists/research staff to self-counts. This diversity likely contributes to the variation seen in prevalence estimates.³ Expert counts are more accurate but are labour intensive and costly. Self-counts by untrained people are attractive because they facilitate data collection from larger populations. An Australian study showed a moderately strong relationship between adults' self-reported total-body naevus density (none, few, some or many, based on images) and a dermatologist's total-body naevus count.⁴ The authors proposed that self-reported categorical measures of naevi (naevus density) better reflect dermatologist counts than self-reported absolute counts.⁴ Given the importance of accurate classification, we compared the characteristics of those who correctly classified their naevus density, based on a dermatologist's naevus count, with those who did not.

We conducted a cross-sectional study of the first 50 participants enrolled in a longitudinal study of naevi.⁵ A single interviewer provided participants with a standard description of naevi as moles or 'spots on the skin that are usually brown or black and can be either raised or flat'. Participants were asked to estimate how many moles ≥ 2 mm they had on their body [few (< 20); some (20–50); many (> 50)]. Subsequently, a dermatologist performed total-body counts of naevi ≥ 2 mm (excluding the scalp and beneath underwear). The dermatologist's total-body naevus (≥ 2 mm) counts (mean $\pm$ SD) ranged from 1 to 142 (35 ± 38). Significant separation in the dermatologist's counts was observed between the self-reported 'few' (23 ± 27) and 'many' (74 ± 36) groups (Fig. 1). Although those classifying themselves as having 'some' (20–50) naevi had an intermediate mean $\pm$ SD count of 46 ± 45 , variation in the corresponding dermatologist's counts was large, leading to substantial overlap of those self-reporting 'some' with both other groups (Fig. 1).

The dermatologist's total-body counts were then converted to naevus density categories for direct comparison with participants' self-reported naevus density [$\kappa = 0.44$ (95% CI: 0.23–0.65)]. Because of the arbitrary cut-offs between the naevus

density categories, we defined misclassification as greater than ± 5 from either boundary. Overall, 40% of participants misclassified themselves. Of those that misclassified themselves as having 'few' naevi (< 20), the majority ($n = 8$; 80%) had 'some' naevi (20–50). Participants misclassifying themselves as having 'some' naevi ($n = 9$) were equally likely to over- or underclassify themselves (five reported 'few'; four reported 'many'). One participant with 'many' naevi incorrectly placed themselves in the 'some' category. Males were more likely to misclassify themselves than females (48% vs. 26%), but this difference was not significant ($P = 0.21$, χ^2 -test). On average, those that misclassified themselves were 5 years younger than those correctly classifying themselves ($P = 0.09$, t -test). People with past keratinocyte cancer were less likely to misclassify themselves than those without such a history (27% vs. 50%; $P = 0.18$, χ^2 -test). Interestingly, those with red/fair/light brown hair were significantly less likely to misclassify themselves compared with those with dark brown/black hair (32% vs. 67%; $P = 0.04$, Fisher's exact test), although it was noted that 92% of those with dark hair were male. Severity of freckling (face, shoulders or hands) did not influence accuracy. Only two participants had a history of melanoma, which precluded its evaluation.

Consistent with previous reports,^{4,6} we saw good separation between the dermatologist's median counts across the three self-reported naevus densities (Fig. 1). However, even allowing a margin of error of ± 5 , 40% of participants still misclassified themselves (vs. 22% misclassification if allowing a margin of ± 10). This is concerning given many melanoma risk scores that quantify their naevus component in this manner.² Although people in previous studies assessed self-reported naevus density with reference to images rather than numerical categories, as in our study, overlap of dermatologist counts between categories also occurred, indicating misclassification in their populations.^{4,6} Others have suggested using dermatologists' naevus counts limited to the right arm for a rapid expert assessment⁷, but when we assessed misclassification of the dermatologist's right arm counts vs. total-body counts, we found somewhat higher (although not significantly) misclassification than that of self-reported naevus density.

Our study was limited by the relatively small sample size, such that we lacked power to detect significant associations. However, the differences in accuracy of self-reported naevus density observed by age, and previous keratinocyte cancer, in addition to the previously reported sex and melanoma history,⁸ approached significance and warrant further investigation. If these differences prove significant in larger studies, the

Fig 1. Distribution of the dermatologist's naevus counts by self-reported naevus density for 50 participants: 'few' (< 20); 'some' (20–50); and 'many' (50+) naevi ($P = 0.002$, Kruskal–Wallis). Pairwise differences (Mann–Whitney): 'Few' was significantly different from 'many' ($P < 0.001$). There was no significant difference between 'few' and 'some' ($P = 0.13$) or between 'some' and 'many' ($P = 0.10$).

effect on risk modelling and prediction requires exploration and correction sought, for example, using Bayesian methodology.

B. Betz-Stablein ^{1,2} U. Koh ² E.I. Plasmeijer,³ M. Janda ^{4,5} J.F. Aitken ^{6,7,8,9} H.P. Soyer ^{2,10,11} and A.C. Green ^{1,11,12}

¹Cancer and Population Studies, QIMR Berghofer Medical Research Institute, Brisbane, QLD, Australia

²Dermatology Research Centre, The University of Queensland Diamantina Institute, The University Of Queensland, Brisbane, QLD, Australia

³Department of Dermatology, Erasmus Medical Centre, Rotterdam, The Netherlands

⁴Centre of Health Services Research, Faculty of Medicine, The University of Queensland, Brisbane, QLD, Australia

⁵School of Public Health and Social Work, Institute for Health and Biomedical Innovation, Queensland University of Technology, Brisbane, QLD, Australia

⁶Cancer Council Queensland, Brisbane, QLD, Australia

⁷Institute for Resilient Regions, University of Southern Queensland, Brisbane, QLD, Australia

⁸Menzies Health Institute Queensland, Griffith University, Brisbane, QLD, Australia

⁹School of Public Health, The University of Queensland, Brisbane, QLD, Australia

¹⁰Dermatology Department, Princess Alexandra Hospital, Brisbane, QLD, Australia

¹¹Australian Skin and Skin Cancer Research Centre, Brisbane, Queensland, Australia

¹²CRUK Manchester Institute and University of Manchester, Manchester Academic Health Sciences Centre, Manchester, U.K.

E-mail: brigid.betz-stablein@qimrberghofer.edu.au

References

- Whiteman DC, Green AC, Olsen CM. The Growing burden of invasive melanoma: projections of incidence rates and numbers of new cases in six susceptible populations through 2031. *J Invest Dermatol* 2016; **136**:1161–71.
- Olsen CM, Pandeya N, Thompson BS et al. Risk stratification for melanoma: models derived and validated in a purpose-designed prospective cohort. *J Natl Cancer Inst* 2018; **110**:1075–83.
- de Maleissye MF, Beauchet A, Saiag P et al. Sunscreen use and melanocytic nevi in children: a systematic review. *Pediatr Dermatol* 2013; **30**:51–9.
- Morze CJ, Olsen CM, Perry SL et al. Good test–retest reproducibility for an instrument to capture self-reported melanoma risk factors. *J Clin Epidemiol* 2012; **65**:1329–36.
- Koh U, Janda M, Aitken JF et al. 'Mind your Moles' study: protocol of a prospective cohort study of melanocytic naevi. *BMJ Open* 2018; **8**:e025857.
- Cust AE, Pickles KM, Goumas C et al. Accuracy of self-reported nevus and pigmentation phenotype compared with clinical assessment in a population-based study of young Australian adults. *Cancer Epidemiol Biomarkers Prev* 2015; **24**:736–43.
- Ribero S, Zugna D, Osella-Abate S et al. Prediction of high naevus count in a healthy U.K. population to estimate melanoma risk. *Br J Dermatol* 2016; **174**:312–18.
- Cust AE, Drummond M, Bishop DT et al. Associations of pigmentary and naevus phenotype with melanoma risk in two populations with comparable ancestry but contrasting levels of ambient sun exposure. *J Eur Acad Dermatol Venerol* 2019; **33**:1874–85.

Funding sources: This work was supported by the National Health and Medical Research Council (NHMRC) – Centre of Research Excellence scheme (APP1099021). H.P.S. is also funded by the Medical Research Future Fund – Next Generation Clinical Researcher's Program Practitioner Fellowship (APP1137127). M.J. is funded by NHMRC Translating Research into Practice Fellowship (APP1151021).

Conflicts of interest: H.P.S. is a shareholder of e-derm consult GmbH and MoleMap by Dermatologists Pty Ltd. He provides teledermatological reports regularly for both companies. H.P.S. also consults for Canfield Scientific Inc., and is an adviser for First Derm™.