Acta Derm Venereol 2015; 95: 118–120

LETTER TO THE EDITOR

Assessment of the Effect of Migration on Melanoma Incidence Trends in Australia Between 1982 and 2010 Among People Under 30

Peter D. Baade[1–3], Danny R. Youlden[1], Philippa Youl[1–3], Michael Kimlin[2,4], Craig Sinclair[5] and Joanne Aitken[1–3]

[1]Cancer Council Queensland, [2]School of Public Health and Social Work, Queensland University of Technology, PO Box 201, Spring Hill QLD 4004, Brisbane, [3]Griffith Health Institute, Griffith University, Gold Coast, [4]AusSun Research Laboratory, Institute of Health and Biotechnical Innovation, Queensland University of Technology, Brisbane, and [5]Cancer Council Victoria, Melbourne, Australia. E-mail: peterbaade@cancerqld.org.au

Accepted Oct 15, 2014; Epub ahead of print Oct 15, 2014

Sir,

In this journal, it has been suggested (1) that the incidence of invasive melanoma among susceptible young Australians is increasing, not decreasing as several other recent studies have noted (2–4). The argument presented was that previous analyses have used the total population as the denominator for the calculation of rates, not the susceptible population, and thereby people who are at low risk of melanoma have been incorrectly included. With the increased migration into Australia of people born in "low risk" countries (for melanoma) such as Asia, Middle East and the Pacific Islands, Czarnecki (1) provided data to suggest that the inclusion of these migrants in the denominator artificially reduced the observed incidence rates of melanoma, thereby hiding the proposed real increase in melanoma.

Population trends in melanoma incidence rates are obtained using data collected through cancer registries. While these registries do collect information on country of birth, these data are typically not complete. Thus any examination of the role of country of birth on melanoma incidence rates will be subject to certain assumptions. Due to the concerns that have been raised (1), we felt that it was important to re-examine this issue further through the use of a simulation study, and discuss the ramifications for ongoing cancer control in Australia.

METHODS

Aggregated data on melanoma incidence and estimated resident population from 1982 to 2010 for Australians aged less than 30 years were obtained from the Australian Institute of Health and Welfare (5). These data are in the public domain.

To model the possible changes in the susceptible, or "at risk" population of people under 30 years, a simulation approach was used, in which we applied various scenarios for the role of migration on the observed population increase among Australians aged 0–29 years over the study period, 1982–2010. Each scenario was modelled by calculating the age- and sex-specific population increase from year to year based on the actual estimated resident population data. Then we removed a percentage of that increase that was assumed to be due to migration from overseas 'low risk' countries. The extremes were that none of the population increase was due to overseas migration from 'low risk' countries (0% migration) and that all of the population increase was due to overseas migration from 'low risk' countries (100% migration). Estimates of 10%, 25%, 50% and 75% migration were included as intermediate scenarios. The impact of these migration estimates on the "at risk" population is shown in Fig. 1. If we assume 100% of the population increase is due to overseas migration, then the population 'at risk' remained constant over the study period.

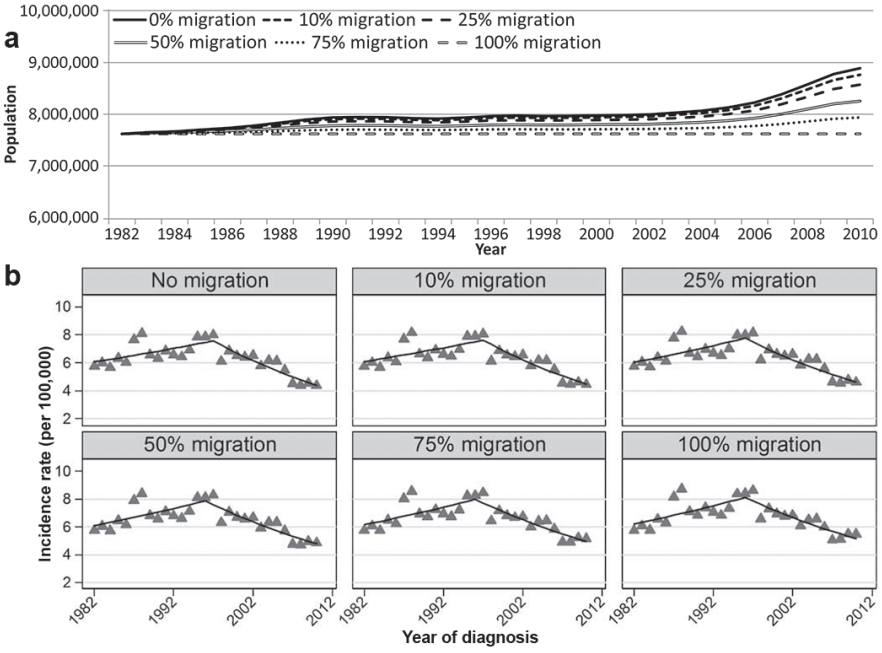

Fig. 1. (a) Australia estimated "at risk" populations, 0–29 years (excluding % of population increase due to migration). (b) Melanoma incidence trends according to various estimates of migration (Australia, 0–29 years, invasive melanomas).

We calculated directly age-standardised incidence rates, with the numerators being the observed number of melanomas and the denominator being the different populations. Rates were age-standardised to the Australian 2001 population. Annual trends were calculated using JoinPoint regression (Version 4.1.0, National Cancer Institute) which identifies changes in the magnitude and direction of the trends (6).

RESULTS

When applying this methodology, we found a significant increase in melanoma incidence in people aged 0–29 years from 1982 until the mid-1990s, followed by a significant decrease since then under each of the six "at risk" scenarios, including the original population (see Fig. 1B and Table I). Even under the extreme assumption that all of the net population increase in young Australians was due to overseas migration from low risk countries, the incidence of melanoma still decreased between 1996 and 2010 by 3.2% per year (Table I). A driving factor of this is that the numbers of melanomas diagnosed in this age group in Australia reached a peak of about 635 in the mid-1990s before decreasing to around 400/year from 2007 onward.

DISCUSSION

These data provide strong evidence against the hypothesis that the observed decrease in melanoma incidence among young Australians since the mid-1990s can be explained solely by the increasing overseas migration and any resultant lowering of the 'at risk' population in Australia.

The hypothesis that the observed decrease in melanoma incidence among young people can be explained by changing migration patterns is not new (7). These simulated data demonstrate that migration from 'low risk' countries could not have substantially altered the observed reductions in melanoma incidence rates among young Australians. Consistent with this, we have noted previously (2, 3) that high rates of immigration from low risk countries into the UK (8) and US (9) have not resulted in a corresponding decrease in childhood melanoma incidence in those countries (10, 11) and that inclusion of low-risk ethnic groups in the rate denominator has limited impact on regional incidence rates in the UK (12). In addition, non-Nordic immigration to Sweden had already begun to increase while childhood melanoma incidence rates also increased in that country (13).

Table I. *Annual percentage change under difference "at risk" population scenarios*

	Latest trend	Annual percentage change
0% migration	1997–2010	–4.1 [–5.5 to –2.7]
10% migration	1997–2010	–4.0 [–5.4 to –2.6]
25% migration	1996–2011	–3.6 [–4.9 to –2.4]
50% migration	1996–2011	–3.5 [–4.7 to –2.0]
75% migration	1996–2011	–3.3 [–4.6 to –2.1]
100% migration	1996–2011	–3.2 [–4.5 to –1.9]

Of particular note in these Australian melanoma trend data since 1982 is the initial increase in melanoma incidence among young Australians to the mid-1990s followed by the significant decrease. By considering only the first and last points of the data series, the previous study (1) neglected these changing temporal patterns and so those conclusions were based solely on the beginning and end points of the time series.

In summary, after taking movements in population composition into account, there is clear evidence for a significant reduction in the incidence of melanoma among young Australians since the mid-1990s. We maintain that the timing and strength of the observed trends in melanoma incidence, the specificity of the changes to young people compared to older adults (14), and evidence that sun protection programs have been successful in changing sun protection attitudes and behaviour (15) provide strong support for a key role for these programs in the observed reduction in rates of melanoma in young people in Australia.

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Response to "Assessment of the Effect of Migration on Melanoma Incidence Trends in Australia Between 1982 and 2010 Among People Under 30"

Douglas CZARNECKI
Department of Dermatology, Doctors' Care Centre, 3155 Melbourne, Australia. E-mail: dbczarnecki@gmail.com

Dr Baade et al. used modelling to attempt to prove that the incidence of melanoma was decreasing in young Australians and that public health campaigns have been a success. The modelling is flawed because it shows that the incidence of melanoma was lower in 2009 than in 1982, even if all of the increase in the population was due to dark skinned people who are at low risk for melanoma. This could not possible be true because more melanomas were removed from young Australians in 2009 than in 1982 (1). If, as the model suggests, there were the same number of susceptible young people in these two years the incidence would be higher in 2009. The data, rather than providing strong evidence that migration is not the main reason for the decrease in the incidence of melanoma in young Australians, show that this model is unreliable.

The decrease in the incidence of melanoma, in the entire young population, from the mid 1990s occurred one generation onwards from the big increase in the migration of low risk people to Australia. Migration and the birth of migrants' children would be expected to influence the data hence the need to adjust the data.

The authors note that the incidence of melanoma is increasing in young people in the United kingdom, United States, and Nordic countries. This is the same as in my finding after adjusting the data for the effects of immigration. No doubt the incidence of melanoma in Europe and the United States will be even higher in young people when the incidence is calculated for the susceptible population. Public health campaigns in these countries, like in Australia, have failed and need to be changed.