

## Trends in melanoma incidence and mortality in New Zealand.

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**Abstract.** This presentation will cover trends in incidence, mortality and thickness of melanoma in New Zealand, including differences by age, sex and ethnicity. It will include a brief comparison of melanoma mortality between New Zealand and Australia. In addition, an overview of the development of a New Zealand-specific prediction model to estimate individual risk of developing melanoma will be presented.

### Results & Discussion

New Zealand and Australia share the dubious distinction of having the highest melanoma incidence and mortality rates worldwide. In 2010 in New Zealand, there were 2341 new registrations of invasive melanoma, making this the 3<sup>rd</sup> highest registration rate of cancer. In the same year 324 people died of melanoma. Cancer is very rare in young people but melanoma is the 3<sup>rd</sup> most commonly registered cancer in young women and 4<sup>th</sup> in young men aged 0-24 years.

If we consider mortality from melanoma first, in New Zealand, age-adjusted melanoma mortality in men has increased by about 12% from 1996 to 2010 whereas it has been stable in women. However, since about 1983 New Zealand men have had higher mortality compared to Australia. For women the discrepancy in mortality rates is even greater: since 1973 the mortality rate in women has been about 40% higher than in Australia (Sneyd and Cox 2013).

But, these summary statistics hide important differences in trends by age. New Zealand women have higher mortality than Australian women for almost all age groups from 1968 to 2003-2007. Over this time in Australia, mortality has decreased significantly in adults aged 15 to 64 years, whereas in New Zealand it has decreased convincingly only for 15-34 year olds.

If we examine the trends by birth cohort (generations), Australian mortality increased successively for each generation born from 1893 to 1923, and for people born since 1958 their mortality rate has tended to decline. In New Zealand, mortality increased for generations born from 1893 to 1918, but any recent decrease is unclear as death from melanoma is rare in recent birth cohorts due to their young age.

If we now examine melanoma incidence rates, as with many cancers, the incidence of melanoma increases with age. While the incidence overall is higher in men, women have higher incidence than men up to age 50-54 years. After age 54, men have a steeper increase in incidence with age. A population survey carried out for the Cancer Society (Sneyd, Cameron et al. 2011) showed that the general population generally understand that fair skin confers a higher risk of melanoma but do not understand that increasing age also increases risk greatly.

Since 1996 (after the introduction of the Cancer Registry Act) the age-adjusted incidence rate of melanoma in New

Zealand has increased by 18% in men and 7% in women. But, like mortality, there is significant heterogeneity with age. In men over 64 years, incidence rate has increased by 6% per annum, whereas in men aged 15-34 the rate has decreased slightly. A similar pattern is seen for women. This suggests that melanoma control might be improving, but only if the lower incidence is maintained as these people age, and only if deep, poor prognosis melanomas are decreasing at the same time as thin ones are decreasing.

The thickness of melanoma at diagnosis is the major determinant of melanoma mortality, and in 2009/2010, 63% of melanoma were thin ( $\leq 1$ mm) and 8% were very thick ( $> 4$ mm). So what is happening to the rates of thick melanomas in New Zealand? If the early diagnosis campaigns for melanoma were having some effect, we would generally expect to see the rate of deep melanomas decrease over time. However, the age-adjusted incidence of thick ( $> 2-4$ mm) and very thick ( $> 4$ mm) melanomas has increased by 38% and 40% respectively, since 1996. The incidence of thin melanomas ( $\leq 1$ mm) has increased by 20% over the same time.

Although New Zealand Europeans have about 10 times the melanoma incidence of Maori, melanomas tend to be thicker at diagnosis in Maori and thus have a poorer prognosis (Sneyd and Cox 2011). The age-adjusted incidence has also increased significantly in Maori since 1996, possibly due to changing classification of ethnicity and changing phenotype.

So what can be done to better prevent melanomas or diagnose them while still thin and are curable? The approach being taken internationally is to target preventive, early diagnostic and surveillance strategies to people at high absolute risk of developing melanoma. However, to do this one must be able to identify those people at high absolute risk. i.e. people who have a high probability of developing melanoma in the next 5 years, say.

Without a mathematical equation it is not possible to calculate an individual's probability of developing melanoma. However, a risk predictor model and associated estimating equations can do this. We have developed such a model for melanoma in New Zealand (Sneyd, Cameron et al. 2014). To do this required data from a New Zealand case-control study of melanoma, accurate population incidence rates for melanoma and accurate all-cause mortality rates for New Zealand. The statistical methods necessitated building logistic regression models to estimate relative risks for risk factors in the case-control study; calculating the attributable risk using the method of Bruzzi et al (Bruzzi, Green et al. 1985) and using estimating equations as described by Gail et al (Gail, Brinton et al. 1989), including baseline melanoma risk and competing mortality, to calculate the 5-year risk of developing melanoma.

As part of this process we formally tested 44 candidate variables for inclusion in the models and chose the most parsimonious model that included variables suitable for use

in general practice. Four variables made a significant difference to the predictive power of the model for women: skin colour, number of big moles >5mm, positive family history of big moles, and history of non-melanoma skin cancer (NMSC). For men, the final variables included were number of big moles, history of NMSC, age at diagnosis, place of occupation <=18 years old, and birthplace (in or out of New Zealand).

The estimates of 5-year risk of developing melanoma in women at high risk ranged from 0.89% in a 20 year old in central New Zealand (includes Wellington), to 14.5% in an 80 year old women living in the midland region (includes Tauranga and Rotorua). Women at low risk had absolute risks ranging from almost 0 to 0.08% over 5 years.

We are now seeking funding to validate and extend this predictive model.

## References

- Bruzzi, P., S. Green, D. Byar, L. Brinton and C. Schairer (1985). "Estimating the population attributable risk for multiple risk factors using case-control data." Am J Epidemiol **122**(5): 904-914.
- Gail, M., L. Brinton, D. Byar, D. Corle, S. Green, C. Schairer and J. Mulvihill (1989). "Projecting individualized probabilities of developing breast cancer for white females who are being examined annually." J Natl Cancer Inst **81**: 1879-1886.
- Sneyd, M. and B. Cox (2011). "Clinical and histologic factors associated with melanoma thickness in New Zealand Europeans, Maori, and Pacific peoples." Cancer **117**(11): 2489-2498.
- Sneyd, M. J., C. Cameron and B. Cox (2014). "Individual risk of cutaneous melanoma in New Zealand: developing a clinical prediction aid." BMC Cancer **in press**.
- Sneyd, M. J., C. Cameron and A. Ward (2011). Sun safety and perception of risk for skin cancer. Auckland, New Zealand, Report for the Cancer Society of New Zealand.
- Sneyd, M. J. and B. Cox (2013). "A comparison of trends in melanoma mortality in New Zealand and Australia: the two countries with the highest melanoma incidence and mortality in the world." BMC Cancer **13**: 372-380.