

## Have attitudes towards sun-tanning changed among the NZ population since 1994?

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**Abstract.** We report results from the triennial five cities Sun Protection Survey series, 1994-2006. The associations of demographic and personal variables with responses to six sun-tanning related statements and a summative ProTan score were investigated. Statistically significantly higher ProTan scores were independently associated with age group (reverse dose-response), male sex, residence (highest in Auckland, lowest in Christchurch), ethnicity (highest among Europeans, lowest among Asians and sun sensitivity. There was no significant change in total ProTan scores between baseline and 2006. When findings reported for the Sun Protection Survey series 2010 and 2013 were included, there was limited evidence of subsequent improvement. A sustained, more intense and pervasive skin cancer primary prevention intervention programme may be required to achieve significant change.

### Introduction

NZ and Australia have, by far, the highest age standardised cutaneous melanoma incidence rates (International Agency for Research on Cancer 2012). NZ regional data suggest high and probably increasing non-melanoma skin cancer incidence (Brougham et al. 2010, Brougham et al. 2011). NZ health system skin cancer treatment costs are substantial (O'Dea 2009). Yet skin cancer is largely a potentially preventable disease (Armstrong 2004) and primary prevention interventions can be effective in increasing sun-protective behaviours (U.S. Centers for Disease Control and Prevention 2012, 2013). Positive attitudes towards tanning are strongly correlated with sun-bathing (Leary and Jones 1993) so modification of such attitudes may lead to more sun protective practices. In NZ, health promotion programs to increase awareness of skin cancer and reduce excessive sun exposure were first implemented in 1988. Data collected for five waves of the Sun Protection Survey series, 1994-2005/6, provide opportunities to investigate whether changes in perceptions regarding sun tanning have occurred and inform skin cancer primary prevention program development.

### Methods

As described fully elsewhere (Reeder A.I. et al. 2014), respondents were 15-69 years, resident in households randomly selected from five metropolitan areas (Auckland, Hamilton, Wellington, Christchurch and Dunedin) which represented approximately 55% of the total resident NZ population in the 2006 Census. A quota system ensured approximately equal representation by sex and area of residence, but (because of a primary prevention focus) over-representation of younger age

groups. Demographic and attitudinal data were obtained via a telephone survey instrument. Six measures of attitudes to sun-tanning were combined into an unweighted, summative ProTan score (between 6 and 30) (Reeder A.I. et al. 2014), applicable to the NZ urban population (Horsburgh-McLeod, Gray et al. 2010). The higher the ProTan score, the more positive the attitudes towards sun-tanning.

### Results

Data suitable for multivariable regression analysis were available from 5,329 participants (Table 1). Before adjustment all demographic and personal characteristics (survey year, city of residence, sex, age group, skin type and self-defined ethnicity) were statistically significantly associated with ProTan score, but after adjustment this association failed to reach significance for survey year. Although ProTan scores peaked in 1999/2000 then declined, there was no evidence of significantly less endorsement of tanning in 2005/6 than in 1994. Christchurch residents had the lowest and Auckland the highest ProTan scores, females a significantly lower mean score than males and there was a strong reverse dose response effect for age. ProTan scores generally increased as sun sensitivity reduced. Asian ethnicity was the most strongly negatively associated and European ethnicity the most strongly positively associated with ProTan score.

Three of the six measures which were combined to obtain the 1994-2006 total ProTan score were retained for the 2010 and 2013 Sun Exposure surveys, so the frequency of their endorsement was tracked from 1994-2013 (analyses not shown). After age adjustment, statistically significant trends of increasing endorsement were found for two statements ("I feel more healthy with a suntan" and "Most of my friends think that a suntan is a good thing"), and declining endorsement of the statement: "A suntan makes me feel more attractive to others." For another measure, "This summer I intend to sunbathe regularly to get a suntan", tracked 1994-2010 (because it was amended in 2013) did not show any significant trend.

### Discussion

Although in the unadjusted analyses survey year was statistically significantly related to total ProTan score, in the adjusted model (Table 1), it lost overall statistical significance once possible demographic changes were taken into account. This highlights the importance of carrying out multivariable analysis. The observed lack of evidence in the adjusted model for any statistically significant improvement in perceptions of sun-tanning in 2006 compared to the 1994 baseline is disappointing.

Furthermore, although there was a significant decline in endorsement of the statement “A suntan makes me feel more attractive to others”, the apparent continuing increase in endorsement of two other statements in subsequent surveys (Gray 2010; HPA Research & Evaluation Unit 2013) reinforces the conclusion that there has been limited positive change to date. It seems that significant attitudinal and behavioural changes are unlikely to be achieved and sustained without greater investment in multicomponent community-wide, primary prevention interventions - particularly those which include settings such as early childhood facilities, primary schools, outdoor workplaces and recreational facilities for which there is evidence of effectiveness in changing sun safety behaviours (U.S. Centers for Disease Control and Prevention 2012-2013). Given that evidence, as well as evidence from the Australian SunSmart programme “that a sustained modest investment in skin cancer control is likely to be an excellent value for money” (Shih, et al. 2009), New Zealand skin cancer control actions should follow the evidence in order to reduce the significant health system, economic and social burden of skin cancer.

**Table 1.** Adjusted\* effects with 95% confidence intervals for total Protan scores ( $n=5,392$ )

Predictor variable	Coeff.	Lower CI	Upper CI	<i>p</i> -value
Year ( <i>summer</i> )				0.142
1994	0.00			
1997	0.08	-0.40	0.56	
1999/00	0.59	0.10	1.07	
2002/03	0.28	-0.21	0.76	
2005/06	0.19	-0.29	0.68	
City ( <i>North to S</i> )				0.006
Auckland	0.00			
Hamilton	-0.36	-0.84	0.11	
Wellington	-0.47	-0.94	0.01	
Christchurch	-0.89	-1.36	-0.42	
Dunedin	-0.29	-0.77	0.19	
Sex				<0.001
Male	0.00			
Female	-0.56	-0.86	-0.26	
Age group ( <i>years</i> )				<0.001
15-19	0.00			
20-29	-1.64	-2.16	-1.11	
30-39	-3.34	-3.86	-2.82	
40-49	-3.69	-4.24	-3.13	
50-59	-4.22	-4.80	-3.65	
60-69	-5.49	-6.16	-4.83	
Skin type				<0.001
( <i>Most sensitive</i> ) I	0.00			
II	1.63	1.27	1.99	
III	1.88	1.40	2.36	
IV	-0.48	-1.93	0.97	
Ethnicity				<0.001
NZ European	0.00			
Māori	-0.48	-1.09	0.14	
Pacific	-1.19	-2.26	-0.11	
Asian	-2.17	-3.02	-1.32	
Other	-1.74	-3.35	-0.13	

\* Adjusted for all other variables in the table

## References

- Armstrong, B. 2004. How sun exposure causes skin cancer: an epidemiological perspective. In: Prevention of Skin Cancer, Hill, D. et al. (Eds.). Dordrecht, Kluwer Academic Publishers, p.89-116.
- Brougham, N.D.L., Dennett, E.R., Tan, S.T. 2010. Non-melanoma skin cancers in New Zealand - a neglected problem. NZ Medical Journal;123:59-65.
- Brougham, N.D.L., Dennett, E.R., Tan, S.T. 2011. Changing incidence of non-melanoma skin cancer in New Zealanders. ANZ Journal of Surgery 81:633-6.
- Gray, R. 2010. Sun Exposure Survey 2010: Topline Time Series Report. Wellington, Health Sponsorship Council.
- Horsburgh-McLeod, G.F.H., Gray, A.R., Reeder A.I., McGee, R. 2010. Applying Item Response Theory (IRT) to a suntan attitudes scale. Australasian Epidemiologist 17:40-46.
- International Agency for Research on Cancer. 2012. Globocan 2008, Cancer Incidence, Mortality and Prevalence Worldwide, <http://globocan.iarc.fr/>.
- Leary, M.R., Jones, J. L. 1993. The social psychology of tanning and sunscreen use: self-presentational motives as a predictor of health risk. Journal of Applied Social Psychology 23: 1390-1406.
- O'Dea, D. 2009. The Costs of Skin Cancer to New Zealand. Wellington, Wellington School of Medicine, University of Otago.
- Reeder, A.I., McLeod, G.F.H., Gray, A.R. McGee, R. 2014. Sun-tanning perceptions of a New Zealand urban population (1994-2005/6). Journal of Skin Cancer, <http://dx.doi.org/10.1155/2014/135473>
- Research and Evaluation Unit 2013. Sun Exposure Survey 2013, Wellington, Health Promotion Agency.
- Shih, S.T.F., Carter, R., Sinclair, C., et al. 2009. Economic evaluation of skin cancer prevention in Australia, Preventive Medicine 49:449-53
- U.S. Centers for Disease Control and Prevention 2012. Preventing skin cancer: Mass media. <http://www.thecommunityguide.org/cancer/skin/community-wide/massmedia.html>
- U.S. Centers for Disease Control and Prevention. 2012. Preventing Skin Cancer: Multicomponent Community-Wide Interventions. <http://www.thecommunityguide.org/cancer/skin/community-wide/multicomponent.html>.
- U.S. Centers for Disease Control and Prevention. 2013. Preventing Skin Cancer: Interventions in Outdoor Occupational Settings. <http://www.thecommunityguide.org/cancer/skin/education-policy/outdooroccupations.html>.
- U.S. Centers for Disease Control and Prevention. 2013. Preventing Skin Cancer: Primary and Middle School interventions. <http://www.thecommunityguide.org/cancer/skin/education-policy/primaryandmiddleschools.html>.