Indicator: Daily ultraviolet radiation levels

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Background

Australia and New Zealand have the highest incidence of melanoma in the world. Using 2008 data, Australia and New Zealand combined have an age-standardised incidence rate of 37 per 100,000 followed by Northern America with 14 per 100,000[1]. One of the primary risk factors for melanoma is exposure to ultraviolet (UV) radiation.

Peak UV radiation levels in New Zealand are approximately 40% higher[2] than comparable latitudes in North America for three main reasons. Firstly, the elliptical orbit around the Sun means the Earth's closest point of approach occurs in December/January; hence the sun is relatively close to New Zealand in the summer months[3]. Secondly, New Zealand's remote location and low population density results in a relatively 'clean' atmosphere, with fewer particulates and industrial gases compared to other countries in the northern hemisphere. This means that UV radiation can pass through the atmosphere relatively unhindered[3,4]. Finally, a comparatively thin ozone layer exacerbates this problem. Summertime ozone levels over New Zealand are reduced as ozone-depleted air moves overhead from Antarctica. This means there are less ozone molecules to absorb UV radiation before it reaches Earth's surface[3,4].

Current national levels and trends

The ultraviolet radiation index (UVI) is a standardised way to report UV levels[5]. UV levels are typically highest between the hours of 11am and 3pm. When UVI values are 3 or higher, a combination of five sun protection measures may be required for personal protection. UVI values 6-11 and higher are considered high to extreme exposure.

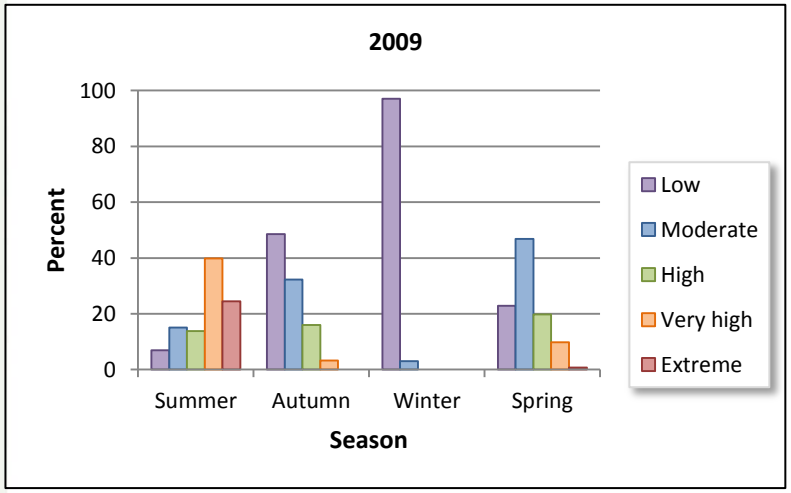

Figure 1: Seasonal % of reported UVI observation categories, NZ 2009

The distribution of observations by UVI category varies considerably by season throughout New Zealand (Figure 1). In 2009, approximately 93% of observations during summer reached or exceeded a value of 3, a level over which sun protective measures are suggested. Moderate or higher exposures were recorded during the majority of observations during spring months, and were about equal to the number of observations recording low exposure in autumn. In winter, approximately 97% of observations were categorised as low, indicating that no sun protection measures were needed. Extreme values of UVI were recorded in approximately 25% of summer observations.

Between 2005 and 2009, seasonal trends in the distribution of reported observations by UVI category, indicate that UVI levels are generally consistent and the same patterns usually emerge (see Appendix figures A to D).

Ethnic, socioeconomic and geographic differences

Table 1 shows the characteristics of populations living in areas (census area units or CAUs) of varying summer UVI. Most areas had UVI values from 7 to 9, with majority having a value of 9. Generally, areas with highest exposure have lower numbers of Europeans, higher numbers of Maori, higher levels of deprivation (NZDep)[7] and about equal numbers of males/females as other areas.

	Summertime daily average UVI				
Variables	**6 n=25**	**7 n=394**	**8 n=347**	**9 n=963**	**10 n=35**
Percent European, average	79.2	78.9	72.8	65.0	70.5
Percent Maori, average	10.7	7.9	14.0	20.1	22.5
Percent male, average	51.2	49.8	49.6	49.4	48.7
NZDep, average	4.8	4.9	5.2	5.9	6.4

Table 1: Demographic characteristics by UVI summer exposure, 2009

Figure 2 (over page) illustrates that, in 2009, all areas of New Zealand were exposed to high (UVI 6 to 7) or very high (UVI 8 to 10) levels of UV in the summer months. Summertime daily average UVI values calculated at the CAU level tend to be highest in the North Island and the upper and central/western parts of the South Island.

International comparison

Although New Zealand and Australia have the highest incidence of melanoma in the world, and despite very high and extreme recorded UVI levels particularly during the summer months, New Zealand does not experience the highest UV levels[8]. Research shows that the world's highest UV exposures occur throughout the Altiplano region of Peru, Bolivian, Chile and Argentina.

Notes

- UV Data source: UVAtlas, National Institute of Water and Atmospheric Research (NIWA). UVI data obtained from approximately 100 monitors across New Zealand. The number of monitors is variable due to changes in monitors over time, and data availability.
- Figure 2 was calculated from NIWA monitoring point data combined with an interpolation technique in ArcMap 10.0 conducted by the author. Summertime daily average UVI = Sum of peak daily UVI observations during summer / total number of observations during summer
- For Appendix figures A to D: Percent of reported observations by UVI category by season = (Reported number of observations within each UVI category by season / total number of observations) * 100.

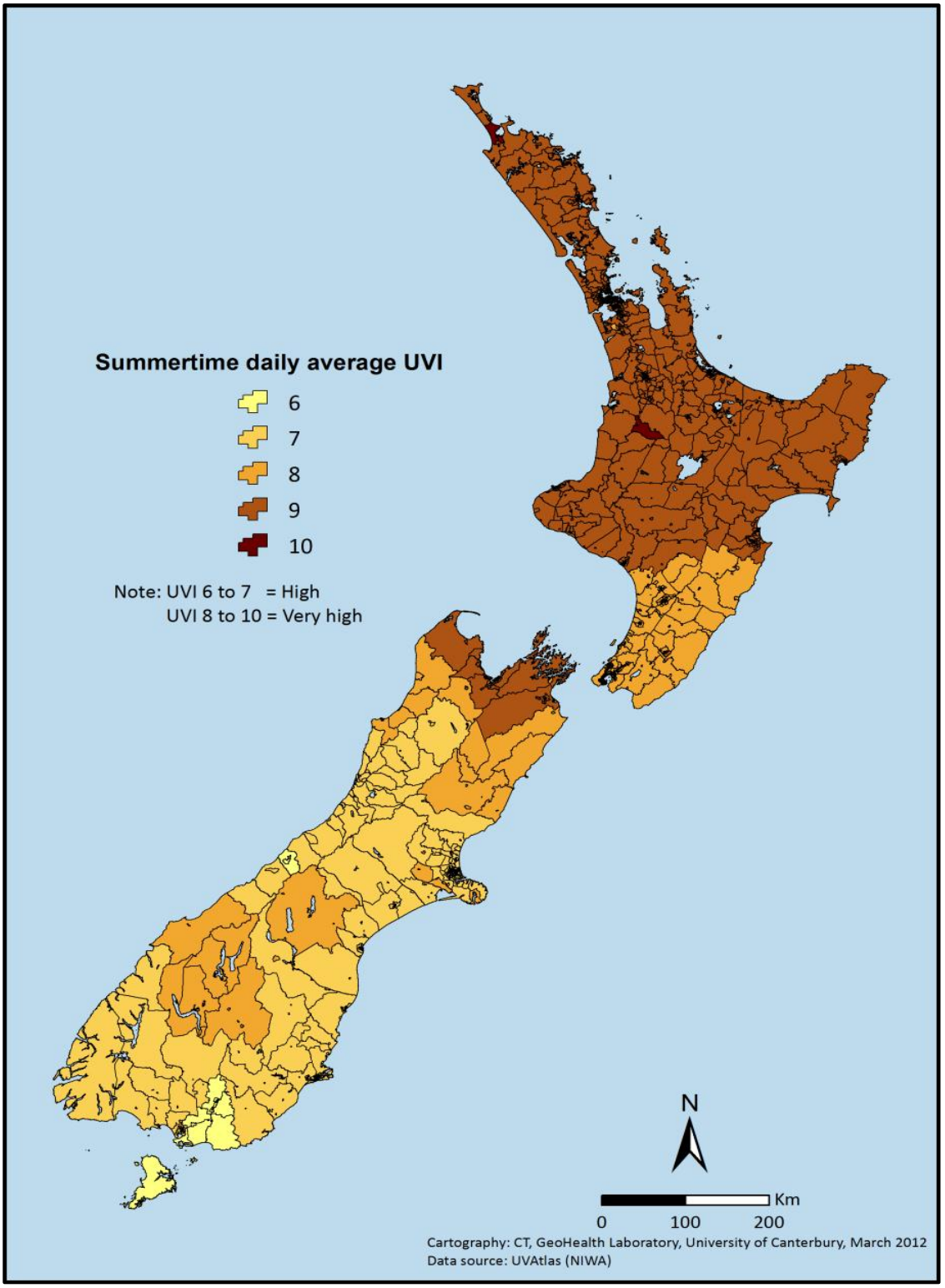

Figure 2: Summertime daily average UVI at the census area unit (CAU) level, 2009

References

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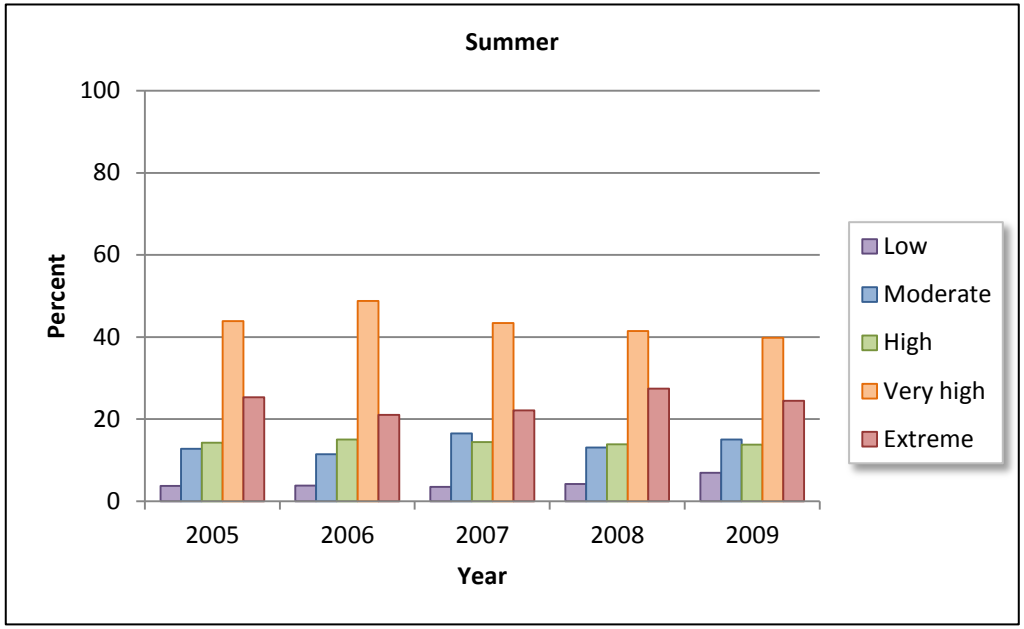
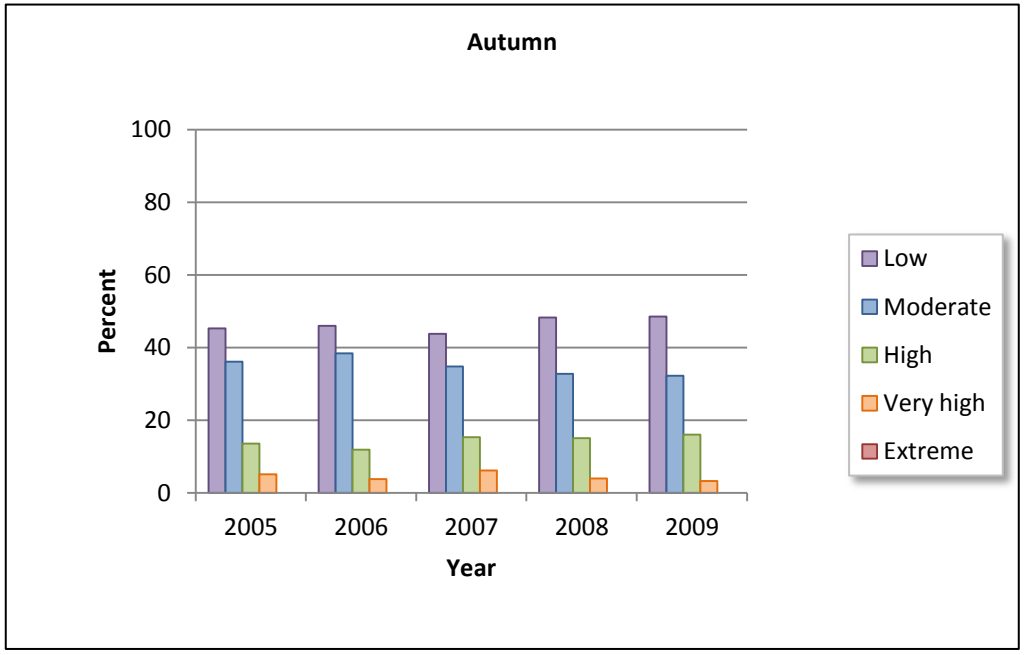
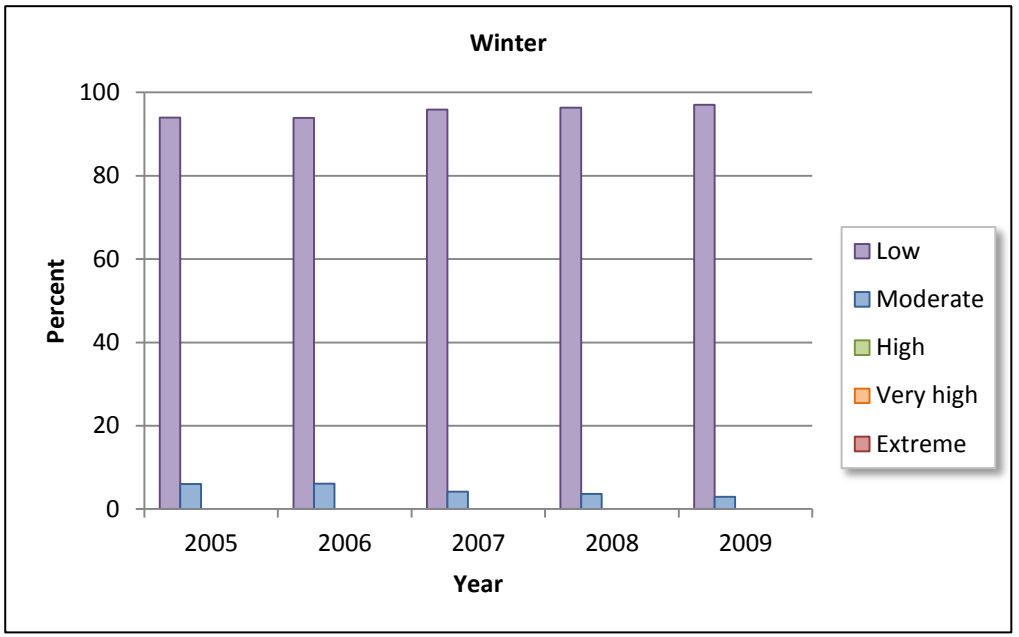


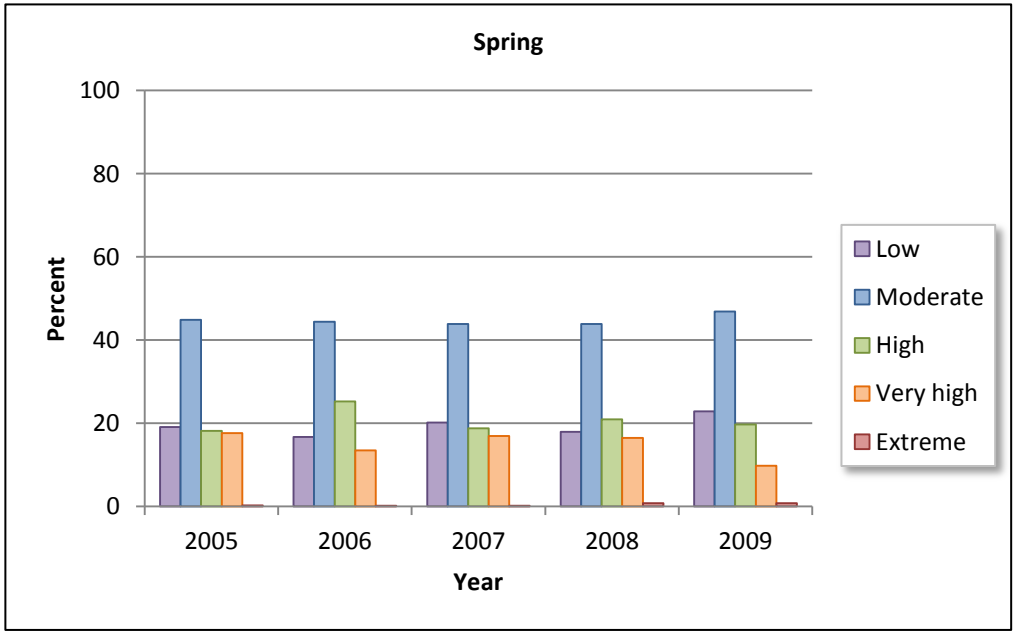
Appendix A: Percent of reported observations by UVI category in New Zealand, Summer (December to February), 2005-2009



Appendix B: Percent of reported observations by UVI category in New Zealand, Autumn (March to May), 2005-2009



Appendix C: Percent of reported observations by UVI category in New Zealand, Winter (June to August), 2005-2009



Appendix B: Percent of reported observations by UVI category in New Zealand, Autumn (March to May), 2005-2009