

Ambient Air Quality in Otago

Air Quality and Health

What is PM₁₀?

PM₁₀ refers to fine particles that make the air hazy, reducing visibility. Smaller than 10 microns across, they are about a fifth the width of a human hair. PM₁₀ is measured in micrograms per cubic metre of air ($\mu\text{g}/\text{m}^3$).

What is the NES?

The National Environmental Standard (NES) for PM₁₀ is a maximum 24 hour average of 50 $\mu\text{g}/\text{m}^3$. The role of the Regional Council is to implement this standard in Otago, and to ensure that there is no more than one breach per year by 2013.

Why are PM₁₀ levels higher in winter?

PM₁₀ particles are found in smoke. During the winter period, extra smoke produced from home heating can raise PM₁₀ levels to excessive levels in many Otago towns. For the purposes of this report, winter is defined as the period 1 June to 31 August.



There is a large amount of evidence from both international and New Zealand studies linking air pollution to adverse health outcomes such as respiratory illness, asthma and cardiovascular diseases⁽¹⁾. Studies have shown that the very young and very old are particularly susceptible to these conditions.

Very little research on this topic has been undertaken in Otago however, and a joint project by Public Health South and the Otago Regional Council has been undertaken to determine the effect of PM₁₀ levels on hospital admission rates across the region. The results of this research are summarised in this pamphlet.

Methods

The Otago Regional Council has identified 22 urban areas within Otago, and grouped these into four airshed categories for the purposes of managing local air quality. The categories are based on previous PM₁₀ monitoring, as well as climatic and topographical features.

The table below lists the towns within each airshed.

Airshed 1: Alexandra, Cromwell, Clyde, Roxburgh, Arrowtown, Naseby, Ranfurly
Airshed 2: Mosgiel, Milton, South Dunedin, Green Island, Palmerston
Airshed 3: Balclutha, North and Central Dunedin, Port Chalmers, Waikouaiti, Oamaru
Airshed 4: Wanaka, Queenstown, Kingston and Hawea.

Previous monitoring⁽²⁾ in some Airshed 1 towns has shown winter PM₁₀ levels can exceed the NES guideline value by a factor of three or four. Monitoring of the lakeside towns in Airshed 4 has shown winter PM₁₀ levels are generally at a relatively low level, comparable to those found at other rural and small town locations around Otago. Therefore for the purposes of this study, hospital admissions from Airshed 4 towns were combined with those from the "rest of Otago".

The Otago Regional Council calculated the average number of breaches of the NES for towns within each of the four airsheds and Public Health South calculated hospital admission rates for relevant respiratory illnesses within the four airsheds. The place of residence of each person admitted was used to place each admission within one of the four airsheds listed above. The admission rates for each airshed were age-standardised to ensure that the airshed populations are directly comparable. Effects of average winter temperature, social deprivation and rural/urban locations were also checked to see if they biased the results.



A layer of smog envelops Alexandra on a calm mid-winter's day.

Results

i) Air quality results

Figure 1 shows that the highest number of breaches of the NES occurred in Airshed 1 towns, with 40% of winter days breaching 50 µg/m³. There were fewer breaches in Airsheds 2 and 3, while monitoring in Airshed 4 revealed no breaches of the NES.

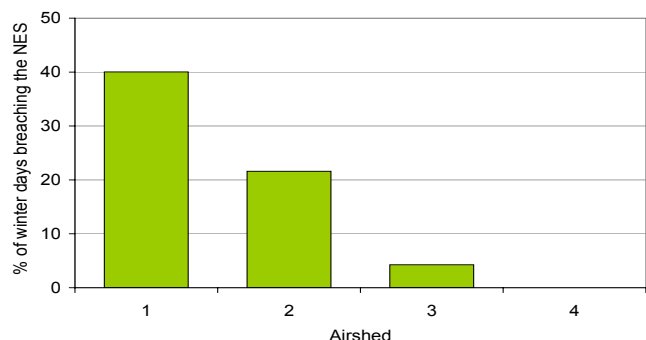


Figure 1.
Percentage of winter sample days > 50 µg/m³ at Otago towns in Airsheds 1 to 4

ii) Hospital admission results

The highest hospital admission rates due to respiratory conditions were found in Airshed 1, while Airshed 4 had the lowest admission rates. Admission rates in Airshed 1 were 1.8 times higher than those in Airshed 4. Social deprivation levels and rural/urban locations were able to be discounted as factors affecting these results.

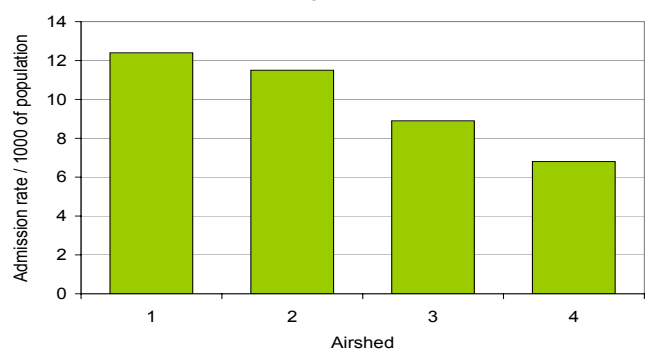


Figure 2.
Age-standardised rates of hospitalisation with relevant respiratory conditions between 2001 and 2003

In line with previous research, it was found that the very young and the very old are more at risk of hospitalisation for a respiratory condition, and this trend was emphasised in Airshed 1 towns. Figure 3 shows that children aged 5 years and under living in Airshed 1 are more than twice as likely as children living in Airshed 4 to be admitted to hospital with a respiratory condition.

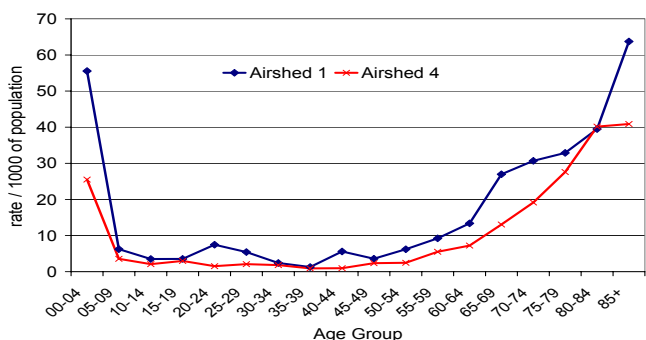


Figure 3.
Age-specific rates of hospitalisation for relevant respiratory conditions in Airsheds 1 and 4 between 2001 and 2003

Conclusions

Otago's air quality is generally very good, with poor quality usually only experienced in towns with specific topography and climate. Towns within Airshed 1 can have PM₁₀ levels that exceed the NES on approximately 40% of the days during winter. Monitoring to date by the Otago Regional Council has not revealed any breaches of the NES at towns within Airshed 4.

In line with overseas findings, an association has been found between hospital admissions for selected respiratory conditions and PM₁₀ levels in Otago. These hospital admission rates are significantly higher for residents of high air pollution areas than for residents of low pollution areas. In addition, the very young and the very old living in Airshed 1 have a much greater chance of being hospitalised for a respiratory condition than those living in Airshed 4. Average winter temperature, level of social deprivation and rural/urban status were all found not to make a significant contribution to the increased rate of admissions in Airshed 1.



Air Info

<http://orc.govt.nz/airinfo>

Air quality info for Arrowtown, Alexandra, Mosgiel and central Dunedin is now available through the Otago Regional Council's online information service.

The Air Info site provides information, received from recently installed monitoring equipment, on an hourly basis throughout the year. It measures temperature, wind speed and the amount of suspended particulate matter (PM₁₀) in the air.

The site gives viewers access to real-time data including timing of excessive PM₁₀ episodes.

Contact

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