

# APPLYING A MULTI-SITE APPROACH TO ESTIMATING RELATIVE RISKS TO HEALTH ASSOCIATED WITH AIR POLLUTION EXPOSURE AT CITY LEVEL: A CASE STUDY IN MELBOURNE

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**Background and Aims:** In time series studies of the health effects of ambient air exposure, multi-site approaches designed to overcome limitations of single-city and meta-analysis studies have increasingly gained popularity. Past studies applying such approaches have mainly estimated pooled relative health risks at national level. We used this approach to obtain a more reliable pooled relative health risk at city level. This can be achieved through an integrated technique to provide information on spatial meteorological and air quality gradients across a city.

**Methods:** Daily concentration fields of common air pollutants and meteorological variables at 3-km spacing in the area around Melbourne, a large city in Australia, for the period 1999-2008 were simulated by The Air Pollution Model - Chemistry Transport Model. The gridded data were subsequently blended with observations and then assigned to statistical local areas (SLAs) on the basis of distance and population density. In each SLA, log-linear Poisson models with smooth functions adjusting for potential confounders were used to estimate relative risks of air pollution on cardiovascular and respiratory mortality and morbidity. Hierarchical models further combined the relative risk estimates to derive overall values.

**Results:** Preliminary findings suggested increases in air pollution exposure attributable to increases in risk rates of most of the health outcomes examined, similar to results found in previous studies undertaken in Australia. Compared to previous single-city studies in which air pollution concentrations and weather variables were averaged uniformly across a city and a city was treated as a single location, the multi-site approach potentially provided better statistical power.

**Conclusions:** As long as estimating location-specific health risks remains necessary for policy and planning development, applying the multi-site approach at the city level has potential to improve statistical power and increase opportunities for exploring heterogeneity in health outcomes.