

USE OF SELF-ORGANIZING MAPS TO CATEGORIZE EXPOSURE PATTERNS IN AIR POLLUTION MONITORING DATA

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Background and Aims: Spatial variation in air pollution processes has presented a problem for exposure classification in time-series studies of air pollution health effects. The aim of this study is to examine the usefulness of self-organizing maps as a means to assess spatial patterns in the air pollution data and relate them to mortality data in a traditional time-series study design.

Methods: A self-organizing map (SOM) has been applied to daily 1-hr maximum nitrogen dioxide (NO₂) observations collected by the Port Phillip Bay air monitoring network in Melbourne, Australia over the period of 1999 to 2006 in order to identify spatial patterns of exposure. Smooth maps for each archetype were created using ordinary kriging. Once the archetypes are defined by the SOM, the daily exposure data was then categorized under the archetype in which it is most similar. This produced a time-series of exposure charts that were then compared to daily mortality using the framework of a generalized additive Poisson regression model.

Preliminary Results: The SOM approach produced 20 archetypes in order to display the range of spatial patterns that occur across the monitoring network. Frequency analysis found the average occurrence of any particular type to be 5% with a range of 1 to 9%.

Conclusions: SOMs are a promising method for assessing spatial variation in air pollution data sets. They provide a visualization of spatial patterns in the data and frequency information—powerful tools in understanding space-time data. Moreover, the output provided is suitable for examination of spatial effects on human health in standard time-series approaches.