Air pollution’s impact on health: a European and N. American analysis

A team of investigators has examined the effects of air pollution on human health using the databases of earlier studies from Europe, the United States and Canada. They concluded that PM$_{10}$ and ozone are associated with an increase in mortality. Different modelling approaches do not significantly affect the results.

Partly-funded by the EU, the APHENA project\(^1\) investigated whether the technique used to assess the effects of air pollution on health could lead to different results. Specifically, it looked at modelling techniques that have been used in previous studies and factors which might cause differences in outcomes.

The databases included air pollution monitoring data for PM$_{10}$ and ozone, and information on mortality and morbidity (incidence of disease), as measured by hospital admissions for cardiovascular or respiratory causes, for Europe, the USA and Canada. These data covered 24 cities across Europe, 90 cities in the U.S., and 12 cities in Canada.

In the first-stage of data analysis, models were designed to analyse the effects of air pollution at the city level. In the second stage the researchers assessed the design of models which collate data from a number of cities to provide an overall picture for each region. They paid particular attention to whether health effects were truly related to air pollution or to other factors that might explain differences found between cities and regions and explored the modifying effect of some of those factors.

For the city-level analysis, the investigators concluded that different modelling techniques produced very similar results, and that one approach was not better than any other. As a result, the researchers decided to adopt a suite of models and assumptions for analysing the health impacts of air pollutants, particularly PM$_{10}$ and ozone. However, as a guideline, the researchers suggest choosing the simplest model that seems to capture the main variability in the data, and to explore in detail the sensitivity of the most scientifically relevant conclusions.

The researchers’ results were very similar to those from previous studies. They found a small, but significant, association between the effects of PM$_{10}$ and ozone on mortality and to a lesser extent on hospital admissions. More specifically, a 10 μg/m$^3$ increase in PM$_{10}$ was associated with all-cause and cardiovascular mortality in Canada, Europe and the United States.

Interestingly, the health impacts of exposure to PM$_{10}$ and ozone were estimated to be two to three times higher for Canada than for Europe and the USA, confirming the results of previous studies. The study was unable to explain this result. Nevertheless, it identified some common modifying factors, including the employment rate, concentrations of pollutants and the age structure of the population that could potentially influence the effect of pollution on health.

In order to more fully compare the effects of air pollutants on health across different countries, the researchers suggest greater standardisation is needed: particularly in monitoring methods and frequency of collection of data on air pollutants, as well as the way in which mortality, hospitalisation and sociodemographic indicators are collected.

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