

Science for Environment Policy

Black smoke pollution may have 'medium-term' delayed effects on mortality rates

Increased black smoke pollution was associated with increased mortality rates almost a month after exposure in a recent study. The researchers studied death rates in relation to pollution concentrations over a 22-year period in the city of Glasgow, UK, and found significantly higher mortality rates among residents at 13-18 and 19-24 days after increased exposure to black smoke.

Air pollution can have severely damaging effects on human [health](#) and has been linked with respiratory problems, cancer and heart disease. With the exception of long-term cases, such as lung cancer, it has often been assumed that the effects of air pollution on mortality rates will be almost immediate (i.e. within three days). However, in this study, the researchers propose that there may be 'medium-term' time delays, of up to 30 days, between exposure to high concentrations of pollution and corresponding deaths.

The researchers used long-term data collected between 1974 and 1998 which detailed the daily mortality rates of residents aged over 50 in Glasgow. Over the same time period, concentrations of 'black smoke' were recorded. This is a measure of particulate matter pollution that has been shown to be a good indicator for traffic and other urban air pollution. The study area, which also incorporates smaller towns bordering Glasgow, includes 1.5 million residents and covers 452 km².

Concentrations of black smoke had been measured daily at a monitoring station in central Glasgow and the researchers also included temperature data in their analyses. Temperature is an important aspect as it is known to affect mortality rates in its own right, but also exacerbates the effects of air pollution.

Once the effects of temperature had been considered, increased concentrations of black smoke were associated with increased mortality rates at 13-18 days and 19-24 days after elevated air pollution concentrations were recorded. Pollution events corresponded with higher rates of death from respiratory problems in particular, compared with rates of death from all causes. This association with respiratory mortality was observed at 1-6, 7-12 and 13-18 days after elevated concentrations of pollution were recorded.

Overall, the researchers calculated that an increase in black smoke of 10 micrograms per cubic metre of air was associated with a 0.9% increase in all types of mortality and a 3.1% increase in respiratory mortality for the following 30-day period.

Because studies often assume that concentrations of pollutants are only relevant to mortality for only a few days after exposure, the researchers of this study suggest that the full effects of pollutants are possibly being underestimated. They note that their results are supported by a small number of other studies, including the EU project APHEA-2¹, which found significant associations between PM₁₀ (particulate matter of 10 micrometres or less) and mortality after a four-week delay.

The authors of this study conclude that the monitoring and management of air pollution, including public health impact assessments and air pollution policies, should take these possible delayed effects into account.



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1. APHEA-2 (Air Pollution and Health: A European Approach) was supported by the European Commission. See: <http://ec.europa.eu/research/success/en/env/0267e.html>