

Science for Environment Policy

Deadly effects of particulate matter pollution shown in French study

Particulate matter (PM) pollution has a significant effect on death rates in French cities, a new study shows. The research confirms the short-term impacts of PM₁₀, but also sheds new light on the effects of smaller particulates: PM_{2.5} and PM_{10-2.5}. Its results could help inform public health advice, the authors propose.

Many studies have linked PM with negative [health](#) impacts. However, most studies looking at [pollution](#) across multiple cities in Europe have, to date, focused on PM₁₀—particles up to ten micrometres in size. Fewer studies of this kind have considered PM_{2.5} (particles of less than 2.5 micrometres) or PM_{10-2.5}.

This study argues that more research is needed to better understand PM_{2.5} and PM_{10-2.5}'s health impacts across Europe. Such research could also help inform a daily limit value for PM_{2.5} in Europe, as recommended by the WHO. At present, a daily value only exists for PM₁₀ in Europe: in this case, 50 micrograms per cubic metre of air ($\mu\text{g}/\text{m}^3$) cannot be exceeded more than 35 times a year, under the EU's [Air Quality Directive](#)¹.

To help fill this research gap, this study analysed the short-term associations between PM (PM₁₀, PM_{2.5} and PM_{10-2.5}) pollution and mortality across nine French cities. These cities represented a range of climates, geographies, urbanisation levels and pollution sources.

The researchers looked at changes in daily death rates following a rise of 10 $\mu\text{g}/\text{m}^3$ for each of the three sizes of PM. Data for pollution and mortality in these cities were assessed for the period 2000-2006. A total of 548 474 people died in the nine cities during this period.

The results suggested a significant link between increases in PM and deaths from all non-accidental causes: an increase of 0.8% in mortality in response to a 10 $\mu\text{g}/\text{m}^3$ rise in PM₁₀. For PM_{2.5}, death rates rose by 0.7% following a 10 $\mu\text{g}/\text{m}^3$ rise.

PM_{10-2.5} had a particularly strong effect on cardiovascular and cardiac mortality, and particularly for the elderly. It was associated with a 3.9% rise in deaths from cardiovascular disease and 4.4% rise in deaths from cardiac problems for people older than 74 years old.

The researchers also found seasonal patterns in the data. For all PMs, the greatest mortality risks were in the summer. For instance, each 10 $\mu\text{g}/\text{m}^3$ rise in PM_{2.5} in the summer was linked with an increase of 5.1% in cardiovascular-related deaths. This is more than seven times higher than the impact of a 10 $\mu\text{g}/\text{m}^3$ rise averaged across the whole year.

During summer, the cardiovascular mortality also increased by 7.2% for each 10 $\mu\text{g}/\text{m}^3$ rise in PM_{10-2.5}. The researchers also observed a 5.7% increase in ischaemic (obstructed blood flow) deaths in the summer in association with PM₁₀.

Similarly, death rates increased in response to PM on warm days (defined as days when the temperature equalled or exceeded the 97.5th percentile of the average temperature range), compared with cooler days. However, the effects varied by the type of PM. For instance, PM_{2.5} was more strongly linked with cerebrovascular causes of death (e.g. stroke) than PM₁₀ in response to warm days.

The study concludes that the results confirm PM₁₀'s impacts on mortality, as shown in earlier studies, and provide new information on the impacts of PM_{2.5} and PM_{10-2.5}. This new evidence could support public health messages in relation to high pollution days. Presently in France, the public are alerted when PM₁₀ exceeds 50 $\mu\text{g}/\text{m}^3$. These results may support the case for alerts when PM_{2.5} and PM_{10-2.5} are also high. In line with WHO recommendations, the study argues that regulation values for these pollutants should be set.



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1. http://ec.europa.eu/environment/air/quality/legislation/existing_leg.htm