

Exposure to air pollution is associated with increased deaths after heart attacks

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Air pollution contributes to an increased number of deaths among patients who have been admitted to hospital with heart attacks, according to a study published online today (Wednesday) in the *European Heart Journal*.

The largest study yet to investigate the links between fine air-borne particulate matter (PM) and patient survival after hospital admission for [acute coronary syndrome](#) (ACS) found death rates increased with increased exposure to PM2.5 – [tiny particles](#) that measure 2.5 micrometers (μm) in diameter or less, approximately 30 times smaller than a human hair. The amount of PM in the air is measured as micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$). The main sources of PM2.5 in the UK are emissions from [road traffic](#) and industry, including power generation.

Dr Cathryn Tonne, lecturer in environmental epidemiology at the London School of Hygiene & Tropical Medicine (London, UK) said: "We found that for every $10\mu\text{g}/\text{m}^3$ increase in PM2.5 there was a 20% increase in the death rate. For example, over one year of follow-up after patients had been admitted to hospital with ACS, there would be 20% more deaths among patients exposed to PM2.5 levels of $20\mu\text{g}/\text{m}^3$, compared to patients exposed to PM2.5 levels of $10\mu\text{g}/\text{m}^3$."

Dr Tonne and her colleague Paul Wilkinson, professor of environmental epidemiology at the London School of Hygiene & Tropical Medicine, estimate that death rates would be reduced by 12% among ACS patients

if they were exposed to naturally occurring PM_{2.5} rather than the higher levels they were actually exposed to. This translates to 4,783 deaths occurring earlier than they should do, due to exposure to PM_{2.5} from man-made sources.

The researchers linked records of 154,204 patients who survived hospital admission for ACS in England and Wales between 2004-2007 with modelled average air pollution concentrations for 2004-2010. The patients were followed up until the end of the study in April 2010 or their death, whichever occurred earlier. During the average follow-up time of 3.7 years, there were 39,863 deaths. The researchers adjusted their results to take account of the patients' sex, age, medical history, treatments and drugs, whether or not they smoked, socioeconomic factors such as income, education and employment, and where they lived.

The air pollution modelling of average exposures for different regions of the country showed the highest average exposures to PM_{2.5} and other air pollutants in London (an average of 14.1 µg/m³), while the North East of England had the lowest exposure (an average of 8.4 µg/m³). However, people's individual exposure to PM_{2.5} varied widely within each region.

Evidence has been growing that exposure to air pollution is associated with the development of heart disease, but, so far, few studies have investigated its effect on survival after heart attacks (myocardial infarction) and the findings have been inconsistent. In addition, it is known that patients from poorer backgrounds often live in more deprived areas with higher levels of air pollution and that they tend to do less well after a diagnosis of heart problems than patients of a higher socioeconomic status. "This raises the possibility that exposure to air pollution may explain, in part, the differences in prognosis among [heart attack](#) patients from different backgrounds," said Dr Tonne.

"Our findings confirm an association between PM2.5 and increased rates of death in survivors of ACS. Our findings also show that PM2.5 exposure contributes only a small amount to differences in survival after ACS among people living in areas with different socioeconomic conditions after accounting for factors such as smoking and diabetes.

"The implication is that while reducing levels of PM2.5 will lead to increased life-expectancy and is an important public health priority, it isn't likely to reduce socioeconomic inequalities in prognosis very much. There are likely to be many other factors that are more important than PM2.5 exposure in explaining socioeconomic inequalities in prognosis, and this requires further investigation."

The study's strength was its size and amount of detailed data available about the patients. A limitation was that the researchers lacked specific causes of death and so were unable to discover how many were heart-related, although they suspect the majority were. Exposure to air pollution was based on where the patients lived and did not take account of amounts of time spent travelling or away from home.

In an accompanying editorial, Professor Pier Mannucci, Scientific Director of the IRCCS Ca' Granda Maggiore Policlinico Hospital Foundation in Milan (Italy), writes: "The most important message is that reduction in the amount of pollutants in metropolitan areas does indeed decrease cardiovascular mortality within a time interval as short as a few years..."

He adds that the "huge toll of deaths...worldwide owing to air pollution could be substantially reduced – by approximately one million annually from the current estimate of 1.34 million – if the WHO [World Health Organization] recommendations pertaining to the limits of PM2.5 concentrations were implemented. The responsibility for controlling air pollution rests on national governments of the planet...."

In the meantime, individual clinicians should "make patients aware of the existence of this risk, and encourage them to be cognizant of the media alerts on air quality in their living areas". Finally, he calls on the European Society of Cardiology to develop scientific statements on [air pollution](#) and cardiovascular disease in order to make governments, clinicians and the public more aware of the problem.

More information: *European Heart Journal*.
[doi:10.1093/eurheartj/ehs480](https://doi.org/10.1093/eurheartj/ehs480)

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