

Daily exposure to ozone pollution linked to increased risk of death

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Daily exposure to ground level ozone in cities worldwide is associated with an increased risk of death, finds the largest study of its kind published by *The BMJ* today.

The findings—based on data from over 400 cities in 20 countries across the world—show that more than 6,000 deaths each year would have been avoided in the selected cities if countries had implemented stricter air quality standards.

Ground level ozone is a highly reactive gas commonly found in urban and suburban environments, formed when pollutants react in sunlight.

Current air quality thresholds (in micrograms per cubic meter of ambient air) range from 100 $\mu\text{g}/\text{m}^3$ (WHO), 120 $\mu\text{g}/\text{m}^3$ (European Union directive), 140 $\mu\text{g}/\text{m}^3$ (US National Ambient Air Quality Standard), and 160 $\mu\text{g}/\text{m}^3$ (Chinese Ambient Air Quality Standard).

Recent reviews suggest that 80% of the world's population in [urban areas](#) are exposed to air pollution levels above the WHO threshold.

Most previous studies have found positive associations between ground level ozone and mortality, but differences in [study design](#) and quality make it difficult to draw consistent conclusions across different regions.

To try and address this, an international research team analyse deaths and environmental measures (weather and air pollutants) in 406 cities in 20 countries, with overlapping periods between 1985 and 2015.

Using data from the Multi-City Multi-Country Collaborative Research Network, they derived daily average ozone levels (above a maximum background level of 70 $\mu\text{g}/\text{m}^3$), particulate matter, temperature, and relative humidity at each location to estimate the daily number of extra deaths attributable to ozone.

A total of 45,165,171 deaths were analysed in the 406 cities. On average, a 10 $\mu\text{g}/\text{m}^3$ increase in ozone during the current and previous day was associated with a 0.18% increased risk of [death](#), suggesting evidence of a

potential direct (causal) association.

This equates to 6,262 extra deaths each year (or 0.2% of total mortality) in the 406 cities that could potentially have been avoided if countries had implemented stricter air quality standards in line with the WHO guideline.

What's more, smaller but still substantial mortality impacts were found even for ozone concentrations below WHO guideline levels, supporting the WHO initiative of encouraging countries to revisit current air quality guidelines and enforcing stronger emission restrictions to meet these recommendations, say the researchers.

This is an observational study, so can't establish cause, and the researchers point to some limitations. For example, areas such as South America, Africa, and the Middle East were unrepresented or not assessed, and differences in monitoring and data collection between countries may have affected the accuracy of their estimates.

Nevertheless, they say their results suggest that ozone related mortality "could be potentially reduced under stricter air quality standards."

Moreover, interventions to further reduce [ozone](#) pollution "would provide additional health benefits, even in regions that meet current regulatory standards and guidelines," they add.

"These findings have important implications for the design of future public health actions; particularly, for example, in relation to the implementation of mitigation strategies to reduce the impacts of climate change," they conclude.

More information: Short term association between ozone and mortality: global two stage time series study in 406 locations in 20

countries, *BMJ* (2020). DOI: [10.1136/bmj.m108](https://doi.org/10.1136/bmj.m108)

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