

Ultrafine particles linked to over 1,000 deaths per year in Canada's two largest cities

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A first-of-its kind study conducted in Canada's two largest cities by McGill-led researchers has linked about 1,100 premature deaths per year to an unregulated air pollutant.

Ultrafine particles (UFPs) primarily come from vehicle emissions and industrial activities. Canada's federal and [provincial governments](#) have not set concentration limits for UFPs, as they have for larger fine particles known as PM2.5.

"Ultrafine particles are incredibly small, allowing them to penetrate deep into the lungs and enter the bloodstream. Increasing evidence suggests these pollutants may contribute to heart and lung diseases, as well as certain forms of cancer," said Principal Investigator Scott Weichenthal, an Associate Professor in McGill's Department of Epidemiology, Biostatistics, and Occupational Health.

"However, until now, studies have not examined the impacts of UFPs on mortality in Canada.

High-tech tools detect deadly pollution

The research team tracked air-pollution levels from 2001 to 2016 in neighborhoods in Montreal and Toronto that were home to 1.5 million adults. Using state-of-the-art models that combine machine learning methods with ground-level measurements, land use information and aerial images, the researchers estimated how many of the tiny particles were in the air at various times. Then, they used [statistical methods](#) to calculate the connection between exposure and the risk of death.

[The findings](#), published in the *American Journal of Respiratory and Critical Care Medicine*, associate long-term exposure to UFPs with a 7.3% increase in the risk of non-accidental death. Respiratory deaths saw the highest increase, at 17.4%, followed by a 9.4% rise in deaths from coronary artery disease.

Weichenthal said the size of particles is important when assessing their health impacts.

"Previous studies that did not take particle size into account might have missed or underestimated the serious health risks associated with them," he added.

A call for clean air

The researchers said environmental regulations have successfully reduced air pollution in North America, but [ultrafine particles](#) are slipping through the regulatory cracks. In New York, UFP levels have risen, even as PM2.5 levels dropped.

"Our research shows a clear link between long-term UFP exposures and increased mortality risk, underscoring the urgent need for regulatory actions targeting these particles," said Weichenthal. "As [urban areas](#) continue to grow, addressing air pollution is increasingly crucial for the health and well-being of city dwellers."

The study was a collaboration between McGill University, the University of Toronto, Carleton University, the University of Ottawa, Health Canada and Statistics Canada.

More information: Marshall Lloyd et al, Airborne Nanoparticle Concentrations Are Associated with Increased Mortality Risk in Canada's Two Largest Cities, *American Journal of Respiratory and Critical Care Medicine* (2024). [DOI: 10.1164/rccm.202311-2013OC](https://doi.org/10.1164/rccm.202311-2013OC)

Provided by McGill University

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