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Air pollution exposure in the US: Systemic racism, not income, drives disparities



New research highlights the role of systemic racism in the uneven effects of air pollution in the United States. Marcos Osorio/Stocksy

- Research has linked air pollution to a range of medical conditions.
- In the United States, racially minoritized groups are exposed to more air pollution than are white Americans.
- A new study finds for the first time that race and ethnicity are a more significant factor in exposure to air pollution than income level in the U.S.

Researchers have suggested that economic disparity is the reason America's racially and ethnically minoritized groups are exposed to disproportionately high levels of air pollution. A new study from researchers at the University of Washington suggests otherwise.

The study finds that, regardless of income, racially and ethnically minoritized groups are the people most exposed to pollutants across the U.S.

Studies have linked air pollution to respiratory disease, cardiovascular disease, cancer, cognitive decline, and other conditions, as well as adverse birth outcomes. The Global Burden of Disease study estimates that globally, 4.5 million people died prematurely from outdoor air pollution in 2019 alone.

"Air pollution and its associated health impacts are not equitably distributed by race/ethnicity or income," write the authors of the study.

Says first author and doctoral candidate Jiawen Liu, "There have been so many improvements. But we still see these disparities persist, even after two decades."

The study appears in the journal *Environmental Health Perspectives*.

What is different about this study

"This is the first time anyone has looked comprehensively at all these main pollutants and watched how they vary over time and space," says the study's senior study author, Dr. Julian Marshall.

"This paper," he suggests, "is a chance to recognize that, while every community is unique, there are some factors that play out over and over again consistently across our country. If we go state by state, there's no place where there are no environmental justice concerns."

The study tracked exposure to five types of air pollution known to have negative impacts on human health:

- **Carbon monoxide (CO):** Produced by fuel-burning sources such as cars, trucks, residential heaters and stoves, and construction and farming equipment.
- **Nitrogen dioxide (NO2):** This comes from the same sources as CO.
- **Ozone (O3):** This ground-level pollutant, Liu explained to *Medical News Today*, is "not emitted directly to air, but from chemical reactions between oxides of nitrogen and volatile organic compounds."
- **Particulate matter:** The study tracked two sizes of particulate matter, 10 micrometers (PM10) and 2.5 micrometers (PM2.5). Both come from cars, trucks, wood stoves, fireplaces, and dust blown from agriculture, roadways, and construction.
- **Sulfur dioxide (SO2):** Produced primarily by the burning of fossil fuels by industry and power plants, and also by vehicles, trains, and ships that burn fuel with high sulfur content, volcanos, and the process of extracting metal from ore.

The study did not include one additional known air pollutant, Liu told *Medical News Today*:

"We didn't include lead since it had a dramatic improvement [— decreasing by approximately 98% over time —] after lead removal from gasoline. It [is] less of a problem nowadays."

The researchers aligned pollution data for 1990, 2000, and 2010 with nationwide population statistics collected in those years. 2010 is the last census year for which complete available air pollution data exists.

Their analysis separated populations by race/ethnicity, income, and location in all contiguous U.S. states and Washington, D.C., as well as for rural versus urban environments. They tabulated national average and local exposures.

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Highest and lowest air pollution exposure

The authors write, "In 2010, the disparity between the racial/ethnic group with the highest [versus] lowest national-average exposure was largest for NO2, smallest for O3."

Professor K. Max Zhang of Cornell University — who was not involved in the study — told *Medical News Today*, "This finding is not surprising but has interesting implications."

Specifically, he said:

"The high disparity for NO2 implies that racial/ethnic minority populations are disproportionately exposed to near-source air pollution, which has been well-documented in the literature and identified as a major environmental justice issue. The low disparity for O3 is due to its regional nature. For example, the highest O3 concentrations in the New York City Metropolitan areas usually occur in Connecticut, downwind of New York City."

The national mean exposure to pollutants was greatest for the following groups:

- For PM2.5 and SO2, the highest exposure was among the non-Hispanic Black population.
- For CO, NO2, and O3, the non-Hispanic Asian population was the most exposed.
- For PM10, Hispanic people experienced the greatest exposure.

While disparities in pollution exposure varied by pollutant and location, in no case did the researchers find non-Hispanic white people to be the most affected group.

The lowest exposure was experienced by:

- non-Hispanic white people for CO, NO2, PM2.5, and PM10
- the Hispanic population for O3
- non-Hispanic Asian people for SO2

Racism, not income

While the study also tied exposure levels to income, Dr. Marshall told *Medical News Today*, "Our findings indicate a stronger correlation for pollution levels with race/ethnicity than with income."

Liu added:

"I would say systemic racism would be the driving force for racial/ethnic disparity in exposure to air pollution. Our study found it did exist, not simply as a reflection of income disparity as some people may argue."

Dr. Zhang concluded:

"While it is crucial to augment our efforts to address the racial/ethnic exposure disparities remaining in all states, it is also important to recognize that air pollution does not follow state or city boundaries. It is our shared responsibility as a society to keep up our efforts to address regional air pollution problems, which have been associated with a wide range of adverse health effects and mortality."

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