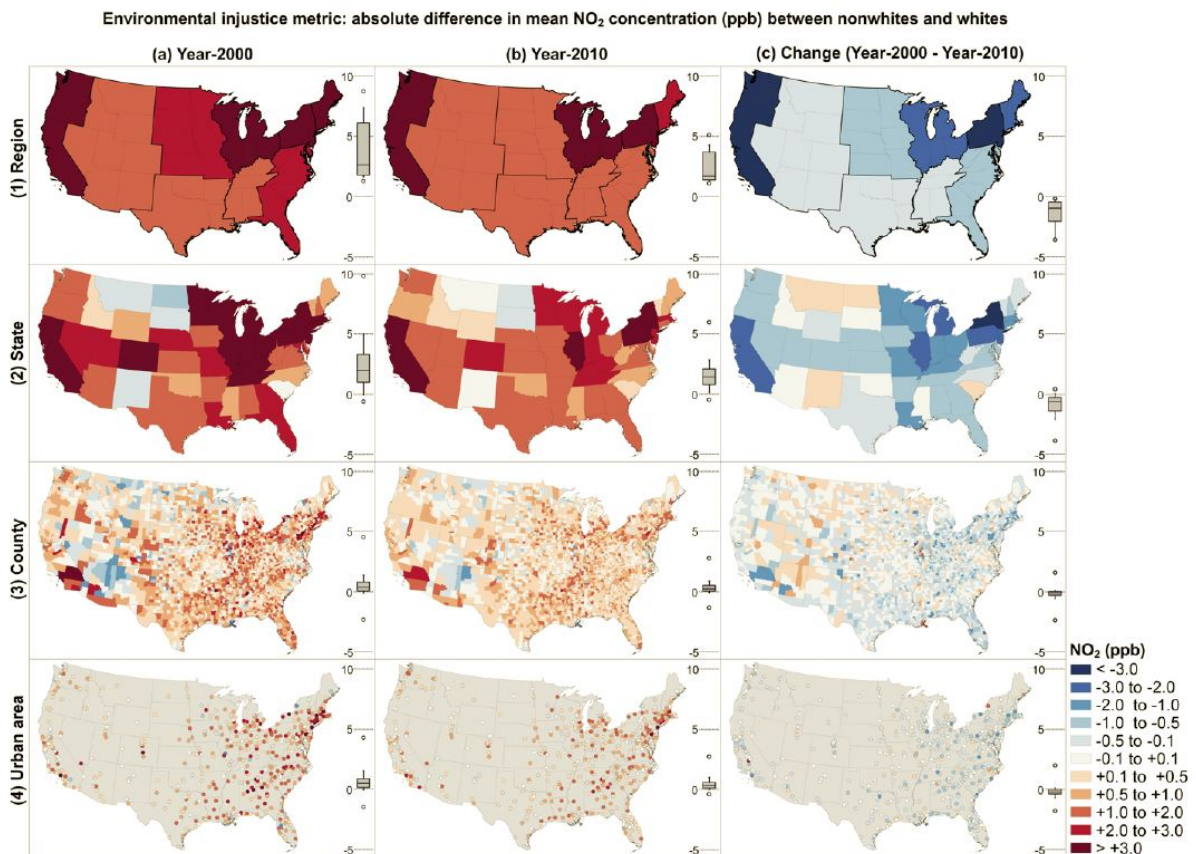


People of color exposed to more pollution from cars, trucks, power plants over 10 years

September 14 2017



In columns A and B, red identifies locations where NO₂ concentrations were higher for nonwhites than whites; blue indicates that NO₂ concentrations were higher for whites than nonwhites; and white means they were equal. In column C, red indicates that the absolute difference in NO₂ concentration between nonwhites and whites increased over time; blue indicates that difference decreased over time; and white indicates no change. Credit: University of Washington

A new nationwide study finds that the U.S. made little progress from 2000 to 2010 in reducing relative disparities between people of color and whites in exposure to harmful air pollution emitted by cars, trucks and other combustion sources.

The groundbreaking study led by University of Washington researchers estimated [exposure](#) to outdoor concentrations of a transportation-related pollutant—nitrogen dioxide (NO₂)—in both 2000 and 2010, based on neighborhoods where people live. It found disparities in NO₂ exposure were larger by race and ethnicity than by income, age or education, and that those inequities persisted across the decade.

While absolute differences in exposure to the air pollutant dropped noticeably during that time period for all populations, the relative difference—or the gap between pollution levels to which white people and people of color were exposed—narrowed only a little.

The study will be published Sept. 14 *Environmental Health Perspectives*. The researchers developed a first-of-its-kind model that combines satellite and regulatory measurements with land use data to predict pollution at a neighborhood level throughout the United States.

The positive news is that across the U.S., average exposure to NO₂ for all races and income levels dropped from 2000 to 2010. Measured in parts per billion (ppb), estimated average annual NO₂ exposure decreased from 17.6 to 10.7 ppb for nonwhite populations, and from 12.6 to 7.8 ppb for white populations.

Yet people of color were consistently exposed to more air pollution than their white non-Hispanic counterparts during the decade. Considering relative differences, nonwhites experienced 40 percent higher exposures

than whites in 2000; in 2010, that gap shrunk only slightly, to 37 percent. Furthermore, in 2000, concentrations of NO₂ in neighborhoods with the highest proportion of nonwhite residents were 2.5 times higher than in neighborhoods with the lowest proportion of nonwhite residents. In 2010, that value increased slightly, to 2.7 times higher.

The study concludes that if people of color had breathed the lower NO₂ levels experienced by whites in 2010, it would have prevented an estimated 5,000 premature deaths from [heart disease](#) among the nonwhite group.

"The finding that shocks us is that when it comes to how much NO₂ a person breathes, it's still race that matters," said senior author Julian Marshall, UW professor of civil and environmental engineering.

"At any income level—low to medium to high—there's a persistent gap by race, which is completely indefensible. It says a lot about how segregated neighborhoods still are and how things are segregated," Marshall said.

NO₂ comes from sources such as vehicle exhaust, power plants and off-road equipment and is one of six important "criteria air pollutants" monitored by the Environmental Protection Agency. It has been linked to asthma symptoms, increased susceptibility to respiratory problems and heart disease.

The research team, which began their work at the University of Minnesota, previously analyzed NO₂ concentrations for the year 2006 by race, income and other demographic factors identified in the U.S. Census. The team's air pollution model, which combines existing EPA [air quality monitoring](#) and satellite data with detailed land use information, allows them to accurately predict pollution concentrations across the country at the U.S. Census block level—information

previously unavailable at that scale.

In this first longitudinal study of its kind, researchers wanted to examine how much progress was made in addressing inequities in NO₂ exposure over a decade. They compared environmental injustice metrics in 2000 and 2010 on a national basis and by region, state, county and urban areas.

On the whole, researchers said, policies to reduce NO₂ air pollution are working. But the finding that exposure differences are larger by race and ethnicity than by income, age or education was equally true in 2010 as in 2000.

"Everyone benefited from clean air regulations and less pollution; that's the good news," said lead author and UW civil and [environmental engineering](#) doctoral student Lara Clark. "But the fact that there is a pervasive gap in exposure to NO₂ by race—and that the relative gap was more or less preserved over a decade—is the bad news."

The UW study did not explore the underlying reasons for that gap, but its findings are consistent with previous research. Both racial minorities and low-income households are disproportionately likely to live near a major road where transportation-related [pollution](#) is typically highest. U.S. cities, in general, also tend to be more segregated by race and ethnicity than by income.

The UW team did conclude that the narrowing of the racial gap in NO₂ exposures was driven more by improving air quality than by demographic changes over the 10-year period.

"That suggests that [air pollution](#) is coming down faster than cities are becoming less segregated," Marshall said.

Next steps for the research team include looking at how changes in demographics, industry and urban form at the city level affect NO₂ exposure, and developing similar models for other EPA criteria air pollutants.

More information: *Environmental Health Perspectives* (2017). [DOI: 10.1289/EHP959](https://doi.org/10.1289/EHP959)

Provided by University of Washington

Citation: People of color exposed to more pollution from cars, trucks, power plants over 10 years (2017, September 14) retrieved 19 April 2024 from <https://medicalxpress.com/news/2017-09-people-exposed-pollution-cars-trucks.html>

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