

# Air pollution exposure inequality persists in Massachusetts

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Despite overall reductions in ambient air pollution in Massachusetts, exposure continues to fall unequally along racial/ethnic, income, and education lines, according to a new study led by a Boston University School of Public Health (BUSPH) researcher.

The study, published in *Environmental Research*, found concentrations of nitrogen dioxide (NO<sub>2</sub>) and fine particulate matter (PM<sub>2.5</sub>) decreased across the state between 2003 and 2010, but exposure remained higher in predominantly Hispanic and non-Hispanic black communities. Within the state's cities, the researchers found exposure inequality actually increased slightly between racial/ethnic groups during the study period.

"Although ambient air pollution concentrations have decreased across all of Massachusetts, these reductions had a higher relative impact on populations that were already in the lowest exposure categories, hence the increase in exposure inequality," says Patricia Fabian, research assistant professor of environmental health at BUSPH and the study's senior author.

While numerous previous studies have shown disparities in [air pollution exposure](#) at one point in time, the current study was one of the first to track those disparities over space and time, allowing for a more nuanced picture of exposures as demographics shift in a given area. Using data from the 2000 and 2010 Census and the 2006-2010 American Community Survey on race/ethnicity, income, educational attainment, and rural/urban land classification, the researchers calculated exposures

using modeled PM<sub>2.5</sub> concentrations from 2003 to 2010 and NO<sub>2</sub> concentrations from 2005 to 2010. The researchers then characterized the disparities using the Atkinson Index, a quantitative measure for relative [inequality](#).

The researchers found the average annual PM<sub>2.5</sub> concentrations across the state decreased by 35 percent between 2003 and 2010 and the average annual NO<sub>2</sub> concentrations decreased by 24 percent between 2005 and 2010. However, non-Hispanic black populations continued to have the highest exposures, followed by Hispanic populations. The gap between exposures for non-Hispanic black populations and non-Hispanic white populations remained the same, while the gap between Hispanic and non-Hispanic white populations slightly increased.

The authors noted that exposure to NO<sub>2</sub> was more dramatically unequal than exposure to PM<sub>2.5</sub>, perhaps because NO<sub>2</sub> is strongly linked to automobile exhaust, which can vary within a city based on traffic patterns, while PM<sub>2.5</sub> is derived from a wide variety of sources and tends to have more regional concentrations.

"Greater inequalities in urban areas, where there is often substantial segregation, reinforces the importance of targeted [exposure](#) reduction strategies within vulnerable populations and neighborhoods," the authors wrote. By looking at these inequalities over time, they said, the study points to the possibility that sociodemographic changes may impact land-use decisions, environmental policy enforcement, and other factors influencing emissions.

More longitudinal, individual-level studies are needed to understand this "complex dynamic," the authors wrote.

Provided by Boston University School of Medicine

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