"What Caused Racial Disparities in Particulate Exposure to Fall? New Evidence from the Clean Air Act and Satellite-Based Measures of Air Quality"

Summary of research by Janet Currie, John Voorheis, and Reed Walker

Background

Many case studies suggest that low income and racial minority groups face disproportionately high exposures to environmental pollution. But the existing evidence is piecemeal and indirect due to the patchy nature of the available environmental data. Existing studies of racial disparities in air pollution exposure, for example, often use data with poor coverage (e.g., EPA air monitor data).

In their latest working paper, Janet Currie, John Voorheis, and O-Lab researcher Reed Walker combine new, high-resolution pollution data with over 30 million individual survey responses from the Census and American Community Survey to provide a more complete picture of disparities in pollution exposure between African-Americans and non-Hispanic whites? What are the gaps, and how have they evolved over time? The researchers find that gaps have narrowed substantially and ask why that is the case.

New and Improved Pollution Data

Recent advances in machine learning and remote sensing have created a wealth of opportunities for social science researchers. In their paper, Currie and coauthors leverage a new dataset of particulate matter (PM2.5) pollution from Di et al. (2016). This dataset was created using a machine learning model that combines ground-level EPA monitor readings with satellite-measured aerosol optical depth to predict historical air pollution levels in areas lacking sensors. These new measurements (left) provide vastly superior coverage and granularity compared to EPA air monitors (right).
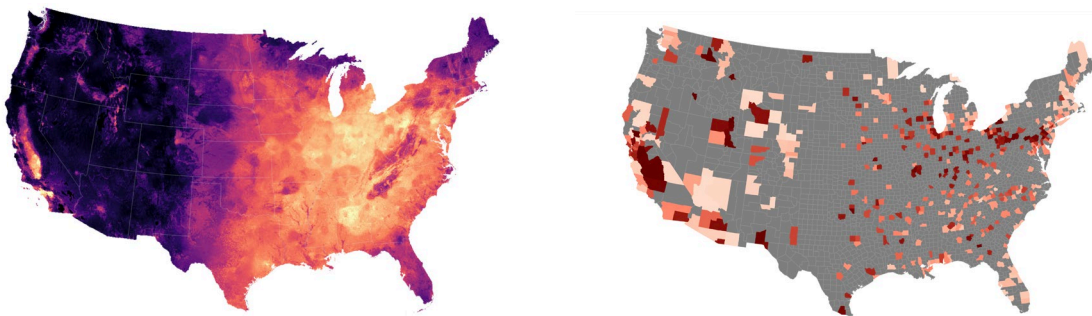
Source: Di et al. 2016 and Environmental Protection Agency.

Racial Gaps in Pollution Exposure

To study how pollution exposure varies between African-Americans and non-Hispanic whites in the US, Currie, Voorheis, and Walker match pollution measures from Di et al. (2016) to individual survey responses using their Census block of residence. Consistent with previous studies, they find higher PM2.5 exposure among African-Americans. In 2000, for example, African-Americans faced PM2.5 levels roughly 12% higher on average than non-Hispanic white Americans.

Surprisingly, these cross-sectional differences in pollution exposure are unrelated to differences in other observable characteristics of these individuals. It is remarkable, for instance, that they are not explained by differences in income or education, even though there are large average differences in income between these groups.

**Why have racial disparities in pollution exposure fallen?**

The dataset compiled by Currie, Voorheis, and Walker allows them to document and investigate race-group specific changes in pollution exposure over time. Notably, the authors find that the size black-white gap in pollution exposure fell from 1.6 µg/m³ in 2000 to 0.54 µg/m³ in 2015.
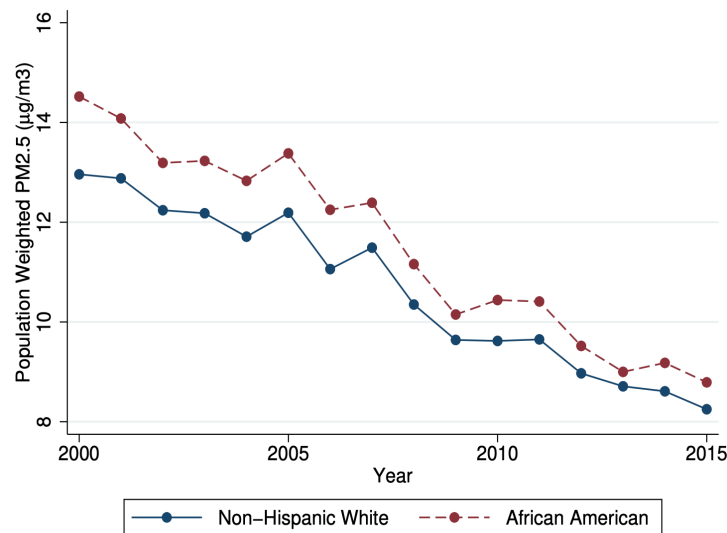
Source: Di et al. 2016, Decennial Census, and American Community Survey

There are two primary potential explanations for the narrowing of the black-white pollution gap. First, it could be the case that people have changed locations in a way that reduces these gaps. Recent research shows that non-Hispanic whites have been moving back to central cities, which are more polluted than suburbs on average. Second, air quality may have improved differentially in black and white neighborhoods, holding mobility fixed.

Currie, Voorheis, and Walker show that changes in population shares from 2000-2015 only explain about 10% of the shrinking gap. Instead, most of the improvement stems from differential regulatory impacts of the Clean Air Act's (CAA) National Ambient Air Quality Standards. New standards for PM2.5 were introduced in 2005, which require air pollution improvements in counties that fail to meet the EPA's air quality standards. Since African-Americans disproportionately live in the most polluted areas, the new standards disproportionately reduced their pollution exposure.
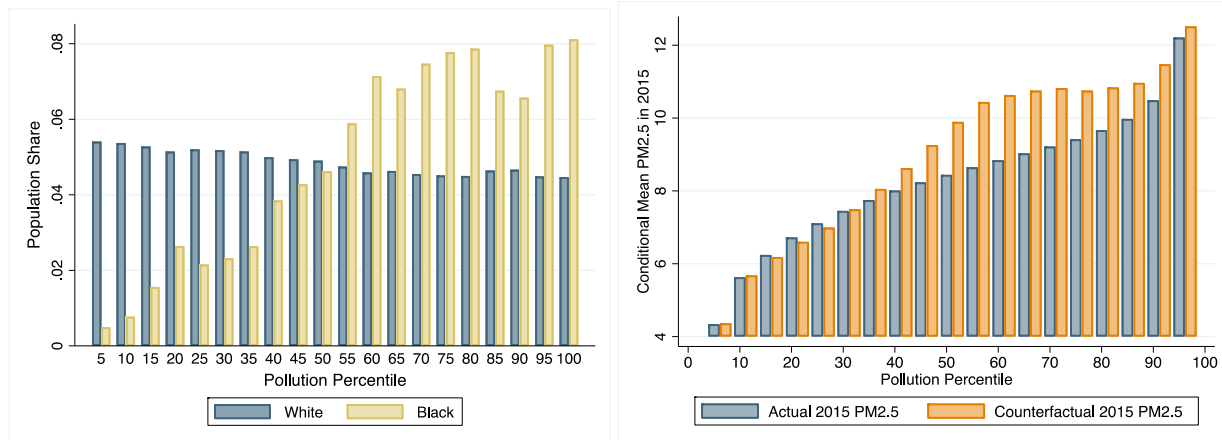
Source: Di et al. 2016, Decennial Census, and American Community Survey

Policy Implications

By identifying the drivers of pollution exposure over time and across space, this study provides valuable information for policymakers striving to achieve equity in terms of exposure to environmental pollution. The finding that individual characteristics do little to explain differences in pollution exposure suggests that redistributive policies aimed at addressing inequality more generally may not reduce inequalities in exposures. In contrast, this work shows that the Clean Air Act had the greatest impact on African-Americans because they have historically lived in the most polluted areas targeted by the regulation.