Air pollution disproportionally affects people of color, lower-income residents in DC

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Air pollution is the leading environmental risk factor to health, and it inequitably affects people of color and low-income residents in the D.C. area, according to new research in GeoHealth. Credit: Jim Kuhn

The rates of death and health burdens associated with air pollution are borne unequally and inequitably by people of color and those with lower household income and educational attainment in Washington, D.C., according to a new study.

Air pollution is considered the leading environmental risk factor to health, and recent efforts have successfully brought down levels of fine particulate matter, or PM2.5, in the air in the D.C. region.

The new study found that while deaths and health burdens associated with PM2.5 halved between 2000 and 2018 in the D.C. area, disparities and geographical segregations in health effects persist.

Most impacted by PM2.5 air pollution are people living in wards five, seven and eight in the District's east and southeast regions. Researchers found in southeast wards, baseline disease rates are five times higher for chronic obstructive pulmonary disease, lung cancer and stroke, up to nine times higher for all-cause mortality and coronary heart disease, and over 30 times higher for asthma emergency department visits, compared to northwest neighborhoods.

In these most impacted neighborhoods, residents have 10% lower education and employment rates, 10% more residents are living in poverty, their median household income is $61,000 lower than households in the rest of the city, and residents have about 10 fewer years of life expectancy. The top 10 impacted neighborhoods have a 54% higher proportion of Black residents and a 44% lower proportion of

white residents.

This study highlights the importance of detailed health and air quality data, and the researchers hope it can guide future policymaking to address environmental health disparities and serve as a model for addressing air pollution health assessments elsewhere. The research was published in *GeoHealth*, AGU's journal investigating the intersection of human and planetary health for a sustainable future.

"We knew that concentrations were higher in the east [of D.C.], and we knew that people were getting sicker in the east, but I don't know if we were able to tell before that they were getting sicker because of pollution," said lead study-author Maria Castillo, a graduate student in City Planning at MIT. "Now that we apply all these calculations, all these concentration response functions, we're able to tell people, 'Air pollution is the cause of some of the morbidity outcomes that you are seeing in this area.' Making that connection between pollution and health impact outcomes I think is very powerful."

Unequal health outcomes can be attributed to two main drivers, according to study co-author Susan Anenberg, an environmental health expert at George Washington University. First, air pollution concentration differs by neighborhood. Infrastructure such as highways or bus depots can release significant pollution into a neighborhood, negatively affecting residents.

The second driver is an individual's health status, independent of air pollution. Rates of underlying disease persistently differ by neighborhoods, with lower life expectancy and greater rates of asthma, health endpoints and emergency visits seen in D.C.'s southeastern neighborhoods. Those underlying health issues can make residents more vulnerable when exposed to pollutants and result in higher levels of poor air pollutant-related health outcomes.

"You can't think about air pollution in isolation. When it comes to health risks and environmental justice, we have to think of the total lived experiences that people are having," Anenberg said. "If folks don't have adequate access to quality healthcare, that means when they are exposed and have health effects as a result of that air pollution exposure, they may have worse outcomes because they're not getting the treatment that they need."

Focusing on fine-resolution data

Researchers worked with new exposure assessment tools to measure the impacts of air pollution in the nation's capital. To evaluate air pollution, Castillo and her co-authors used pollution estimates that combined information from on-the-ground air monitors with satellite data to capture some of the spatial differences in pollution levels across the city.

For health outcome data, they looked at both Centers for Disease Control data as well as administrative disease rate data obtained from the D.C. Department of Health, which provided health data in greater detail on a local scale.

Researchers aim to take advantage of the unique position of D.C. as a city with thought leaders in environmental justice and policy, and with more granular health data than other states, to make scalable solutions applicable in other regions. They hope this study can be used as a model to not just bring down overall air pollution but create targeted policy.

"I think one of the strengths of the study is that it really laid out a road map that could be done other places," said Jonathan Levy, an expert in Environmental Health at Boston University who was not involved in the study. "The air quality data they used, that's universally available every place across the U.S. … there are real opportunities to take this kind of approach and do it much more widely."

This study could also be used as a model help ensure policymaking is driven by health data that accurately reflects racial diversity and health outcome disparity in populations—something that was not historically the case, according to Kelly Crawford, study co-author and Associate Director of the D.C. Department of Energy and Environment.

"Doing further studies that at the very least acknowledge the disparity or lack of diversity in data sets… I think that is the role of government and research in addressing racism," Crawford said.

More information: Maria D. Castillo et al, Estimating Intra-Urban Inequities in PM 2.5 -Attributable Health Impacts: A Case Study for Washington, DC, *GeoHealth* (2021). DOI: 10.1029/2021GH000431

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