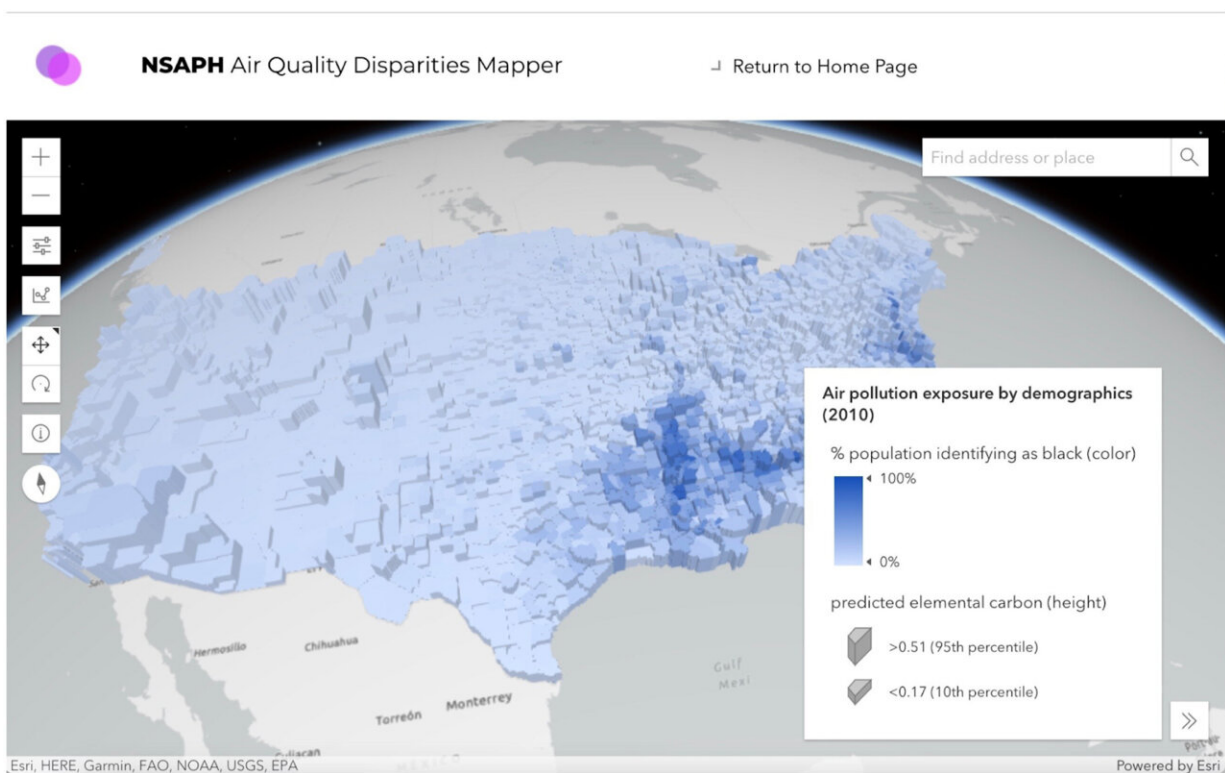# Web-based tool provides insights into disparities in exposure to fine particulate airborne matter

November 22 2023

The first visualization type, a surface map, depicts each county in the form of a 3D bar. The height is controlled by the chosen air pollution variable, whereas the color corresponds to the demographic variable. While this visualization tends to obscure the underlying geography, it succeeds in depicting both color and size with independent visual means. Credit: *Environmental Modelling & Software* (2023). DOI: 10.1016/j.envsoft.2023.105881

A team of researchers led by the Institute for Climate Change, Environmental Health, and Exposomics at Mount Sinai has developed an innovative web-based tool that provides accessible insights into disparities in exposure to fine particulate airborne matter, known as $PM_{2.5}$. The work was published in *Environmental Modelling & Software* on November 20, 2023.

$PM_{2.5}$ has long been recognized as a significant health concern, with strong links to increased mortality and morbidity. It often disproportionately affects minority and low-income communities.

While existing research has illuminated these disparities, it has largely focused on describing and explaining them. What has been missing is a comprehensive assessment of exposure disparities to the main components of $PM_{2.5}$ and a means of communicating these disparities in a way that is easily digestible for the general public. Further, $PM_{2.5}$ composition is location-specific and reduction plans need to account for which emitting sectors are of the highest priority in each area.

The research team's Air Pollution Components Mapper is the first air quality mapper that shows exposure disparities for ambient fine particulate matter composition; it combines high-resolution predictions of $PM_{2.5}$ components with demographic data from the U.S. decennial census, delivering a powerful visualization of the relationships between exposure and demographic variables.

"This research has far-reaching applications, making air quality data more accessible to the public and informing policy outcomes," said Heresh Amini, Ph.D., MSc, senior author and Associate Professor of Environmental Medicine and Public Health, Icahn School of Medicine at Mount Sinai. "By raising awareness and providing accessible tools for understanding air pollution disparities, this innovation has the potential to drive positive change for affected communities and contribute to a

healthier, more equitable future."

Key features of the air quality mapper include:

1. High-Resolution Data: The tool uses a 50m x 50m grid to offer fine-grained predictions of $PM_{2.5}$ components, including elemental carbon, ammonium, nitrate, organic carbon, and sulfate.
2. User-Friendly Interface: Leveraging the ArcGIS Javascript API, the mapper is designed for easy interaction, with controls allowing users to modify selected measures and preferred styles of visualization.
3. Broad Accessibility: Accessible from any web-enabled device, the mapper is available to a wide audience, making critical information about air pollution disparities more widely available.

To underscore the health concern around $PM_{2.5}$, the World Health Organization (WHO) updated its guidelines for this harmful pollutant in 2021 to no more than 5 micrograms per cubic meter as an annual average, down from 10 micrograms per cubic meter. Because $PM_{2.5}$ composition varies depending on the location, the updated WHO guidelines can be difficult to achieve. For example, in New York City, traffic is a major source of $PM_{2.5}$. In other parts of the country, agricultural activities or organic carbon may contribute more to $PM_{2.5}$ levels.

The Air Pollution Components Mapper can help communities identify the most relevant sources and components of $PM_{2.5}$ in their area and facilitate targeted reduction programs to meet the WHO target.

Provided by The Mount Sinai Hospital