

US air pollution rates on the decline, but pockets of inequities remain: Study

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Over the last decades, air pollution emissions have decreased substantially; however, the magnitude of the change varies by demographics, according to a new study by Columbia University

Mailman School of Public Health. The results indicate there are racial/ethnic and socioeconomic disparities in air pollution emissions reductions, particularly in the industry and energy generation sectors. The findings are published in the journal *Nature Communications*.

The research provides a national investigation of air [pollution](#) emission changes in the 40 years following the enactment of the Clean Air Act (CAA). Until now, studies have primarily focused on evaluating air pollution disparities simultaneously, focusing on pollutant concentrations instead of emissions.

A focus on emissions, however, has more direct implications for regulations and policies. In this study, the researchers used county-level data to evaluate racial/ethnic and [socioeconomic disparities](#) in air pollution emissions changes in the contiguous U.S. from 1970 to 2010.

"The analyses provide insight on the socio-demographic characteristics of counties that have experienced disproportionate decreases in air pollution emissions over the last 40 years," said Yanelli Nunez, Ph.D., the study's first author, who is a scientist in the Department of Environmental Health Sciences at Columbia Mailman School of Public Health and affiliated with PSE Healthy Energy.

By analyzing air pollution emissions, the researchers identified specific pollution source sectors that are potentially important contributors to air pollution exposure disparities.

Nunez and colleagues leveraged air pollution emissions data from the Global Burden of Disease Major Air Pollution Sources inventory to analyze air pollutant emissions from six pollution source sectors: industry (sulfur dioxide), energy (sulfur dioxide and [nitrogen oxides](#)), agriculture (ammonia), on-road transportation (nitrogen oxides), commercial (nitrogen oxides), and residential (particles of organic

carbon).

On average, national U.S. air pollution emissions declined substantially from 1970 to 2010 from all source sectors the researchers considered except for ammonia emissions from agriculture and organic carbon particle emissions from the residential sector, which the researchers indicate is primarily from using solid biofuels for indoor heating.

The most pronounced emission decreases were observed for [sulfur dioxide](#) from industrial and energy generation activities. Nitrogen oxide emissions from transportation, [commercial activities](#), and energy generation decreased moderately.

Despite the overall downward trends for most pollutants, the researchers found that certain populations experienced relatively smaller reductions or even increases in air pollution emissions.

For instance, an increase in a county's average Hispanic or Indian American population percentage resulted in a relative increase in [sulfur dioxide](#), [nitrogen oxides](#), and ammonia emissions from the industry, energy generation, and agriculture sectors, respectively.

Additionally, an increase in the county median family income was linked with increased emissions reductions in every pollution source sector the researchers analyzed, except agriculture.

"Air pollution emissions do not perfectly capture population air pollution exposure, and we also know that neighborhood-level air pollution inequities are common, which we were not able to analyze in this study given the data at hand," noted Marianthi-Anna Kioumourtoglou, ScD, associate professor of environmental health sciences at Columbia Mailman School, and senior author.

"In this study, we provide information about potential racial/ethnic and socioeconomic inequalities in air pollution reductions nationwide from major air pollution sources, which can inform regulators and complement local-level analysis."

"Policies specifically targeting reductions in overburdened populations could support more just reductions in air pollution and reduce disparities in air [pollution](#) exposure," observed Dr. Nunez. "This is an important lesson gained from 53 years of Clean Air Act implementation, which is particularly relevant as we develop policies to transition to [renewable energy sources](#), which will have a collateral impact on air quality and, as a result, on public health."

More information: Yanelli Nunez et al, *Nature Communications* (2024). [DOI: 10.1038/s41467-023-43492-9](https://doi.org/10.1038/s41467-023-43492-9)

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