

American Indian communities less likely to benefit from recent downward trends in air pollution exposures

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A new study at Columbia University Mailman School of Public Health highlights disparities in fine particulate matter ($PM_{2.5}$) trends between American Indian (AI) and non-AI populated counties of the U.S. $PM_{2.5}$

is one of several air pollutants regulated by the U.S. Environmental Protection Agency (EPA), with the current annual standard set at $12\mu\text{g}/\text{m}^3$. Downward trends in $\text{PM}_{2.5}$ concentrations were steeper among the non-AI populated compared to AI-populated counties. Although AI-populated counties had lower $\text{PM}_{2.5}$ concentrations than non-AI populated counties in 2000, by 2018, their levels were higher. With most U.S. air pollution research conducted in urban settings, this is the first study to detail the extent of particulate air pollution levels and its potential health consequences among rural AI communities. The findings are published in the *American Journal of Public Health*.

"Our results underscore the need to strengthen air pollution regulations and prevention implementation in tribal territories and areas where AI populations live," said Maggie Li, Ph.D. candidate in the Department of Environmental Health Sciences at Columbia Mailman School, and first author. "Until now, insight into $\text{PM}_{2.5}$ exposure burdens in AI communities has been limited, in turn contributing to the lack of air pollution [epidemiological studies](#) which include this population in the contiguous U.S."

The researchers compared ambient $\text{PM}_{2.5}$ average concentrations and trends in AI-populated vs. non-AI-populated counties in the contiguous U.S. from 2000 to 2018. They conducted their analysis at the county level, the most relevant unit to inform regulatory action. Population data and household income were obtained from the U.S. 2010 Census.

Average concentrations were $1.46\mu\text{g}/\text{m}^3$ lower for modeled $\text{PM}_{2.5}$ in AI-populated counties vs. non-AI-populated counties in 2000; however, towards the end of the study period, $\text{PM}_{2.5}$ concentrations in AI-populated counties became significantly higher compared to non-AI-populated counties. By 2018, concentrations were on average $0.66\mu\text{g}/\text{m}^3$ higher in AI-populated counties than non-AI-populated counties.

"Although we observed that average $\text{PM}_{2.5}$ concentrations were higher in

non-AI-populated counties at baseline and across most of the study period, the gap between AI- and non-AI-populated counties decreased over time; after approximately 2015, average PM_{2.5} concentrations were higher in AI-populated counties," observed Li.

Short- and long-term exposure to particulate matter $\leq 2.5 \mu\text{m}$ (PM_{2.5}) increases the risk of cardiovascular and respiratory disease, among other [health outcomes](#). In the U.S., socioeconomically disadvantaged communities are often exposed to higher PM_{2.5} exposure levels. They bear a disproportionate burden of disease, even at levels well below air quality standards set by the U.S. Environmental Protection Agency.

"Our findings build upon existing studies showing that socioeconomically disadvantaged communities experience disproportionate burdens of environmental hazards, such as ambient air pollution. Native Americans may be particularly susceptible to the adverse health effects of PM_{2.5} and air pollution, but research quantifying air pollution exposures and impacts on health among this population is lacking," said Marianthi-Anna Kioumourtzoglou, ScD, assistant professor of environmental health sciences at Columbia Mailman School, and senior author. "These communities already face a large disease burden attributable to environmental pollution due, for instance, to extensive mining and water contamination on Tribal Lands."

Cardiovascular disease, one of the outcomes associated with exposure to PM_{2.5}, and the leading cause of death in AI populations, occurs at significantly higher rates than in white populations. "There is a critical need for future investigations of health impacts associated with air pollution exposure in AI populations, as well as of interventions to ensure the observed inequalities can be eliminated," noted Ana Navas-Acien, MD, Ph.D., professor of environmental [health](#) sciences at Columbia Mailman School, and a senior co-author.

More information: Maggie Li et al, Air Pollution in American Indian Versus Non–American Indian Communities, 2000–2018, *American Journal of Public Health* (2022). [DOI: 10.2105/AJPH.2021.306650](https://doi.org/10.2105/AJPH.2021.306650).
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