When air and road travel dropped during COVID, so did air pollution levels

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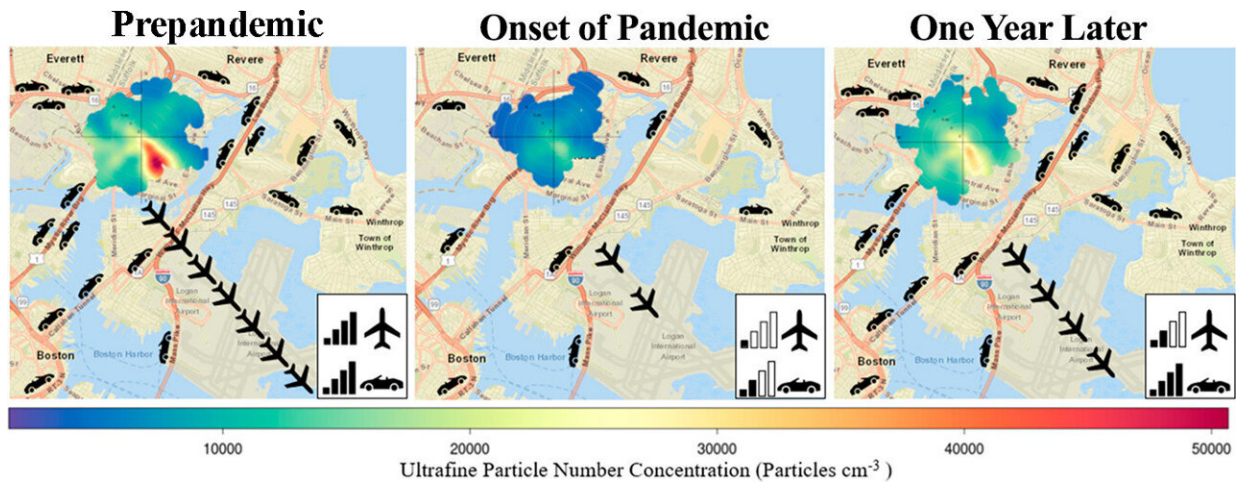

Graphical abstract. Credit: *Environmental Science & Technology Letters* (2022). DOI: 10.1021/acs.estlett.2c00322

During the first year of the COVID-19 pandemic, global road travel and commercial flight activity decreased by 50% and 60%, respectively, compared to pre-pandemic levels. During the lockdowns that cities imposed in the initial months of COVID, flight activity in particular was reduced to a near standstill, decreasing by 96%—nearly triple the percentage of flight reductions that followed the 9/11 attacks.

This unexpected and widespread halt in travel provided a rare opportunity for researchers to explore the impact of these mobility

changes on air pollution, specifically ultrafine particles. Now, a new study by Boston University School of Public Health (BUSPH) has found that ultrafine particle concentration dropped by nearly 50% due to reduced aviation and road activity during the first few months of the pandemic.

Published in the journal *Environmental Science & Technology Letters*, the study analyzed measurements of ultrafine particles, referred to as particle number concentration (PNC), that were collected before and during the first year of COVID at a rooftop site near Boston's Logan International Airport. The findings revealed that during the state-of-emergency period from April-June 2020, average PNC was 48% lower than pre-pandemic levels, corresponding with flight activity that was 74% lower, highway traffic volume that was 51% lower, and local traffic volume that was 39% lower than pre-pandemic levels.

Total air quality measurements occurred from April 2020 through June 2021 and the researchers compared them with pre-pandemic measurements from 2017 and 2018.

By June 2021, traffic volume had returned to pre-COVID levels, while flight activity remained 44% lower than normal. Similar to traffic volume, average PNC levels also returned to normal by summer 2021—except when the site was downwind of Logan Airport.

The findings build upon previous studies on PNC, which have focused primarily on road traffic emissions, during much shorter time periods. The new study is the first to distinguish between aviation and automobile-related contributions to PNC over several months, providing a clearer understanding of the unique emissions produced by each transportation source.

Identifying and quantifying the emissions sources that contribute most to

air pollution levels in a given area or region is crucial for air quality management, the researchers say.

"Urban air pollution is a serious public health threat, and residing in neighborhoods near sources of ultrafine particles, such as major roadways, trains and airports, has been shown to have elevated adverse health impacts," says study lead author Sean Mueller, a Ph.D. student in the Department of Environmental Health at BUSPH.

"Our work shows that while airplanes can contribute to some of the highest community-level exposures to ultrafine particles, these exposures occur predominantly during specific meteorological conditions. Following the differences in road and flight activity patterns before and during the pandemic allowed us to understand that PNC in the community typically follows road traffic patterns—i.e. high during typical commuting rush hour, and lower after midnight—but that the highest air pollution levels occur when the site is downwind of Logan Airport."

Ultrafine particles, which are 800 times smaller than a human hair, are particularly toxic pollutants that can cause inflammation in the lungs, brain, and other organs. They are also not regulated by the US Environmental Protection Agency. Approximately 40 million people in the US, including many in lower-income neighborhoods, live near major airports and bear the brunt of the health impacts that follow exposure to these pollutants.

In the absence of federal oversight, there are still policy changes that can help reduce exposures, including increasing the adoption of sustainable aviation fuel technology, such as low-sulfur fuel and electric engines, says study senior author Dr. Kevin Lane, assistant professor of environmental health at BUSPH.

"The EPA currently considers there to be insufficient health evidence at this time to promulgate an ultrafine particle air quality standard, so more research is needed to support regulation development," Lane says.

"While waiting for federal action and the development and integration of new technology to reduce exposure to air pollution, action can be taken at the local level by continuing to bring near-airport communities, researchers and airport administrators together to explore mechanisms to reduce community exposure, including integration of in-home air filtration such as HEPA filters."

More information: Sean C. Mueller et al, Changes in Ultrafine Particle Concentrations near a Major Airport Following Reduced Transportation Activity during the COVID-19 Pandemic, *Environmental Science & Technology Letters* (2022). DOI: 10.1021/acs.estlett.2c00322

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