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Move Over, Traffic: Aircraft Emissions and Preterm Birth

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Just over 11% of babies worldwide are born preterm (before 37 weeks of pregnancy) putting them at risk for problems with their heart, lungs, eyes, and brain development.[1] Previous studies have suggested outdoor air pollution exposure may be a risk factor for preterm birth.[2,3] Much of this research has focused on traffic-related air pollution. A recent study in *Environmental Health Perspectives* reports on the association between preterm birth and another source of air pollution—aircraft emissions.[4]

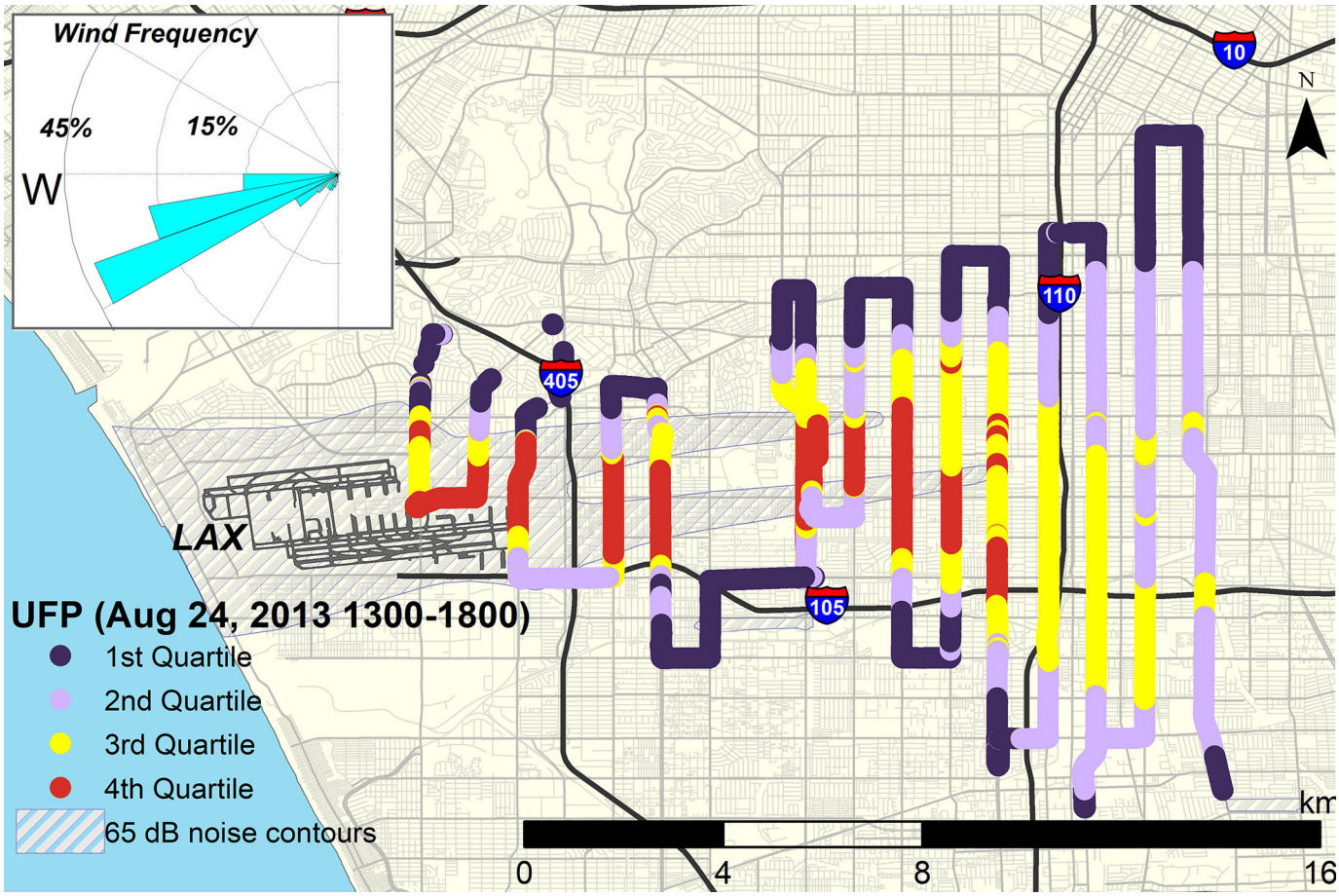
The study focused on exposures to ultrafine particles (UFPs), which are less than 0.1 μm in aerodynamic diameter. On an equal mass basis, UFPs may have a greater impact on tissues than larger particles—their small size allows them to move freely throughout the body, and their greater surface areas allow them to adsorb more toxic chemicals.[5] However, UFPs are not routinely monitored or regulated by state or federal governments.[6]

Although there is evidence that UFPs can cross the placenta,[7] it is not clear exactly how these particles might contribute to prematurity. However, experiments in mouse and human cells suggest that UFP exposures can cause inflammation and oxidative stress,[8] which have been associated with preterm birth.[9]

For the new research, first author Sam Wing, a PhD candidate at the University of California, Los Angeles (UCLA), was guided by co–senior authors Scott Fruin of the University of Southern California Keck School of Medicine and Beate Ritz of UCLA. The investigators modeled preterm birth risk due to aircraft UFP emissions downwind of Los Angeles International Airport (LAX). Fruin and coauthor Tim Larson of the University of Washington first created a novel dispersion model for UFPs that assumed two steady-state incoming flight paths. The model was validated using mobile air measurements of daytime UFP concentrations that Fruin had previously collected[10] around LAX. In that earlier testing, landings appeared to account for a large fraction of UFPs dispersed downwind of the airport.[10]

The authors then reviewed records for all births between 2008 and 2016 to mothers living within 15 km of the airport. They adjusted for nitrogen dioxide as a proxy for nearby traffic-related air pollution as well as for other variables that may affect risk of preterm birth, including airport-related noise and mother's age, education level, and race.

Ultimately, the researchers estimated that expectant mothers in the highest quartile of average UFP exposure were about 14%



After modeling UFP exposures downwind of LAX, the authors of a new study estimated that pregnant women up to 15 km from the airport could potentially be exposed to concentrations over 2.5 times baseline levels. Image: Wing et al. (2020).[4]

more likely to have a preterm birth than mothers in the lowest quartile. "The data suggest that airplane pollution contributes to preterm births above and beyond the main source of air pollution in this area, which is traffic," says Ritz.

"In many urban areas, airports are located very close to population centers. It is important to recognize that not just traffic but also airport emissions can have adverse impacts on preterm births and potentially other health outcomes," says Jun Wu, an epidemiologist at the University of California, Irvine, who was not involved in the study. Furthermore, Wu says, while the impact of aircraft UFP pollution on preterm births may appear small in relative terms, the potential risk could be important on the population level since so many people worldwide live near airports.

The researchers could not confirm how much time the pregnant women may have spent at home, exposed to airport UFP pollution, or whether they lived in climate-controlled homes with indoor air filtering systems. Time spent outside the home or farther from the airport also would have affected their exposure levels.

Future studies could explore whether similar associations are seen in pregnant women living near other airports around the world, Ritz says. They also could look at biomarkers in mothers' blood or urine to better understand how UFPs behave in the body, she says, noting that some mothers may have stronger reactions than others. Wing adds, "Hopefully, more studies like this can start to drive the conversation about plans to measure and regulate these particles."

Lindsey Konkel is a New Jersey–based journalist who reports on science, health, and the environment.

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