Air Pollution from Agricultural Fires **Increases Hypertension Risk**

In an article recently published in the Journal of Environmental Economics and Management, Mateus Souza and his coauthor Hemant K. Pullabhotla document yet another link through which air pollution can affect human health.

Mateus Souza

The study was conducted within the context of India. Like in many parts of the developing world, farmers in India widely use deliberate fires to burn vegetation and clear land to plant crops. The study not only shows that the pollution from these fires can increase hypertension risk but also identifies particularly vulnerable populations.

As shown in Figure 1, several types of data were combined for this project. Satellite data from NASA were used to identify the location of the fires. Fine-scale air pollution data were obtained from MERRA-2. These were all matched with data on blood pressure tests for nearly 784,000 individuals from the National Family and Health Survey. Finally, the main empirical strategy of the study leverages variation in wind directions, which were identified with the ERA5 reanalysis data. As illustrated by the schematic below, the idea was to identify villages that, by chance, were more exposed to smoke carried from "upwind" fires.

Figure 1: Distribution of Sample Locations, Fire Activity, Air Pollution, and High Blood Pressure Incidence.

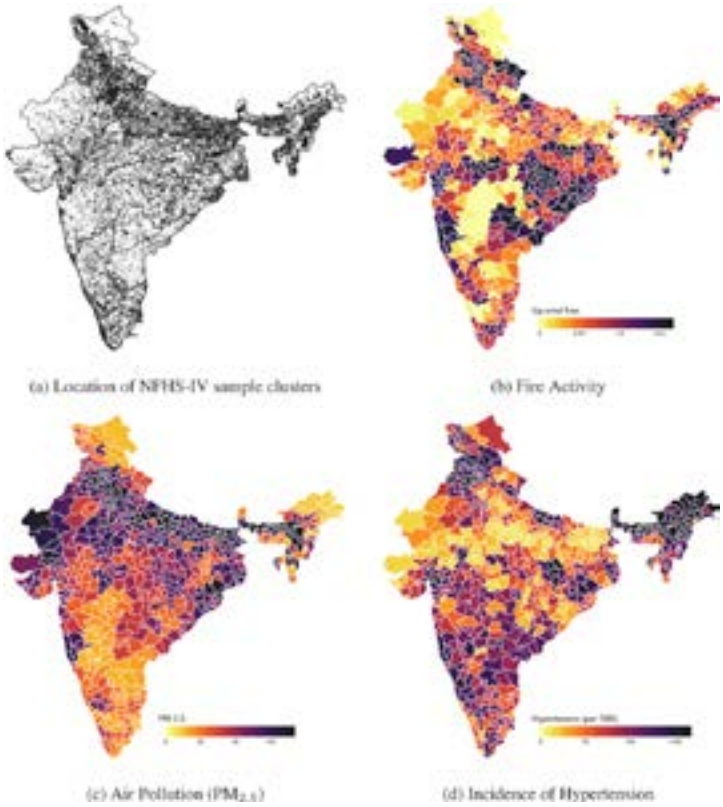
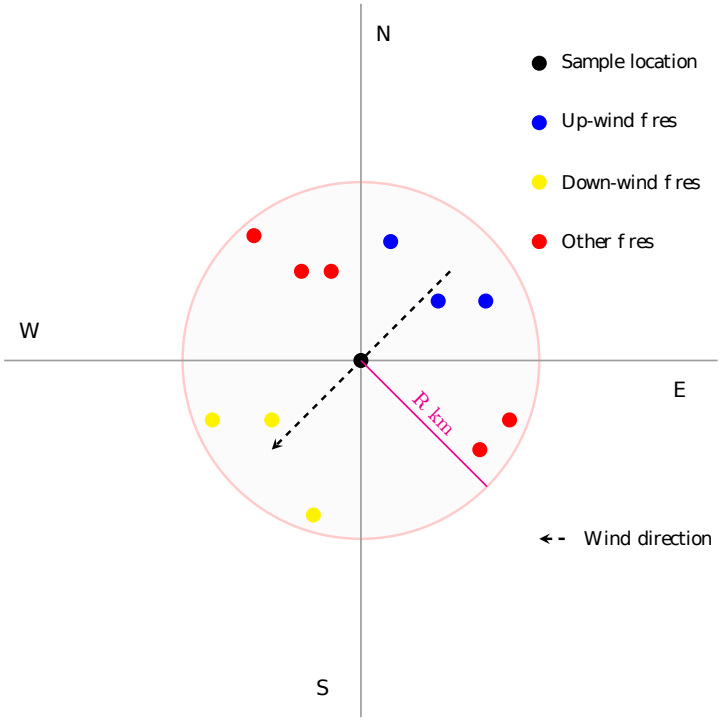


Figure 2: Schematic for Upwind Fires

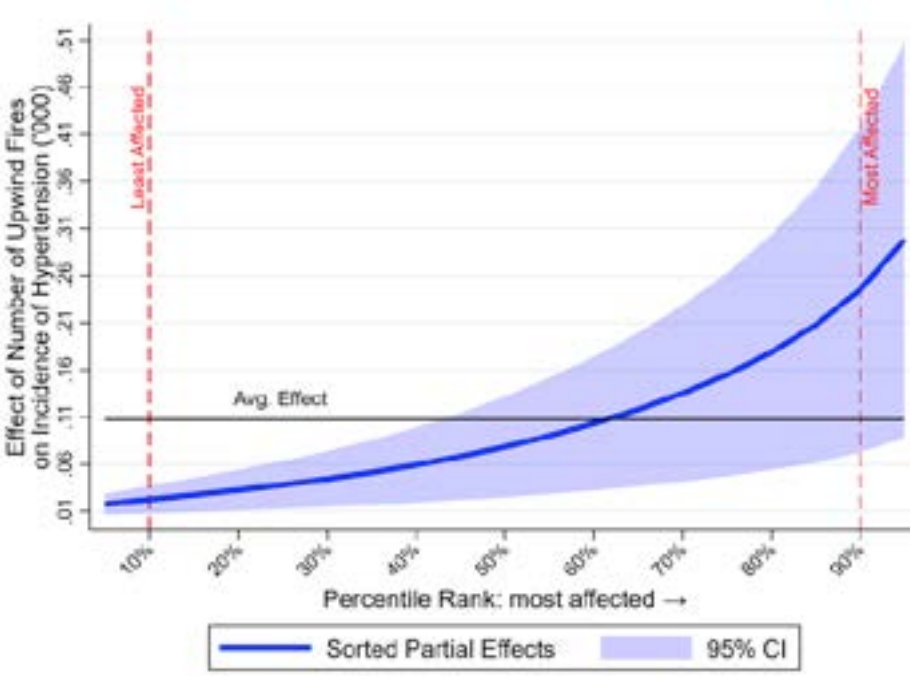


Regression analyses leveraging this variation show that the incidence of hypertension increases by 1.8% for each standard deviation (approximately 14 fires) increase in the number of upwind fires observed one day before the blood pressure readings. Results also suggest that a standard deviation increase of upwind fires leads to about 27% higher PM2.5 concentrations. Ultimately, these estimates imply that agricultural fires in India lead to hypertension-related additional mortality, associated with USD 9 billion annually in costs.

The authors dig deeper into this issue by employing the Sorted Effects Method and Classification Analysis. These reveal, as shown in Figure 3, that certain individuals are substantially more vulnerable to air pollution exposure. In particular, the estimated effects were stronger among older males, smokers, individuals who were already on blood pressure medication, and individuals belonging to socially marginalized groups. These results are well-aligned with epidemiological and medical literature.

The study, therefore, highlights the importance of examining hypertension as an additional pathway to the impact of air pollution. The results from this study can help explain why prior literature finds adverse effects also on labor productivity, cognition, mortality, and other important human capital outcomes. Finally, this study provides insight into the potential adverse health impacts of other biomass fire events, such as large wildfires, which also occur in some developed economies, and which may become even more prevalent due to climate change •

Figure 3: Results from the Sorted Effects Method



Further reading

Hemant K. Pullabhotla and Mateus Souza (2022). "Air Pollution from Agricultural Fires Increases Hypertension Risk" *Journal of Environmental Economics and Management* 115, 102723.