



Research Summary: Short term exposure to Particulate Matter and Blood Pressure in a Near Highway Population

By: Oliver-John Bright

Background

Studies have shown that particulate matter (PM), a type of air pollution, has negative effects on human heart and blood health. However, PM includes many different types of particles and we do not yet know which type of particle is the most responsible for the impact of PM on health.

Among the health problems associated with PM is elevated blood pressure, supported by the findings of several research studies. PM is related to blood pressure in many different types of people, including diabetes patients, schoolchildren, nonsmokers, and elderly patients with heart and blood disease. Our study investigated three types of PM: black carbon (BC), PM smaller than 2.5 μm in diameter ($\text{PM}_{2.5}$), and the tiniest, ultrafine particles (UFP), and attempted to understand which was associated with elevated blood pressure.

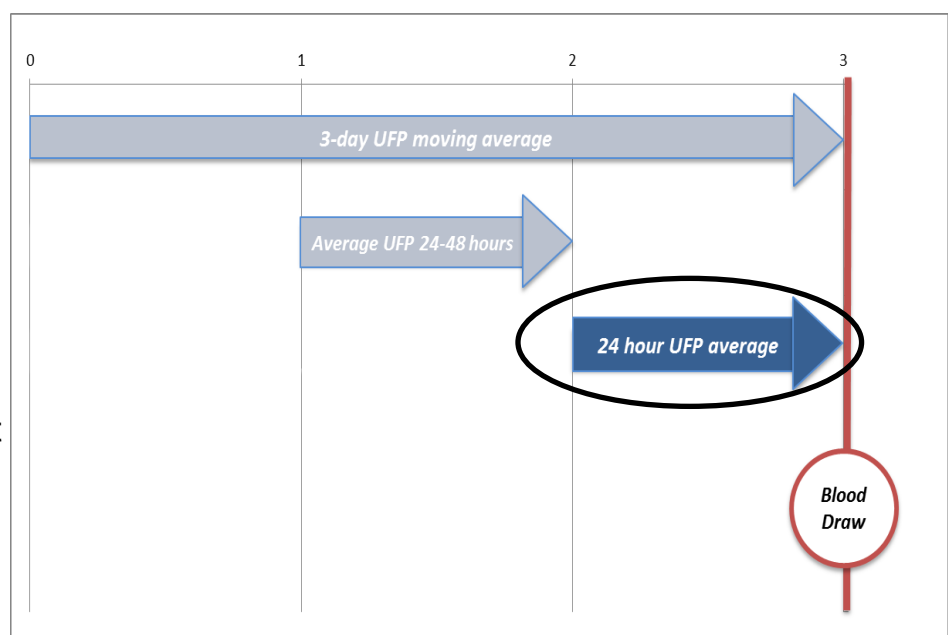


Figure 1: The three different types of air pollution level averages commonly used in air pollution studies to demonstrate acute, short term effects of exposure on health. While the other two averages are shown for comparison, our study uses the average UFP level for the 24 hours before participants' blood was drawn.

How was it done?

As part of the Community Assessment of Freeway Exposure and Health (CAFEH) study, participants living near and far from the highway in Dorchester and Somerville had their blood pressure recorded during clinic visits. We used hourly measurements of BC, $\text{PM}_{2.5}$ and UFP measured from a central site at Harvard Medical School. These measurements allowed the team to estimate the amount of each pollutant participants were exposed to for the 24 hours before their blood pressure was measured (**Figure 1**).

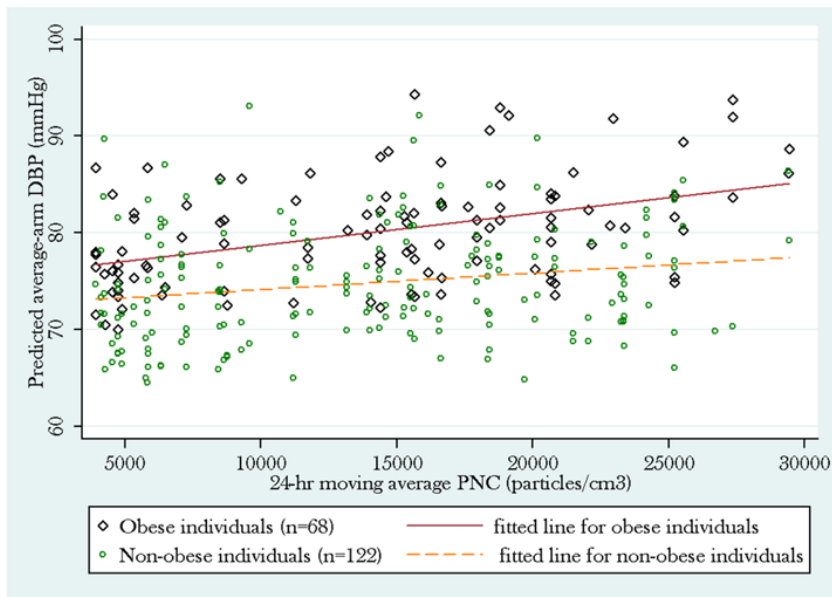


Figure 2: The association between UFP exposure and blood pressure for obese and non-obese study participants. This graph shows that obese participants had larger increases in blood pressure with exposure to UFP compared to those who were not obese.

What did we find?

The main finding from this study was that those with higher 24-hour average exposures to UFP had higher blood pressure. We predict that for every additional 10,000 particles/cm³ of UFP exposure, an individual's blood pressure increases by 2.8%. Additionally, we observed that the increase in blood pressure in response to UFP exposure was strongest in obese participants (**Figure 2**). However, our team did not find an association between blood pressure and exposure to BC or PM_{2.5}, the other two types of PM.

Why is it important?

This study is important because it contributes to understanding the relationship between PM and health. Only a small number of studies have investigated blood pressure and different types of PM, and the findings have not all been the same. Our study is unique because our participants live near the highway, where UFP levels are known to be at their highest, which may have helped us observe the relationship between UFP and blood pressure. The results of our study help to better understand how living near the highway could be bad for one's heart and blood health.

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To learn more about this research, please refer to the following source:

[Chung M, Wang DD, Rizzo AM, Gachette D, Delnord M, Parambi R, Kang C-M, Brugge D. Association of PNC, BC, PM_{2.5} measured at a central monitoring site with blood pressure in a predominantly near highway population. *International Journal of Environmental Research and Public Health*. 2015; 12\(3\): 2765-80.](#)