

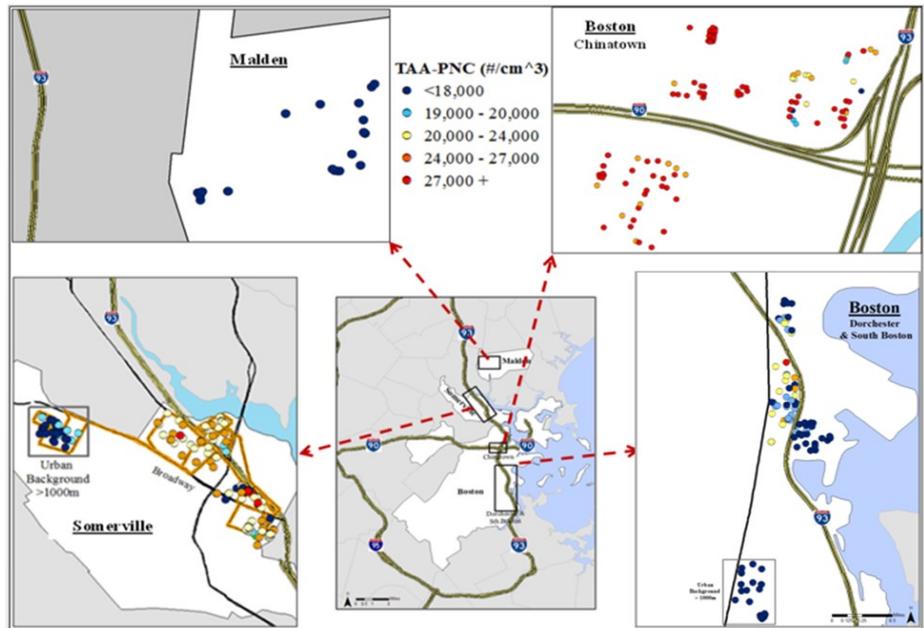


## Research Summary: People Exposed to Ultrafine Particles Near Highways Have More Inflammation

By: Byron Lu

### Background

Very tiny particles in the air, called ultrafine particles (UFP), are formed in the exhaust of motor vehicles. Because they come from vehicle exhaust, UFP have high concentrations near major roadways. While it has been established that people living near such roadways are more likely to suffer from health problems, it is not completely understood how UFPs affect health. There are other traffic-related pollutants near roadways, and noise, which also affect health.



**Figure 1.** The map shows the location of all of the participants in the study. The colors show the levels of UFP (also known as particle number concentration or PNC) in the air, with red being the highest levels and blue the lowest.

### What did we do?

The study involved driving a van containing air monitoring equipment to measure UFP levels around four neighborhoods in the Boston area. We used location, weather, and traffic conditions to build mathematical models explaining how UFP levels change over time. Then we used these models to estimate UFP levels for every hour of an entire year in each neighborhood. We also recruited people living in the areas where UFP levels were measured (Figure 1). Each participant in the study filled out a long questionnaire, had their weight and height measured, and provided blood samples. The blood was

#### Side bar

Inflammation is a reaction that the body has to injury or infection. When you cut yourself and the area around the cut may swell and turn red. This inflammation is the immune system sending warrior cells to the site of the cut and fighting away infection; that is an example of good inflammation. However, when, those same warrior cells are in your blood for a long time, the general inflammation they cause harm can lead to heart attacks, strokes and other illnesses.

were able to estimate how much UFP was in the air they breathed by taking into consideration how much time they spend at home, at work, at school, or in the car on a highway, etc. We then asked the question: Did people with higher UFP exposure also have higher levels of inflammation?

### What did we find?

We found that people with higher exposure to UFP, who were more likely to live near a highway, also tended to have higher levels of inflammation in their blood (Figure 2). This was true even when we accounted for other things that cause inflammation including age, sex, smoking, overweight/obesity, and race/ethnicity. Interestingly,

we also found that White participants were more likely to have higher inflammation levels if their UFP exposure was high, while this was much less true in Asian participants.

### Why is this important?

This research adds to a small, but growing number of studies that show a link between UFP and health, in particular, diseases caused by inflammation. Ours is the first study to look at these health effects from long term exposure to near roadway UFP. Other long term UFP studies that came out recently looked at UFP levels over much larger areas, but also found associations with health. Since UFP are not regulated and much of the public is unaware of them, this study adds important information about their possible health risks.

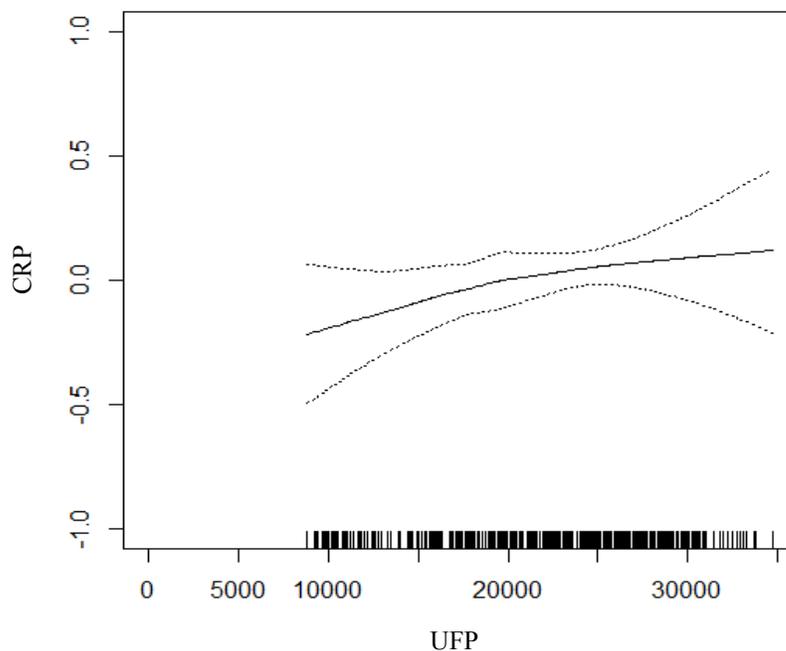


Figure 2. Difference in C-reactive protein (CRP) levels for people with different levels of UFP in the air where they spend their time. People with higher levels of UFP in the air they breathe (marks on horizontal axis) tend to have higher levels of CRP (marks on the vertical axis).

### For more information, contact:

Kevin J. Lane  
Department of Environmental Health,  
Boston University School of Public Health, Boston, MA, USA  
Yale University School of Forestry & Environmental Studies,  
New Haven, CT, USA [k.lanejr@gmail.com](mailto:k.lanejr@gmail.com)

### This study was funded by:

National Institute of Environmental Health Sciences (NIEHS) (Grant No. ES015462)

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

<http://www.sciencedirect.com/science/article/pii/S0160412016300940>