



Research summary: Estimation of ultrafine particle concentration at near-highway residences using data from local and central monitors

By: Christine Papastamelos

Being in close proximity to a highway exposes you to pollutants from vehicle exhaust. Among the most harmful of these pollutants are ultrafine particles (UFP). UFP are small enough to enter the lungs, penetrate the blood stream and cause negative health effects. Ultrafine particles can cause inflammation in the body that may affect health of the lungs, heart and blood circulation. Therefore, it is important to learn about how much near-highway residents are exposed to UFP. Often, UFP concentrations have been monitored from monitoring sites located far from highways. However, measuring levels of UFP concentration from such sites may not reflect levels near highways since UFP are usually higher next to heavy traffic. Accurately measuring the concentration of ultrafine particles at near-highway sites could help us understand the level of exposure to near-highway residents.

Researchers from Harvard and Tufts Universities examined whether data monitored at a monitoring site was similar to UFP concentration that was monitored in urban homes.

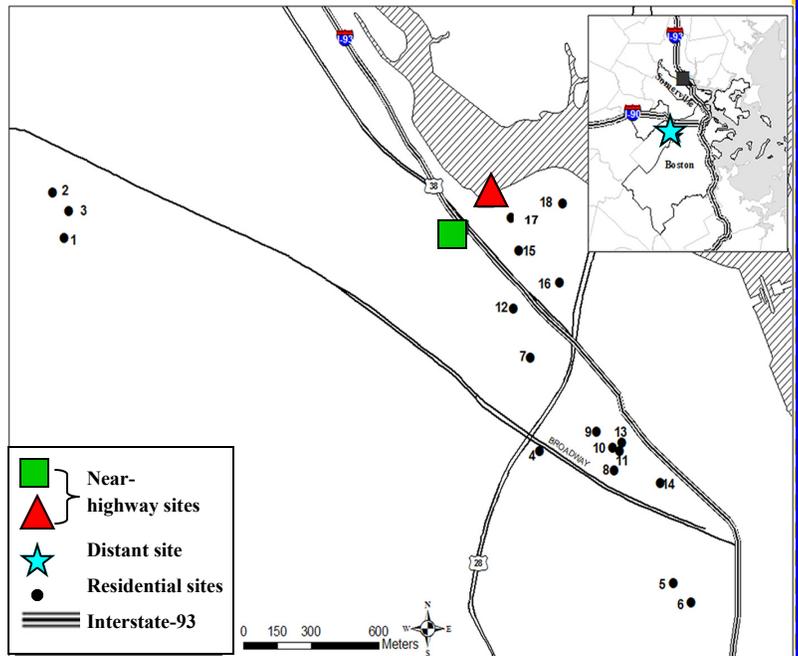


Figure 1: Map of Somerville study area showing distant site, near-highway sites, and residential sites and their relation to I-93.

How was it done?

Christina H. Fuller, at the time a doctoral student at Harvard University, led a research study in which UFP concentrations were monitored at 18 homes in Somerville, MA. The residences were chosen from three different recruitment areas categorized by distance from Interstate-93. Residential distances from I-93 were classified as less than 100m, 100-400m, or greater than 1000m (urban background). UFP monitors were also placed at two separate near-highway sites in southeast Somerville. Monitoring of UFP concentration was carried out through the spring, summer, and fall of 2010. Short term monitoring (1-3 weeks) was conducted at the residences, while longer monitoring took place between November

2009 and December 2010 at the near-highway sites. Data was also obtained from a distant site (several kilometers from the highway) in Boston at the Longwood medical area.

What did they find?

This study showed that UFP concentration at homes was more closely related to UFP concentration at near-highway sites than to UFP concentration at the distant site. High UFP concentrations were seen at the homes in the study when UFP concentrations were high at the near-highway sites. But there were also increased UFP concentrations at the homes, although smaller, when UFP concentration increased at the distant site. It was found that of the residential sites monitored, homes closer to I-93 were exposed to more UFP. Overall the concentration of UFP decreased with distance from the highway, the lowest concentrations being in the urban background area. Winds can carry pollutants from the highway to near-highway residences, increasing UFP concentration. Near-highway homes may be more affected by changes in local wind conditions.

Why is it important?

This study provides evidence that levels of pollutants monitored far from near-highway residences, as was done at the distant site, are likely to be inaccurate for near highway

may better capture the pollution exposure of urban communities near heavy traffic. The close proximity of near-highway monitors to the tested residences appears to contribute to a more accurate measurement of UFP concentration. Understanding how wind speed, wind direction, precipitation, traffic volume, and time of day affect UFP levels will help researchers determine how much UFP people are exposed to next to highways.

What can you do?

Residents living close to highways have higher outdoor concentrations of ultrafine particles. However, there are things that residents can do to help protect their health. Try keeping the windows closed during times of heavy traffic, especially in the early morning to minimize the amount of pollutants entering your home. Also, using central air-conditioning instead of opening the windows during warmer months of the year will reduce the level of UFP in the home. Lastly, if you enjoy spending time outdoors, try to do so in areas away from the major highways and busy local roads.

Christine Papastamelos is an Undergraduate Intern with the Tufts Community Health Program

For more information, contact:

Christina Hemphill Fuller, ScD
Postdoctoral Research Associate
Institute of Public Health
Georgia State University
cfuller@gsu.edu

This study was funded by:

- National Institutes of Health
- National Institute of Environmental Health Sciences



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



Fuller CH, Brugge D, Williams P, Mittleman M, Durant JL, Spengler JD 2012. Estimation of Ultrafine Particle Concentrations at Near-Highway Residences Using Data from Local and Central Monitors. *Atmospheric Environment* 57:257-265.