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A Few of the Facts

By Sophia Burks

As of April 1, 2012, the Community Assessment of Freeway Exposure and Health (CAFEH) study reached its four-year anniversary. The data collection for all human data in Somerville, Dorchester, and Chinatown was completed as of February 2012. Environmental data collection is completed in Somerville and Dorchester, with Chinatown scheduled to wrap-up during Summer 2012. This is an exciting time for the CAFEH study Team!

Enclosed in the following pages of this 3rd Issue of the *CAFEH Newsletter* are informative fact sheets based on three published academic papers by the CAFEH Study. The 3 fact sheets will touch on the following topics:

- Observing ultrafine particle (UFP) concentrations during a winter day in Somerville, MA;
- Comparing traffic exposure and cardiovascular health in Puerto Rican participants; and
- Traffic exposure of Puerto Rican participants who use insulin injections or take oral diabetes medication, and the effects on their level of C-reactive protein.

It is our hope the information packed into the following pages of this season's newsletter will continue to educate people on the health effects of near-highway pollution, continue to pursue intervention studies of possible benefits of reducing exposure to UFPs, and more importantly, continue the dialog to influence community-level policy and practice.

Enjoy the facts and remember to visit our website, <http://sites.tufts.edu/cafeh/>, for more updates about the CAFEH study!

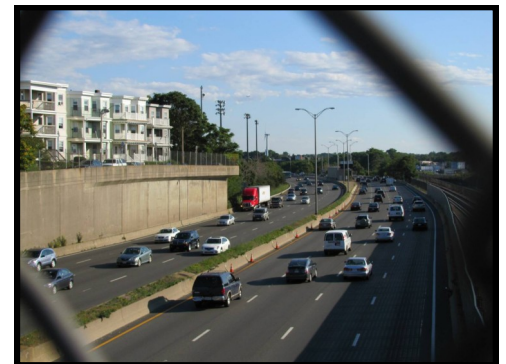


Image Source: Wig Zamore

Announcements & Upcoming Events

**CAFEH Advisory
Board Meeting
Scheduled Tuesday,
July 17, 2012 @ 9AM-1PM**

*Joseph M. Tierney Learning Center
125 Mercer Street, South Boston, MA*



The CAFEH Team has diligently worked to complete ALL human data collection!!!

Environmental data collection will wrap up with Chinatown during the Summer 2012.

Engaging communities and policy makers about near highway pollution and health
 Ellin Reisner¹, Kevin Lane², Christine Rioux³, Sophia Burks⁴, Doug Brugge⁵
 (1) Somerville Transportation Equity Partnership; (2) Boston University School of Public Health; (3) Tufts University School of Medicine; (4) Tufts University
 FUNDED BY: NIEHS ES015462; NHLBI CA148612; HUD MALHH0194-09; EPA STAR FP-91720301-0; EPA STAR FP-917349-01-0; and P.E.O. Scholar Award

Abstract
 The Community Assessment of Freeway Exposures and Health study is a community-based participatory research effort collecting data to test associations between ultrafine particle levels near highways and blood markers of inflammation in people living closer and farther from the highways. As a CBPR project, we have a deep commitment to engaging the community, public and policy makers and have developed a number of communication strategies. We have a website that has recently been reformatted and updated. We have published two issues of a project newsletter and plan to publish at least two more. The newsletter audience includes the project team, a lot of interested people, including Advisory Committee meeting attendees and participants in the study who participated in the census appointment. Four educational sessions about the project with school children (Boston and Somerville Public Schools, Museum of Science, and Tufts Community Day) have been held and they generated a lot of excitement and interest. A group of transportation-related students made a short film about the study which premiered on YouTube and is now available on YouTube and through the Transportation Research Board Health & Transportation Policy Committee. We have been able to secure a much broader audience through regular news coverage of the project on local and regional news papers, television and radio. This work has been published in the New York City News and Physicians for Social Responsibility. Finally, we have an advisory board that meets once a year that is attended by 25-45 people. Attendees include project team members, community leaders, study participants, municipal, state and federal agency staff, and elected officials. The meetings include presentations, mostly by our graduate students, of recent findings as well as presentations and discussion about policy and practice relevance of the study.

New Website:
<http://sites.tufts.edu/cafeh>

Project Newsletter:
 Vol 1 Issue 2

Advisory Board Meetings

CAFEH In The News

CAFEH Team Presentations

- Metropolitan Area Planning Council (MAPC) - Wig Zamore
- Transportation Research Board (TRB) - Ellin Reisner & Wig Zamore
- American Public Health Association (APHA) - Ellin Reisner
- Massachusetts Public Health Association (MPHA) - Ellin Reisner & Wig Zamore
- Boston Museum of Science - Christine Rioux
- Boston and Somerville Public Schools - Chris Rioux, Allison Patton & Luis Prado-Martinez
- Tufts Community Day - Chris Rioux & Doug Brugge



CAFEH Advisory Board Meeting & Community Report Back

The Summer 2012 Advisory Board Meeting & Community Report Back will take place **July 17, 2012 from 9AM to 1PM** at the **Joseph M. Tierney Learning Center** located at **125 Mercer Street in South Boston, MA.**
 CAFEH participants, community members, and volunteers are encouraged to attend.

LEFT IMAGE: Members of the CAFEH Steering Committee presented the poster displayed to the left at the Partnerships for Environmental Public Health (PEPH) Annual Meeting this past March in Bethesda, MD.
 Visit the CAFEH website, <http://sites.tufts.edu/cafeh/> for full view.

CAFEH Community Partners

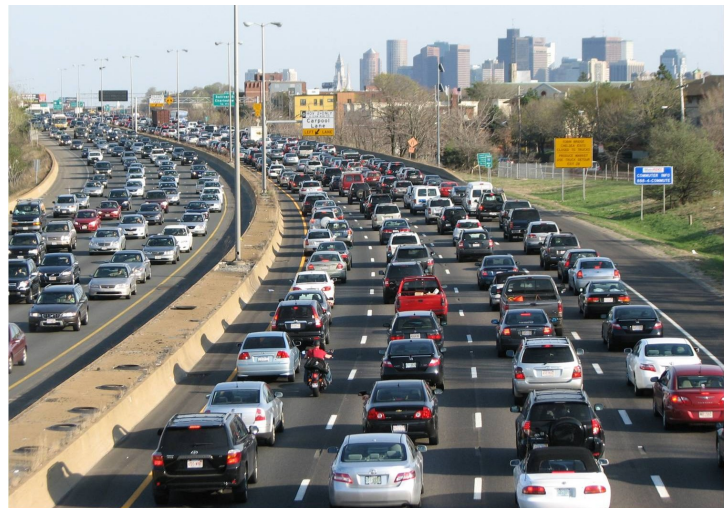
SOMERVILLE TRANSPORTATION EQUITY PARTNERSHIP

Tufts UNIVERSITY School of Medicine Partners in Medical Education

Chinese Progressive Association

CRA Chinatown Residents Association

MUNICIPAL FREEDOM GIVES NATIONAL STRENGTH SOMERVILLE, MASS.



Working together on a five-year study to examine the effect of air pollution of traffic on the health of people living near major highways.

NEW Website!
<http://sites.tufts.edu/cafeh/>

NEWSLETTER CREDITS:
 Doug Brugge—Issue Co-Editor
 Sophia Burks—Issue Co-Editor, Designer, & Producer



COMMUNITY ASSESSMENT



OF FREEWAY EXPOSURE & HEALTH



Research summary: Near-highway distribution of ultrafine particle pollution on a winter morning in Somerville

By: Nina Grossman

Among the air pollutants from highway traffic, ultrafine particulates (UFP) are thought to be some of the most harmful. UFP are particles that are smaller than 100 nanometers across (100 billionths of a meter, or less than four millionths of an inch) made up of sulfate, metals and hydrocarbons. Their small size allows UFP to enter the blood stream through the lungs when they are breathed in. Frequent exposure to UFP, particularly in the form of highway exhaust, may contribute to heart disease. To study these risks, it is important for researchers to be able to estimate the amount of UFP to which a person is exposed. The concentration of pollution in the air tends to be higher if an area is closer to a highway, but it changes rapidly based on factors like weather, temperature, and wind speed and direction. This makes it more difficult to estimate a person's exposure based on their location.

Researchers from Aerodyne Research, Inc. and Tufts University, contracted by the Mystic View Task Force, conducted a study to better understand how the concentration of pollutants, including UFP, next to Interstate-93 in Somerville, MA changed over the course of one typical winter morning.

How was it done?

To determine how the concentration of UFP and other pollutants changed between 6:00 AM and 11:00 AM on January 16th, 2008, researchers repeatedly drove a van carrying monitoring equipment on a route of local roads near Interstate 93 (I-93) in Somerville. The van was equipped with instruments that continuously monitored the concentration of UFP and other pollutants, like carbon dioxide and nitrogen dioxide. It had a global positioning system (GPS) so that the instruments' readings could be matched with their location. The temperature, wind speed and wind direction for the time period were recorded at a station nearby in Medford. Hourly vehicle counts on I-93 were provided by the Massachusetts Highway Department.

What did they find?

The researchers found that concentrations of particles close to the highway were higher and varied more throughout the

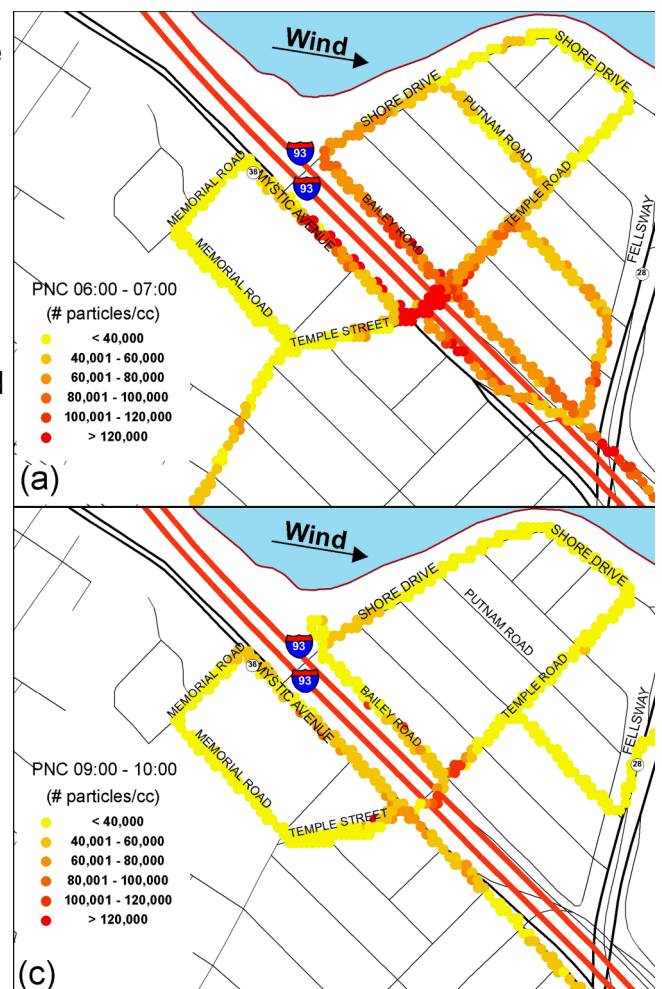


Figure 1: Ultrafine particle (UFP) concentration in the study area in Somerville from 6 AM to 7 AM (a) and 9 AM to 10 AM (c). The darker the red shown on the map, the higher the concentration of UFP that was found at that location. The two darkest shades are levels of UFP similar to those found on highways.

morning than those in areas that were farther away from the highway. As seen in figures 1 and 2, in the early morning, from 6 AM to 8 AM, particle concentrations were higher, particularly in areas closest to the highway. This is most likely because during the early morning temperatures and wind speeds were lower, causing less dilution of particles. Areas that were upwind of the highway had lower concentrations of particles than areas downwind.

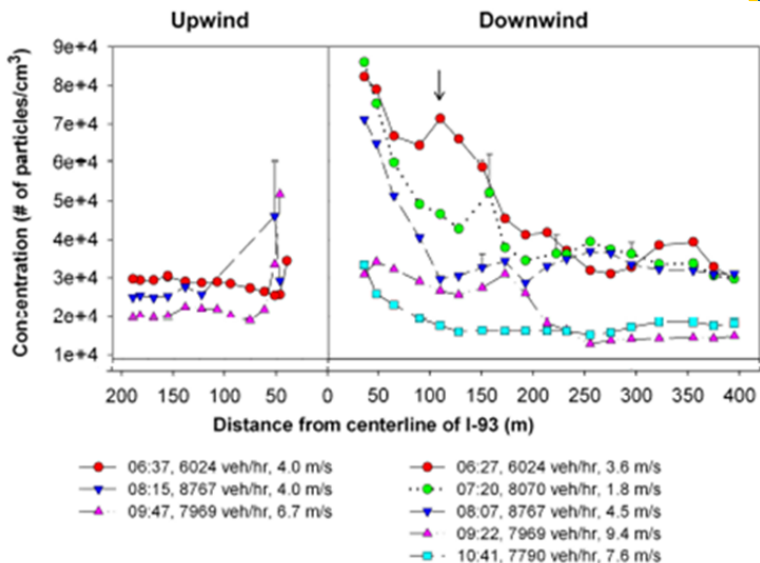


Figure 2: Graph of ultrafine particle (UFP) concentration by distance from I-93 for five times in the morning. Downwind of the highway, UFP shows higher levels during readings taken in the early morning (6:27, 7:20, and 8:07) closest to the highway. UFP concentration decreases as time progresses, with less UFP found later in the morning.

Why is it important?

These findings will be helpful to researchers studying the health effects of UFP. In order to determine whether breathing in UFP causes conditions like heart disease, researchers compare levels of blood markers of heart disease in people with different amounts of UFP exposure. The knowledge that spending time close to the highway will expose someone to more UFP during times of low temperature and wind speed, such as the early morning, will make it easier for researchers to determine people's actual levels of exposure. This should produce more accurate tests of association between UFP and health, and may eventually provide evidence to support the regulation of UFP.

What can you do?

If you live close to a highway, it may be advisable to sleep with windows closed to avoid breathing in air from the outside during the early morning when UFP levels are highest. Likewise, if you jog or exercise in the early morning, it might be best to do so away from the highway.

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This study was funded by:

- Mystic View Task Force
- Aerodyne Research, Inc. IR&D
- The National Institutes of Health



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

Durant JL, Ash CA, Wood EC, Herndon SC, Jayne JT, Knighton WB, Canagaratna MR, Trull JB, Brugge D, Zamore W, Kolb CE 2010. Short-Term Variation in Near-Highway Air Pollutant Gradients on a Winter Morning. Atmos Chem Phys 10:8341-8352. <http://www.atmos-chem-phys.net/10/8341/2010/acp-10-8341-2010.html>



Research summary: Urban traffic exposure and the risk of cardiovascular disease in the Puerto Rican Health Study By: Andrea Stewart

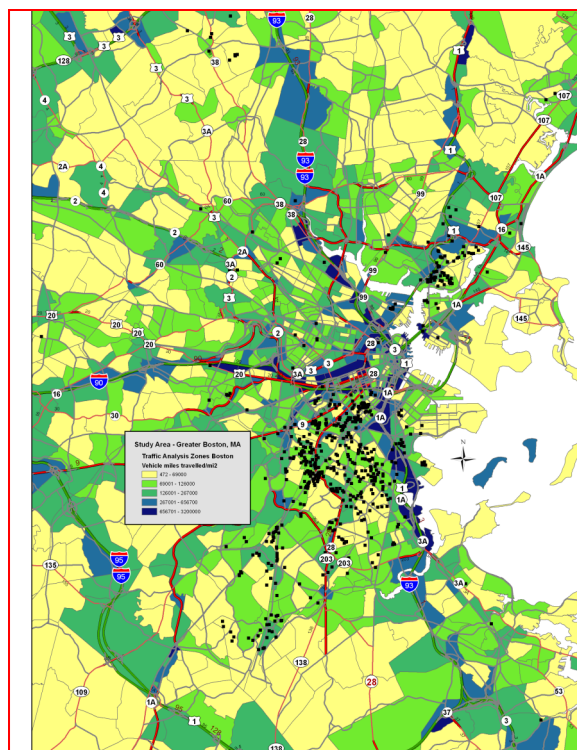
Pollution caused by traffic is harmful to the environment, as well as human health. While we are all exposed to traffic and pollution during our daily lives, those living close to major roads or in areas with greater traffic volume may be at a higher risk of getting sick. People living in high-traffic areas are chronically exposed to elevated levels of pollutants, as well as louder background noise. Researchers at Tufts and Northeastern University in Boston have conducted a study to determine if living close to traffic might cause an increased risk of cardiovascular disease (CVD), such as heart attacks and strokes.

How was it done? To compare exposure to traffic and cardiovascular health, Dr. Christine Rioux and colleagues at Tufts and Northeastern Universities looked at participants in a study conducted by the Boston Puerto Rican Center for Population Health and Health Disparities. Puerto Ricans aged 45-75 in the greater Boston area were part of a study of nutrition, stress, and health. Dr. Rioux looked at the levels of C-reactive protein (CRP) in the blood of the 1,017 study participants, as well as their pulse pressure (the difference between the higher and lower numbers of blood pressure measurements). High levels of CRP and high pulse pressure are both signs of an increased risk of heart attack or stroke.

Exposure to traffic was calculated in two different ways. Participants' home addresses were used to find the distance to major roads on which more than 20,000 vehicles traveled per day. The researchers also looked at the amount of traffic on the roads surrounding participants' homes using data from the Boston Region Metropolitan Planning Organization (MPO).

What did they find? After taking into consideration many factors, several significant associations were found between elevated CRP levels and these traffic measures.

The researchers noted significantly higher CRP levels in study participants living in areas with the highest traffic volume compared with people living in areas with the lowest traffic volume. When the researchers looked at only participants who were obese, those who lived within 200 meters (about two football fields) of a major road, as well as those living in areas with higher traffic volume, had higher CRP than those obese participants with lower levels of traffic exposure.



“Traffic Analysis Zones” in the Boston area. The darker areas have more traffic, while the lighter zones are less well-traveled. The black dots represent participants in the study.

With regards to pulse pressure, people living within 200 meters of two or more major roads were found to have higher pulse pressure than those with no major roads close to their residence. This difference in pulse pressure was even higher when researchers looked at only obese participants and when they looked at only those with diabetes.

Why is it important? This study contributes to an increasing body of evidence that people living closer to major roads or in high-traffic areas may experience greater risks of numerous health problems. In addition, people with diabetes or obesity, who are already at a higher risk of CVD and heart attacks, may be at an even greater risk of these conditions when they are also exposed to high levels of traffic and pollution.

This study is notable because it examined both distance to major roads and traffic volume as measures of traffic exposure near participants' homes. The innovative technique of using MPO-created traffic analysis zones to characterize the amount of traffic in a certain area can be applied to other studies as a measure of exposure to traffic. The results for the sub-populations of obese and diabetic people are important, as they add to the evidence that people with these conditions may be particularly susceptible to traffic.

What can you do? It may not be possible to move further away from a highway, but there are some things you can do to reduce your risk of heart attack and stroke and also improve the air quality of your neighborhood. Regular, moderate exercise is a great way to keep your heart healthy, as well as eating healthy foods and refraining from smoking. If you want to exercise outside, make sure to do it away from major roads, where pollution is high. On days when pollution levels are high, exercise indoors, or take it a little easier if you do decide to exercise outdoors. If you are obese or have diabetes, you should talk to your doctor about ways to maintain your health and protect your heart. You might tell your doctor if you live near a major highway. Be aware of the signs of a heart attack or stroke, and know when to seek medical attention.

You can also help scientists better understand the health effects of air pollution by joining a study like this one. Participating in these types of studies comes with minimal risk to yourself and benefits your community by providing a better idea of what it is like to live there.

Another way to help change your environment is to join efforts to educate the public and your elected officials about the health effects of near-highway pollution. If policy makers are informed about this issue, they may propose changes to regulations to improve the air quality.

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This study was funded by:

- The National Institute of Environmental Health Sciences
- The National Institutes on Aging



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

Rioux CL, Tucker KL, Mwamburi M, Gute DM, Cohen SA, Brugge D 2010. Residential Traffic Exposure, Pulse Pressure, and C-reactive Protein: Consistency and Contrast among Exposure Characterization Methods. *Environ Health Perspect* 118:803-811. <http://dx.doi.org/10.1289/ehp.0901182>



Traffic exposure, diabetes medications and risk of heart disease and stroke

By: Andrea Stewart

Type 2 diabetes is a condition where sugar builds up in the blood. This happens because the body is unable to produce the insulin it needs to process the sugar. People diagnosed with Type 2 diabetes usually have it for the rest of their lives, and have to take medication to help control their blood sugar. These people also have a higher risk of experiencing heart attacks and strokes than non-diabetics. Researchers at Tufts and Northeastern Universities recently conducted a study that examined the health of people with Type 2 diabetes who live close to major roads.

Living close to traffic exposes people to higher levels of pollution and noise, which can harm health. Past research has shown that people with diabetes are more vulnerable to air pollution than non-diabetics.

While investigating whether individuals in the Boston Puerto Rican Health Study were at an increased risk of heart attack and stroke if they lived closer to major roads, Dr. Christine Rioux and her fellow researchers at Tufts and Northeastern noticed an interesting trend in people with Type 2 diabetes.

When Dr. Rioux and colleagues looked at just people in their study who had diabetes, they noticed the trend they expected was reversed. People with diabetes living closer to major roads had a lower risk of heart attack and stroke than those living further away from major roads. This interesting finding prompted the researchers to focus

on the population of 379 study participants with Type 2 diabetes. They decided to look at the different medications people were taking to control their diabetes. They wanted to determine if diabetes medication affects the relationship between exposure to traffic and risk of heart attack and stroke.

How did they measure risk and exposure? Dr. Rioux and colleagues determined risk of heart attack and stroke by measuring the levels of C-reactive protein found in blood samples from the participants in the study. C-reactive protein (CRP) is found in everyone's blood. When you are sick, CRP levels rise as part of your immune system's response to infection. High CRP is also a warning that someone is at risk of having a heart attack or stroke. CRP is also higher in people with Type 2 diabetes.



Treatment for Type 2 diabetes can include either insulin injections, pills that are swallowed, or both.
Image source: diabetesmine.com

In their study, Dr. Rioux and her colleagues measured traffic exposure by looking at how close people in the study lived to major roads. Researchers determined the distance between participants' home addresses and roads on which more than 20,000 vehicles traveled per day. The researchers proposed that people living closer to these roads with high traffic would experience higher CRP.

What relationships did they look at?

Researchers divided the diabetic study population into two groups: those who used insulin injections to treat their diabetes, and those who used only oral diabetes medication. Oral medications are taken by mouth as pills. These pills help diabetics control their blood sugar by helping the body use the insulin it produces by itself.

When the researchers looked at the relationship between traffic and CRP levels within this population, they found an interesting difference between insulin users and those who were taking only oral medications. Diabetics who used insulin had higher CRP levels if they lived closer to major roads, compared with those insulin users who lived further from traffic. This result confirmed the researchers' idea that people who live closer to traffic will have higher CRP. However, the exact opposite effect was seen in the study participants taking just oral medications. For these people, those who lived closer to traffic actually had significantly *lower* CRP levels than those who lived further from a major road. This means this study found that diabetics who live closer to traffic should have *lower* risk of heart attack or stroke if they are taking only oral diabetes medication.

Why does this happen? We don't know based on this one study, but the researchers suggested that people who need to take insulin may be experiencing insulin resistance. Insulin resistance weakens blood vessels and can lead to atherosclerosis and stroke. Insulin users are at an increased risk of heart attack and stroke, and exposure to traffic may increase this risk. Oral medications, on the other hand, help the body use the insulin it makes by itself. These drugs also suppress genes that lead to inflammation. C-reactive protein is involved in inflammation, so levels of CRP in the blood of oral medication users might be

affected by their medication. The researchers proposed that breathing in inflammation-causing traffic pollution might actually trigger anti-inflammatory processes in the bodies of people taking only oral diabetes medication, which would lead to lower CRP levels.

Why is it important? This is the first study to compare how different diabetes medications influence the human body's reactions to traffic. Puerto Ricans living in the United States have a high rate of Type 2 diabetes, so this study is an important contribution to the knowledge about this particular population.

What can you do? If you have Type 2 diabetes, or are at risk of developing it, make sure to talk to your doctor about how to best control your blood sugar. Your doctor can help you decide on diet, exercise and medication that will reduce your risk of heart attack and stroke.

People who live close to highways or major roads can reduce their exposure to pollution by exercising in areas with less traffic, keeping their windows shut and using filtration systems which clean the air coming in from the outside.

Andrea Stewart is a Undergraduate Intern w/ the Tufts Community Health Program.

For more information, contact:

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Tufts University School of Medicine

This study was funded by:

- The National Institute of Environmental Health Sciences
- The National Institutes on Aging



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

Rioux CL, Tucker K, Brugge D, Gute DM, Mwamburi M. 2011. *Traffic exposure in a population with high prevalence Type 2 diabetes – do medications influence concentrations of C-reactive protein?* Environmental Pollution. doi:10.1016/j.envpol.2010.12.025 <http://www.sciencedirect.com/science/article/pii/S0269749110005919>