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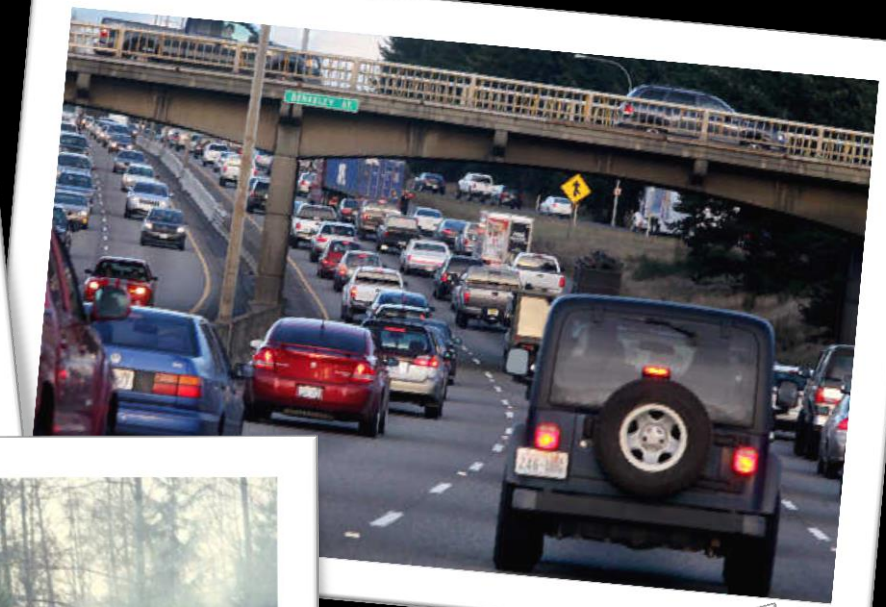
Working together for clean air

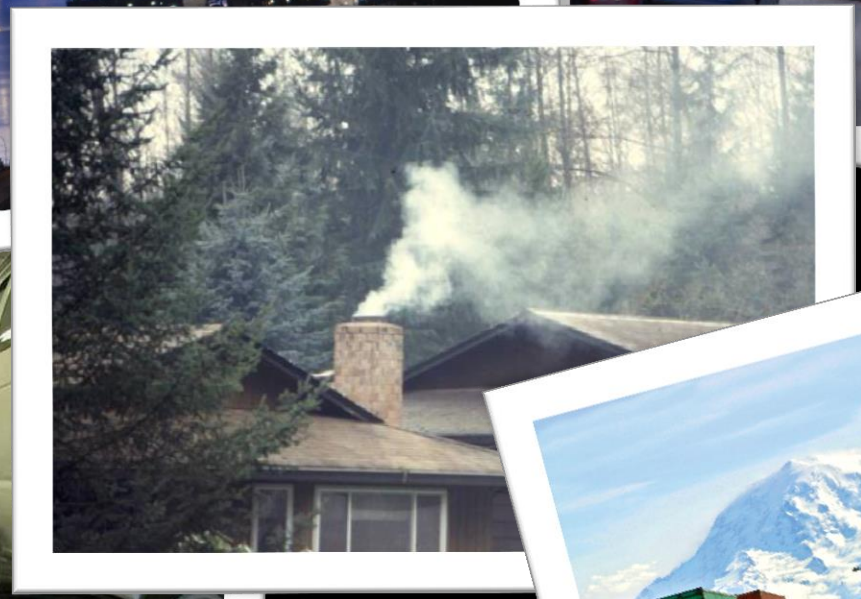
Overview of NW near-road pollution impacts

Puget Sound Clean Air

Erik Saganic

Feb 2015






2001
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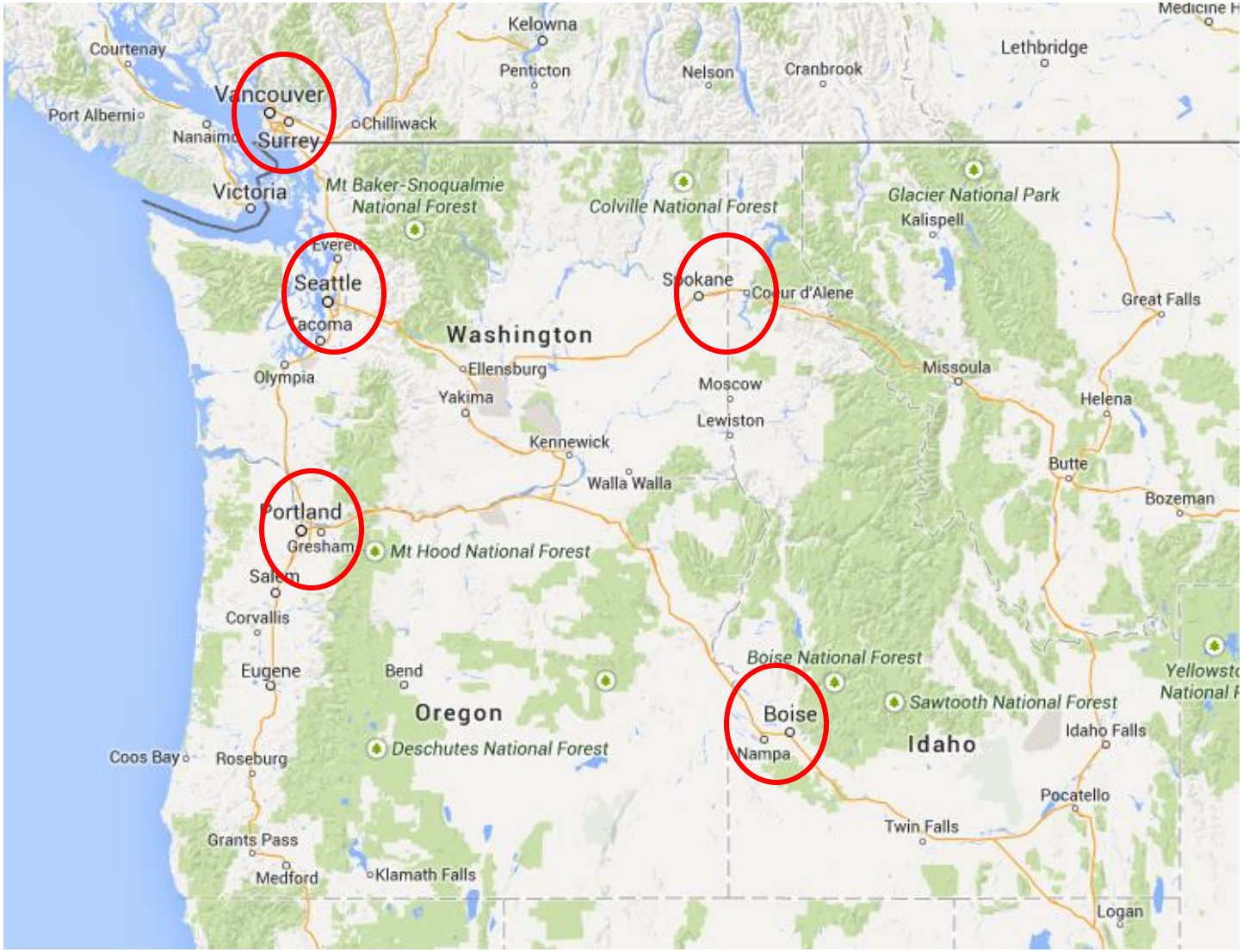
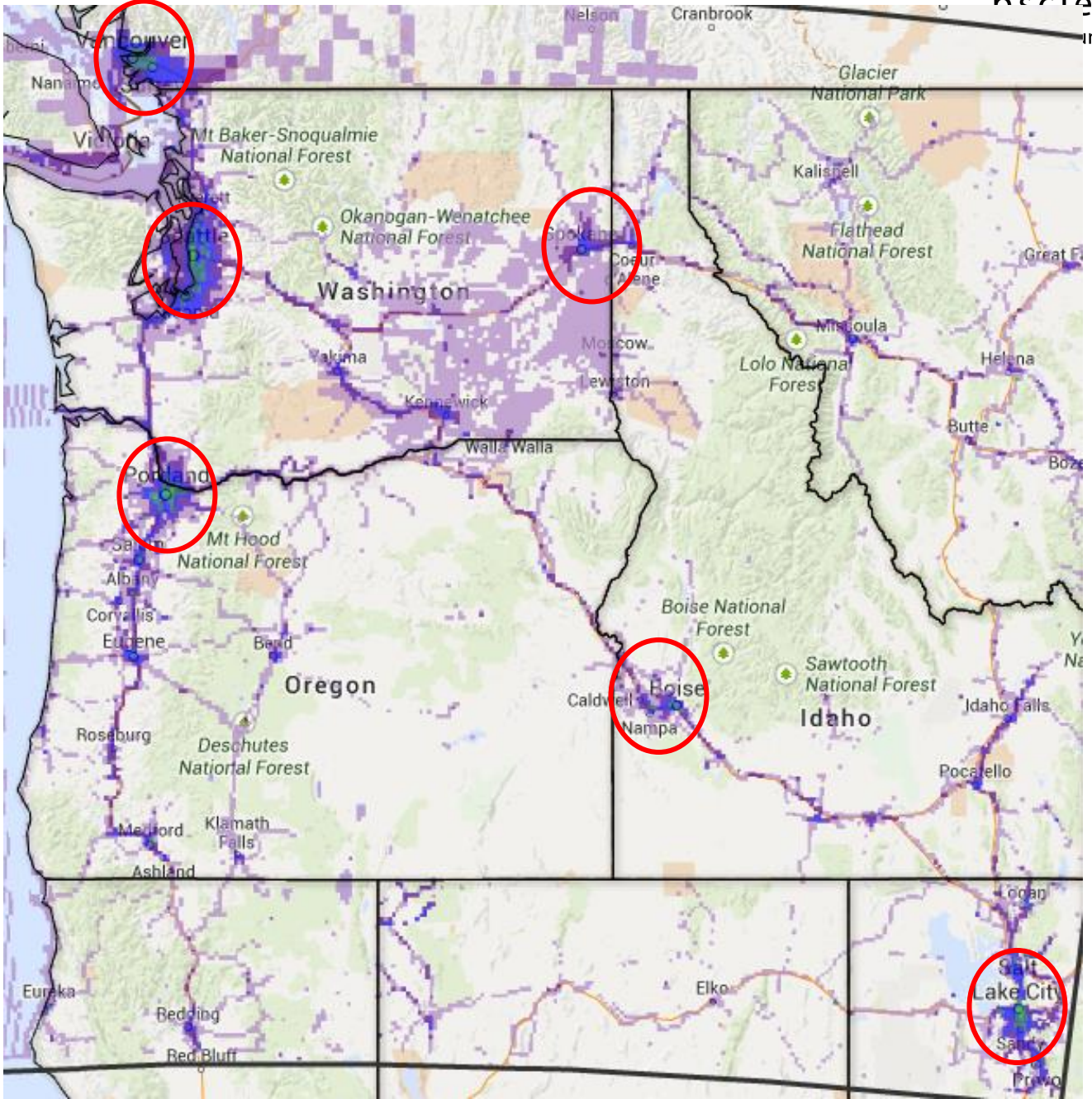
Traffic through major cities




Nelson
Cranbrook
Glacier National Park
Kalispell
Mt Baker-Snoqualmie National Forest
Okanogan-Wenatchee National Forest
Flathead National Forest
Great F
Coeur d'Alene
Washington
Missoula
Moscow
Yakima
Lewiston
Lolo National Forest
Helena
Kennewick
Butte
Walla Walla
Portland
Mt Hood National Forest
Albany
Corvallis
Eugene
Bend
Boise National Forest
Sawtooth National Forest
Oregon
Boise
Caldwell
Nampa
Idaho
Idaho Falls
Roseburg
Deschutes National Forest
Pocatello
Medford
Klamath Falls
Ashland
Logan
Eureka
Elko
Redding
Red Bluff
Salt Lake City
Provo

Many Different Types of Pollutants

- Fine Particles
- Nitrogen Dioxide
- Ozone (Smog)
- Sulfur Dioxide
- Carbon Monoxide
- Lead

Has Federal Limits in the Clean Air Act

- Air Toxics (like benzene)

Many Different Types of Pollutants

- Fine Particles
- Nitrogen Dioxide
- Ozone (Smog)
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- Lead
- Air Toxics (like benzene)

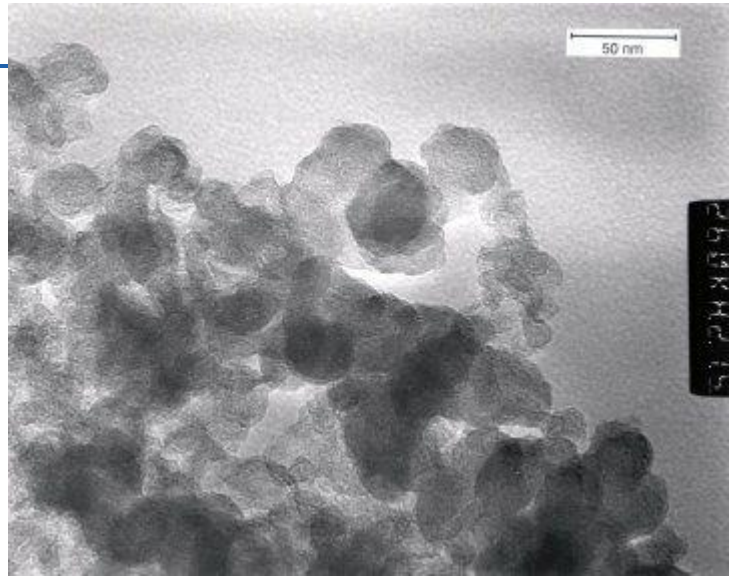
Has Federal Limits in the Clean Air Act

The sources: trucks vs cars

- Diesel particulate
- Nitrogen dioxide
- Air toxics
- PAHs

- Nitrogen dioxide
- Air toxics
- Tire, brake wear
- Oil in badly tuned cars

Are all fine particles the same?



- No
- Diesel particles are a smaller percentage of the total, but more toxic
- No federal standard specifically for diesel exhaust

Who is affected?

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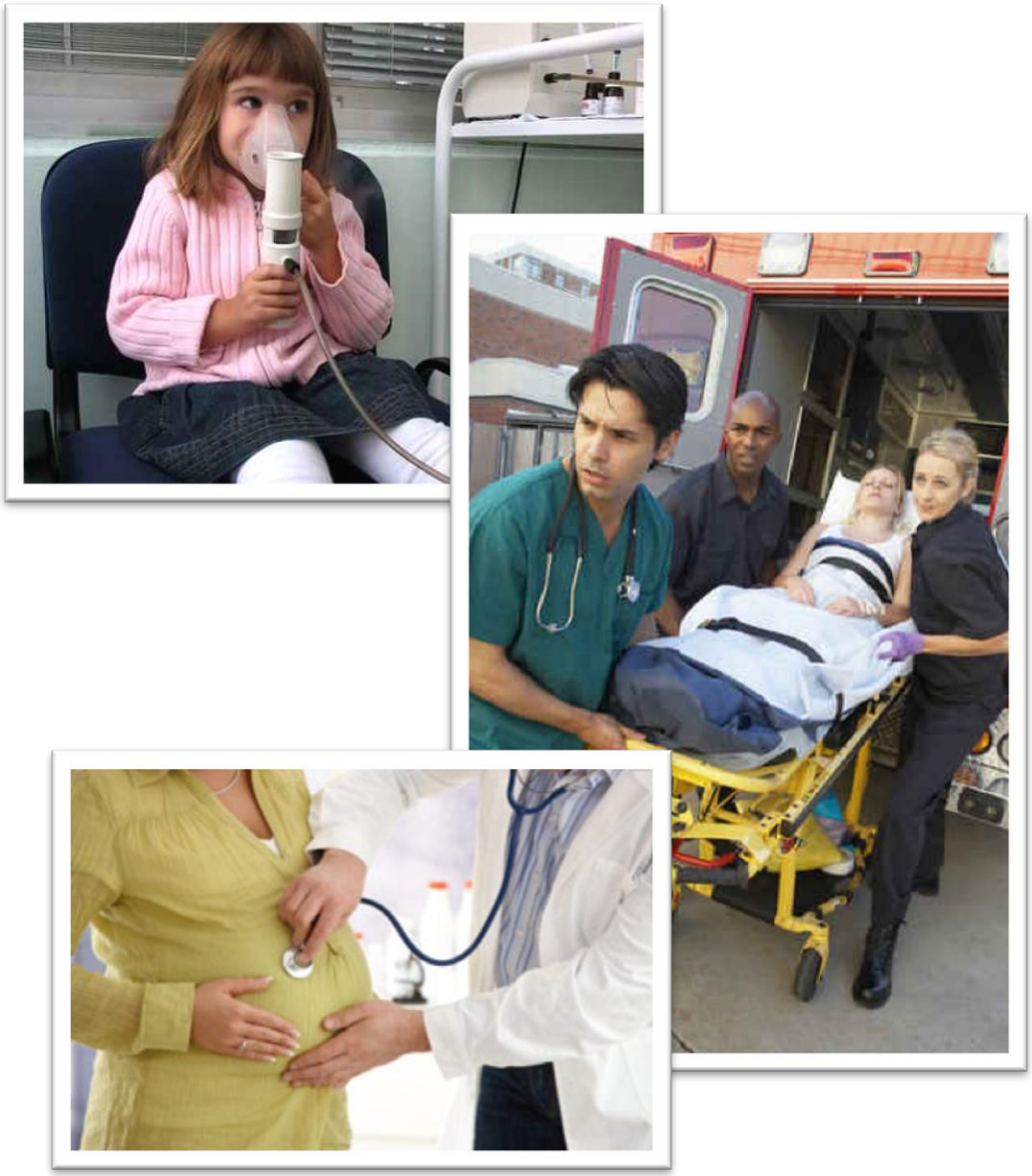

- **Expectant mothers**
- **Children**
- **People living with heart or lung disease**
- **Undiagnosed older adults**

Many Health Effects

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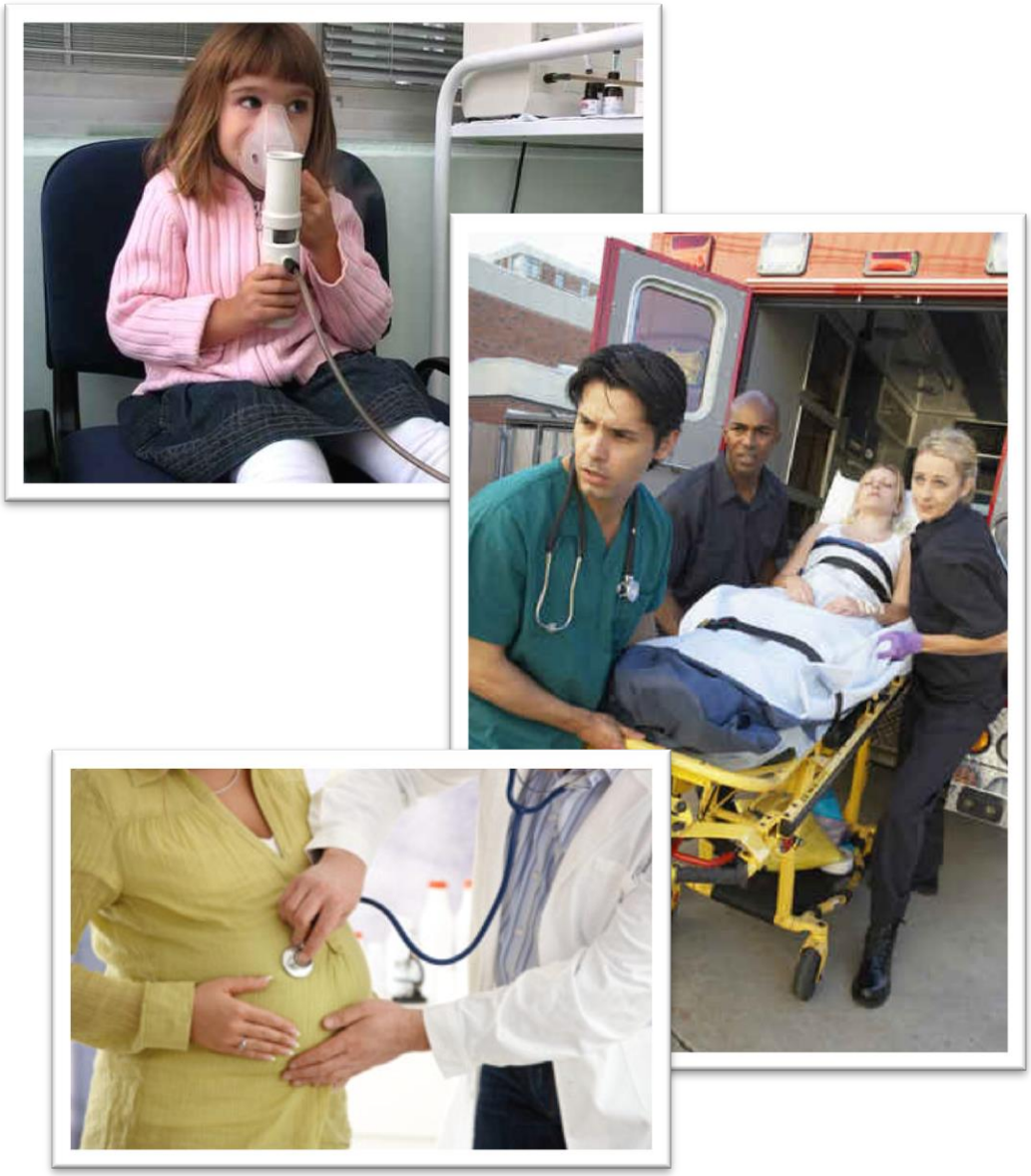

- Reduced lung function
- Heart attacks
- Strokes
- Premature death
- Cancer

Health Effects in Children

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- Pre-term birth
- Low birth weights
- Early pneumonia and bronchitis
- Possibly fetal/infant mortality
- Reduced lung function
- Asthma attacks

Recent studies showing associations in children, but not well studied

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- Diabetes
- Obesity
- Autism
- Reaction time

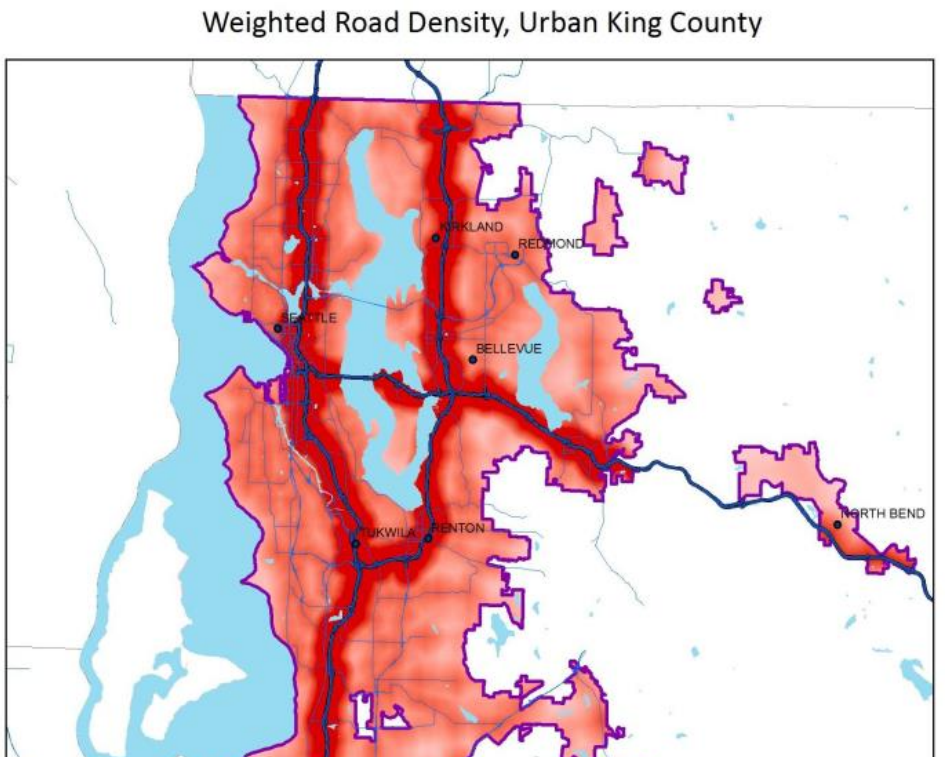
No “one size fits all” answers

- **Too many issues to count comparing studies**

- **Examples:**
  - **Health response lags (1 day, 1 week, 1 month)**
  - **Defining length of “long-term exposures”**
  - **Different fleet ages or engine types (new trucks, European vs Canadian vs US trucks, etc)**
  - **Multi-pollutant corrections**

Obvious confounders

Low-income and minorities generally closer to traffic volume



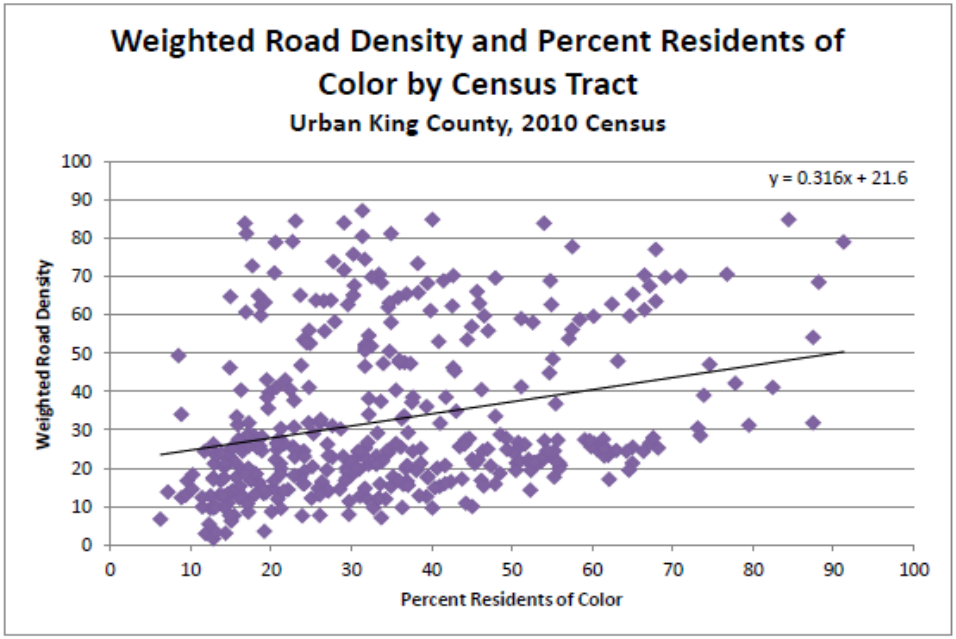


Figure 7. Weighted road density and percent residents of color by census tract, urban King County, 2010 census

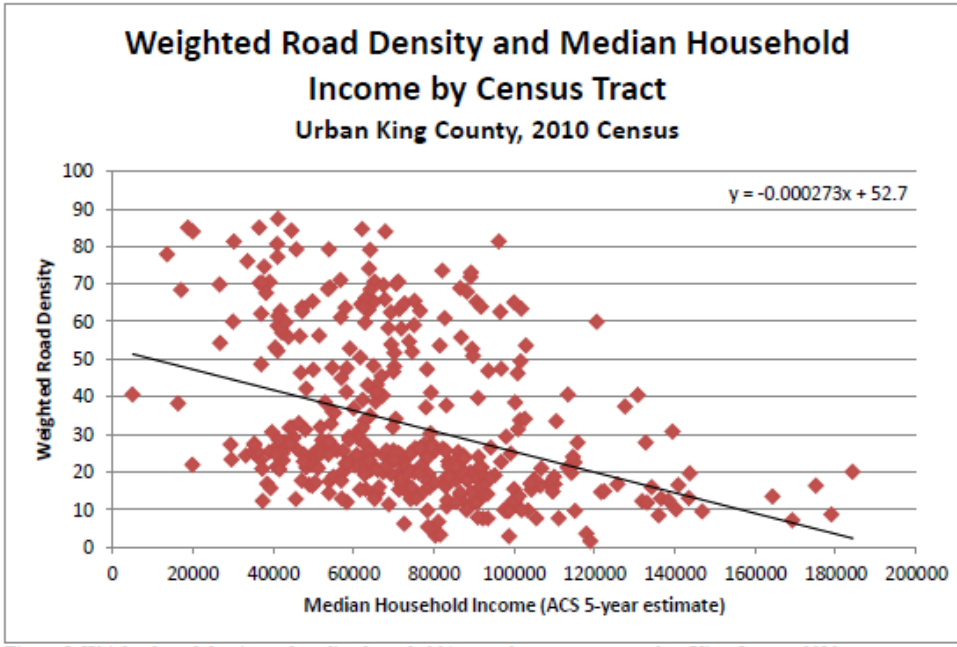
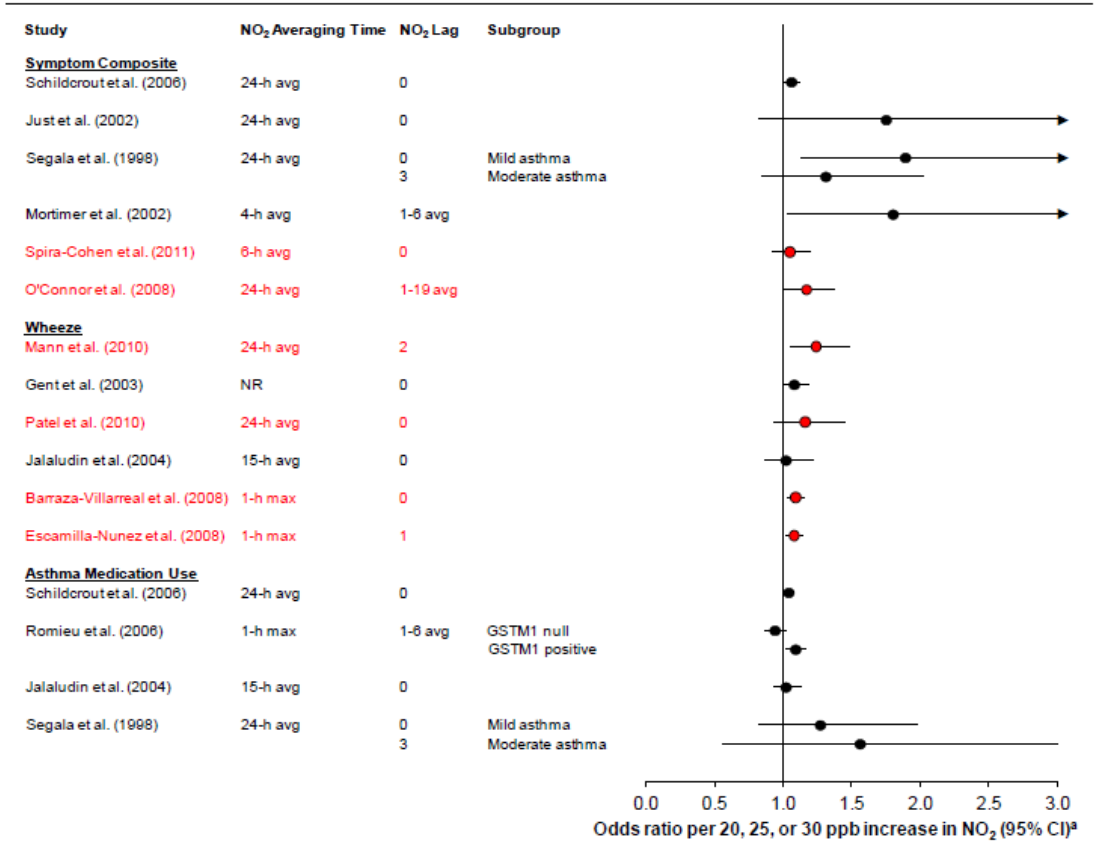


Figure 5. Weighted road density and median household income by census tract, urban King County, 2010 census.

Magnitude of risks

- **Example, asthma symptoms in children:**



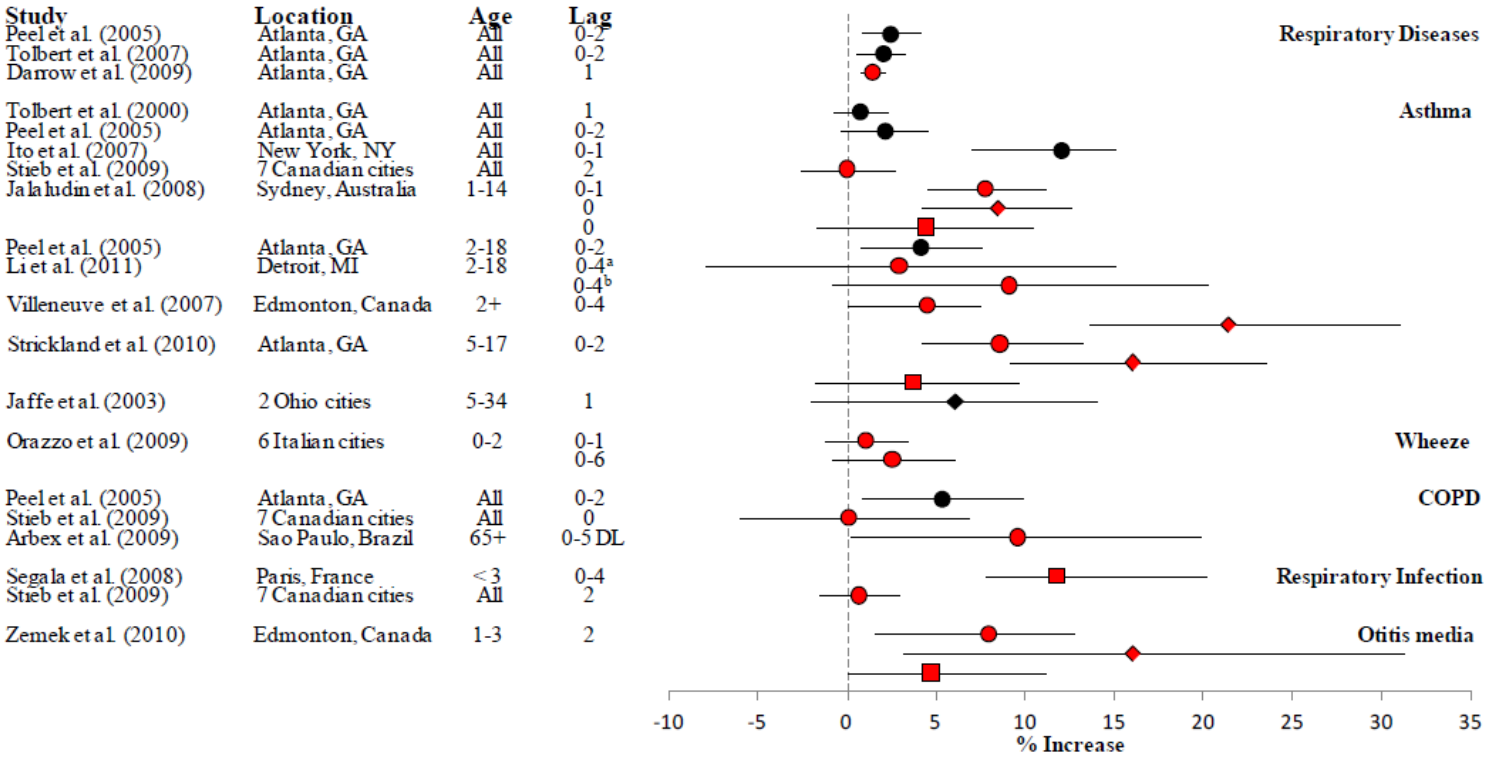
Note: Studies are presented in order of decreasing study strength (e.g., exposure assessment method, potential confounding considered). Red=recent studies, Black=previous studies. Study details and quantitative results are reported in Table 4-18.

[a]Effect estimates are standardized to a 20-ppb increase for 24-h avg or 15-h avg NO_2, 25 ppb for 4-h avg, 6-h avg or 8-h max NO_2, and 30 ppb for 1-h max NO_2.

Figure 4-3 **Associations of ambient NO_2 concentrations with respiratory symptoms and asthma medication use in children with asthma.**

Source: Draft 2013 EPA NO_2 Integrated Assessment

Respiratory emergency visits



Note: Black = U.S. and Canadian studies from the 2008 ISA for Oxides of Nitrogen, Red = recent studies. Circles = all-year, Diamonds = summer/warm, and Squares = winter/cold. a = time-series analysis results; and b = case-crossover analysis results.

Figure 4-9 **Percent increase in respiratory-related ED visits for a 20-ppb increase in 24-h avg or 30-ppb increase in 1-h max NO_2 concentrations from U.S. and Canadian studies evaluated in the 2008 ISA for Oxides of Nitrogen and recent studies in all-year and seasonal analyses.**

Source: Draft 2013 EPA NO_2 Integrated Assessment

How close is too close?

- **“Depends”, but ranges from 200 to 500 meters depending on studied health outcome and pollutant**

Karner et al 2010

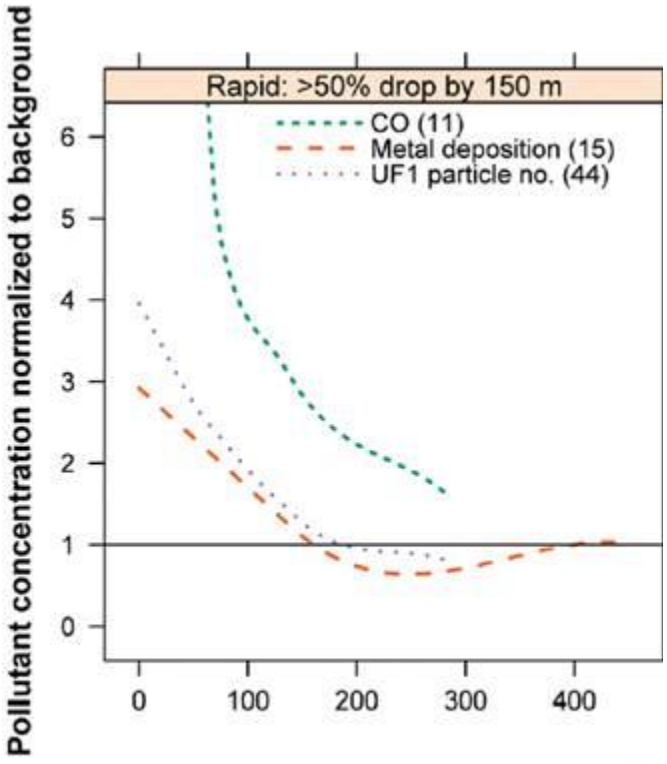
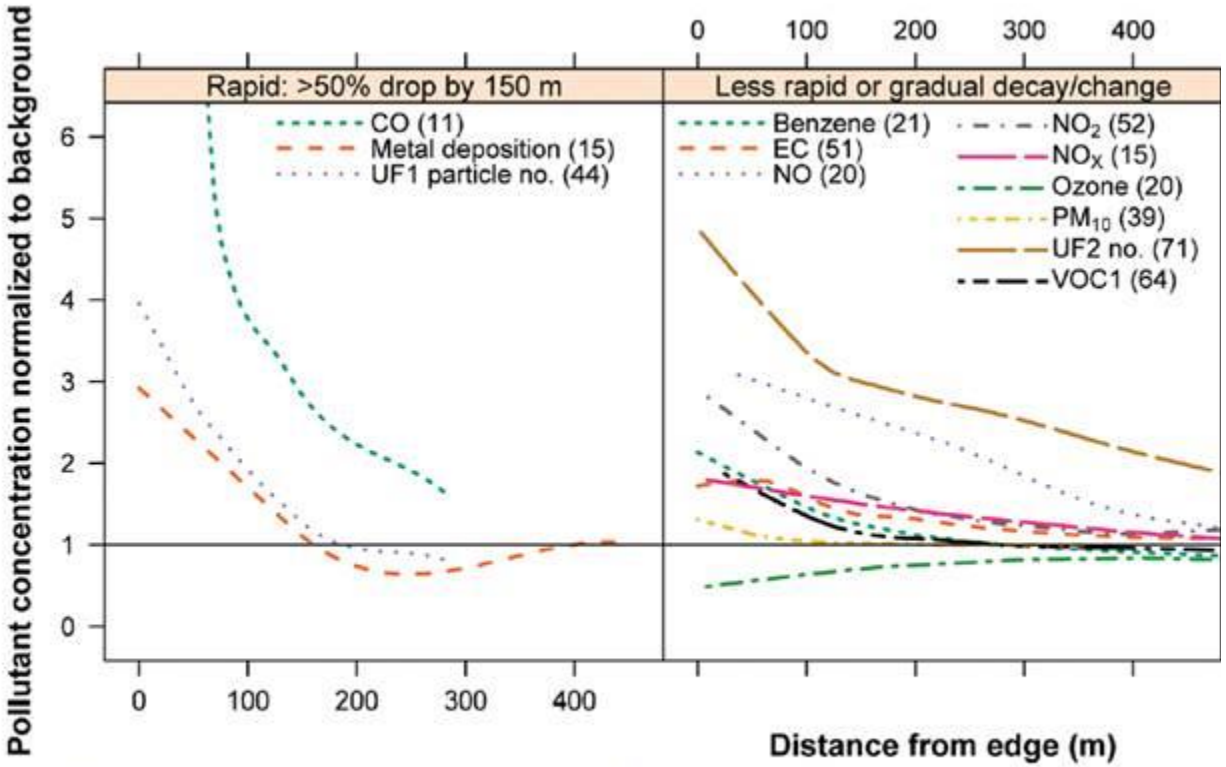


FIGURE 2. Local regression of background normalized concentrations on distance. The horizontal line indicates background concentration. A loess smoother (alpha =0.75, degree =1) is fitted to each pollutant which is placed into one of three groups. The regression sample size, n, is given in parentheses after each pollutant.

Karner et al 2010



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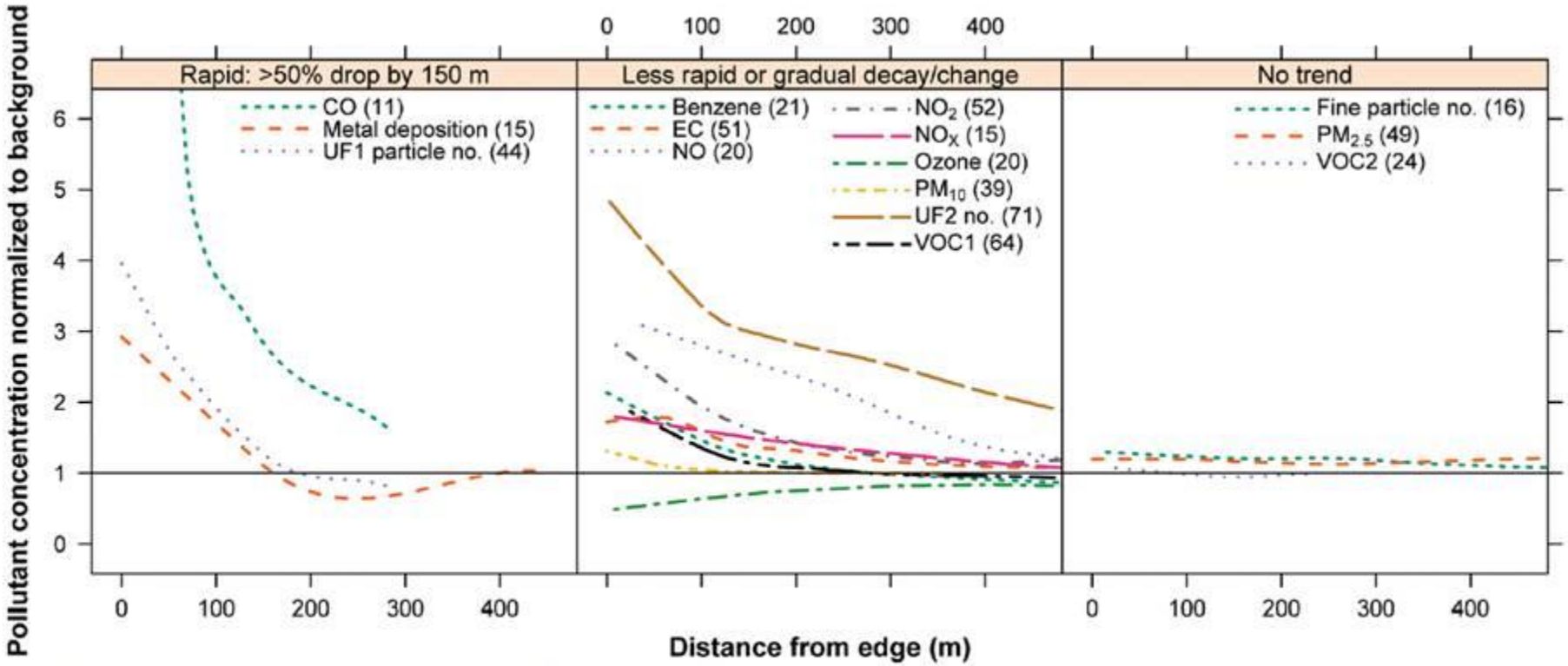
Karner et al 2010



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Our pilot study last fall

Fall 2014

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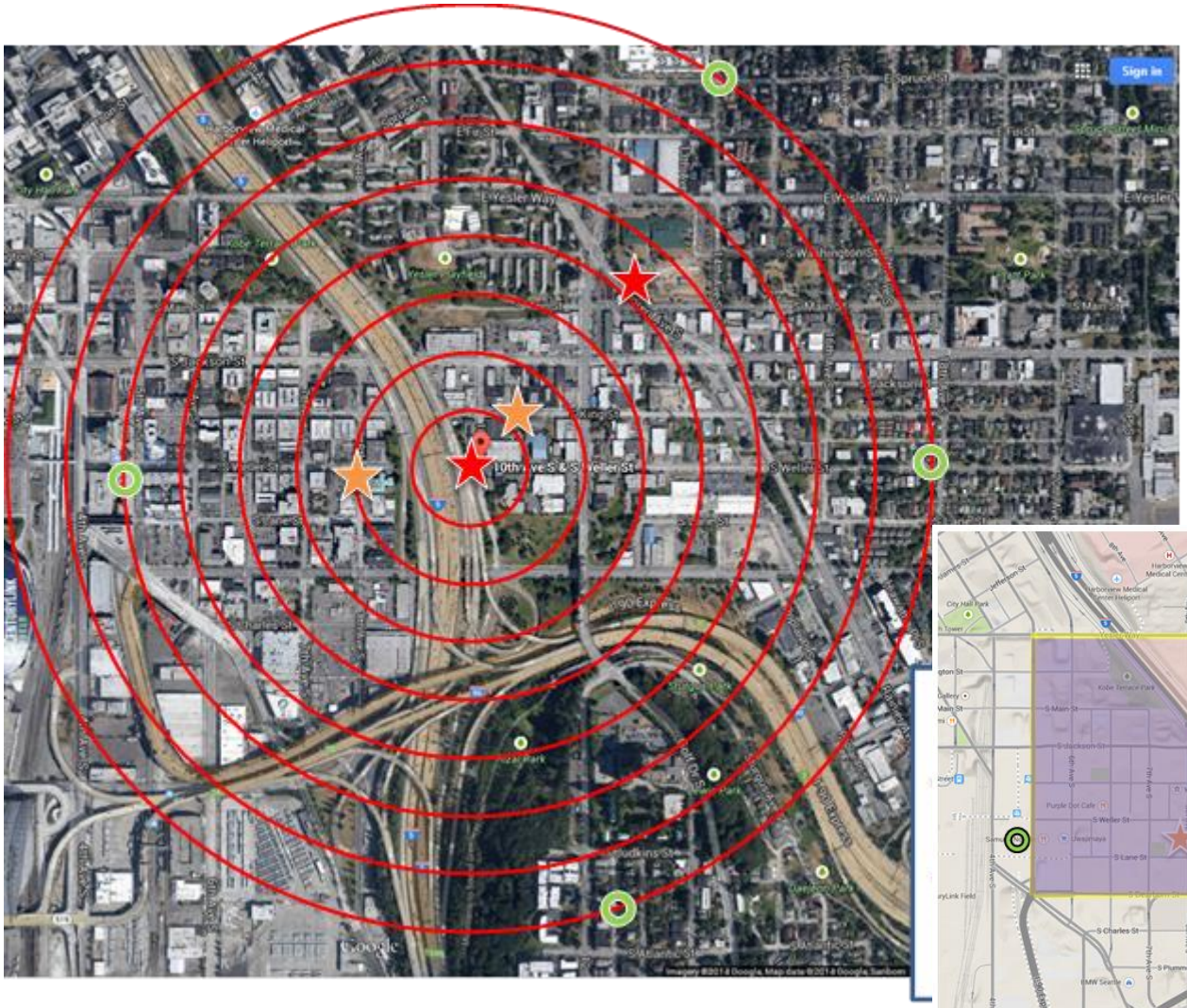

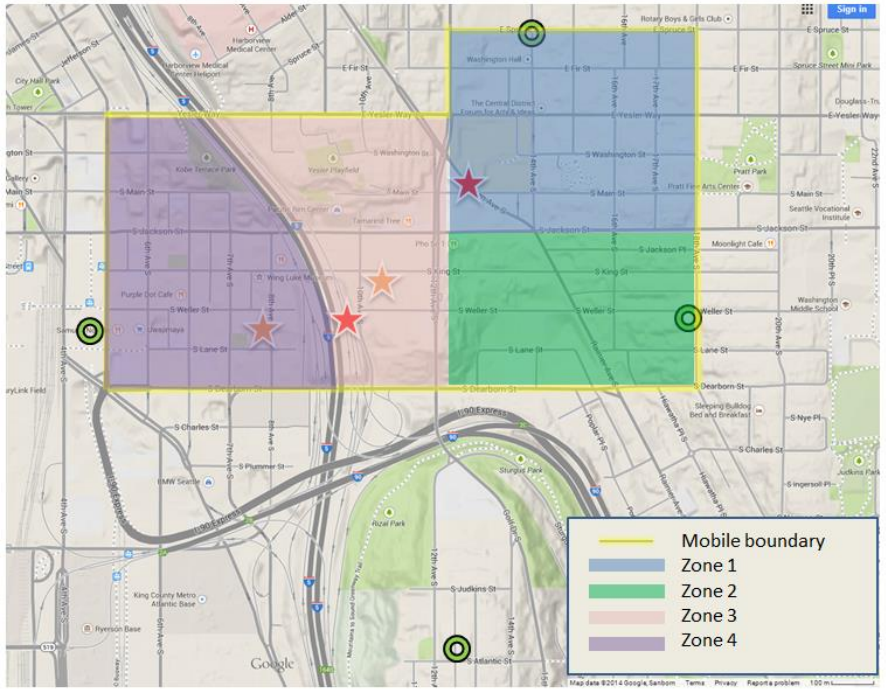

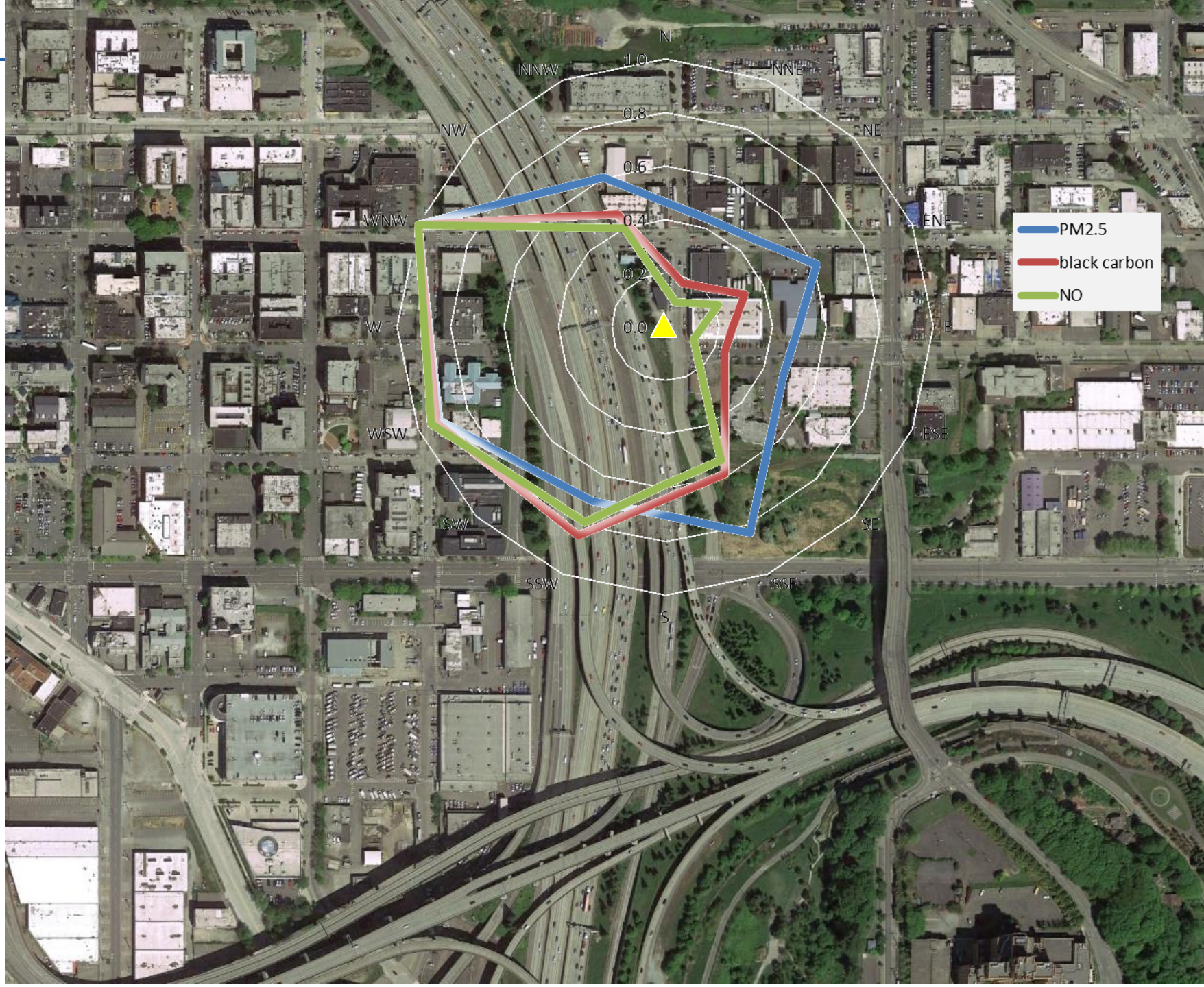
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PM2.5
black carbon
NO

Pollution vs Distance to major traffic

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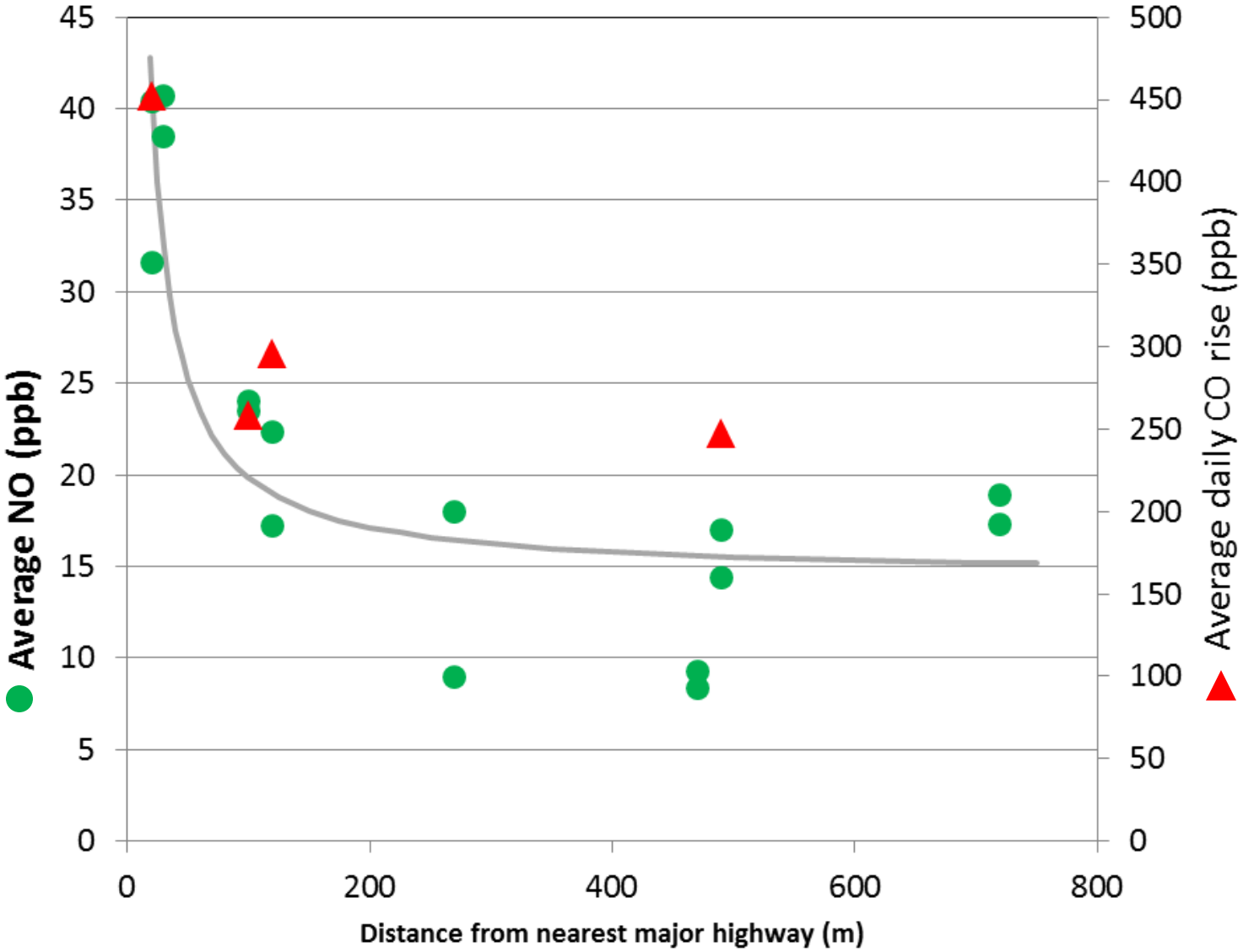

New map coming soon!
Washington Tracking Network (DOH)

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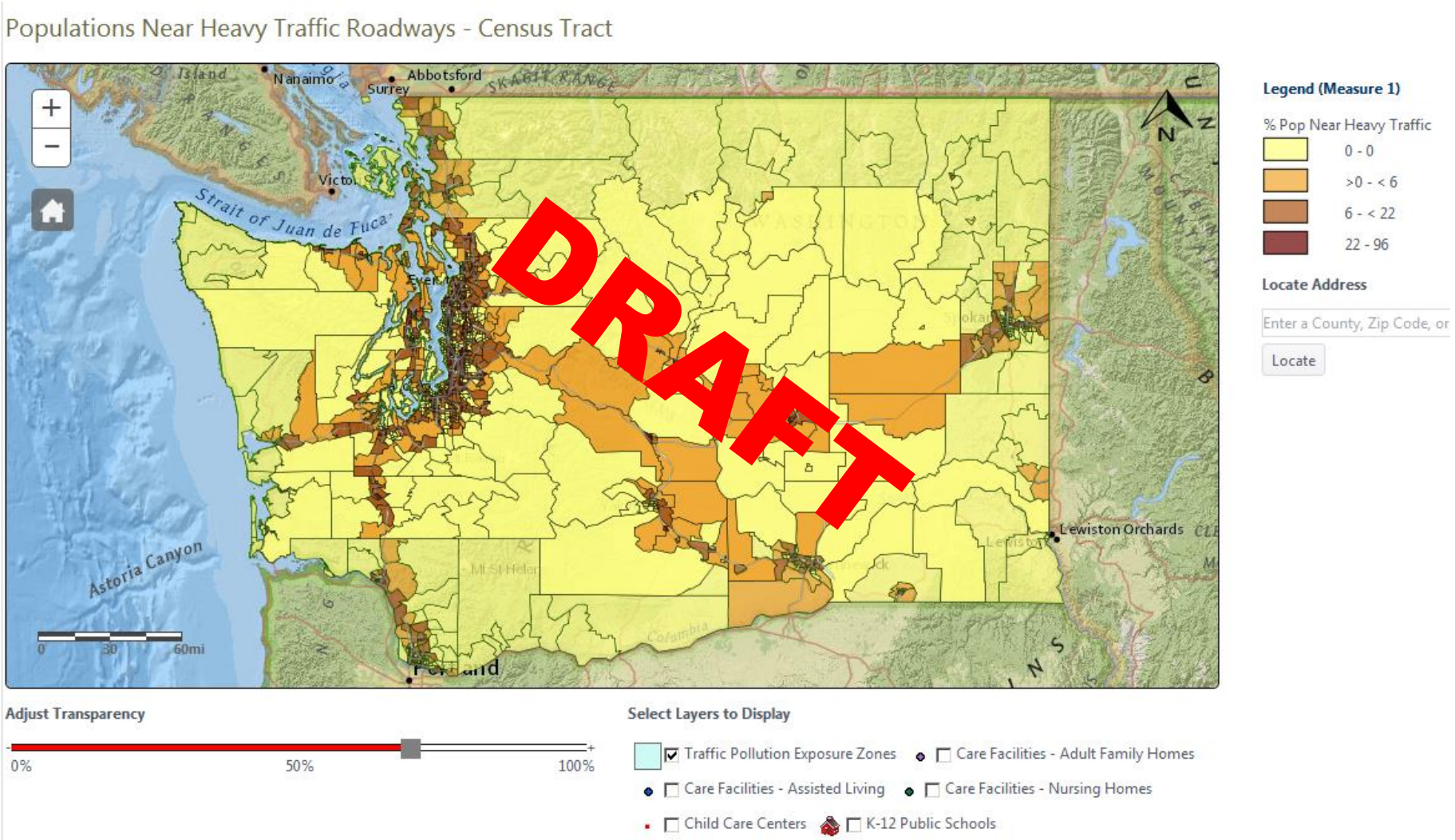
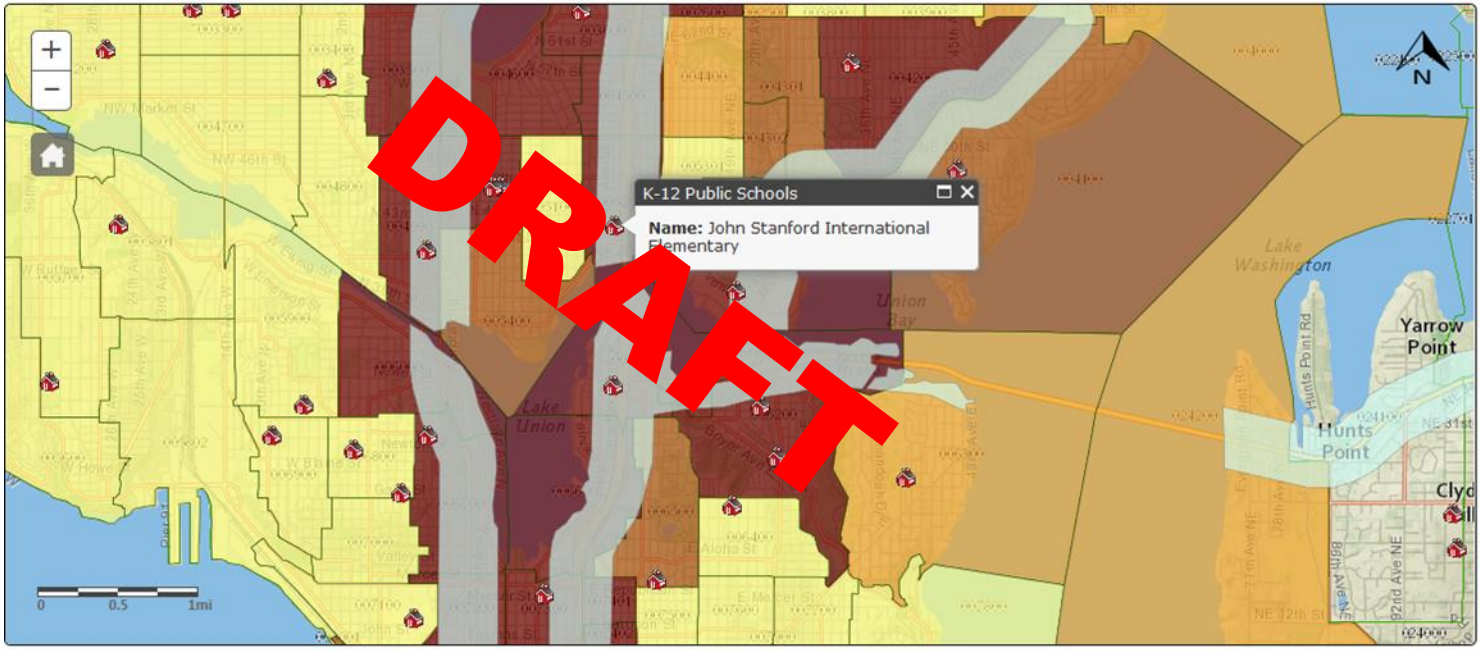


Measure 1

Populations Near Heavy Traffic Roadways - Census Tract



Legend (Measure 1)

% Pop Near Heavy Traffic

- 0 - 0
- >0 - < 6
- 6 - < 22
- 22 - 96

Locate Address

Enter a County, Zip Code, or Address

Locate

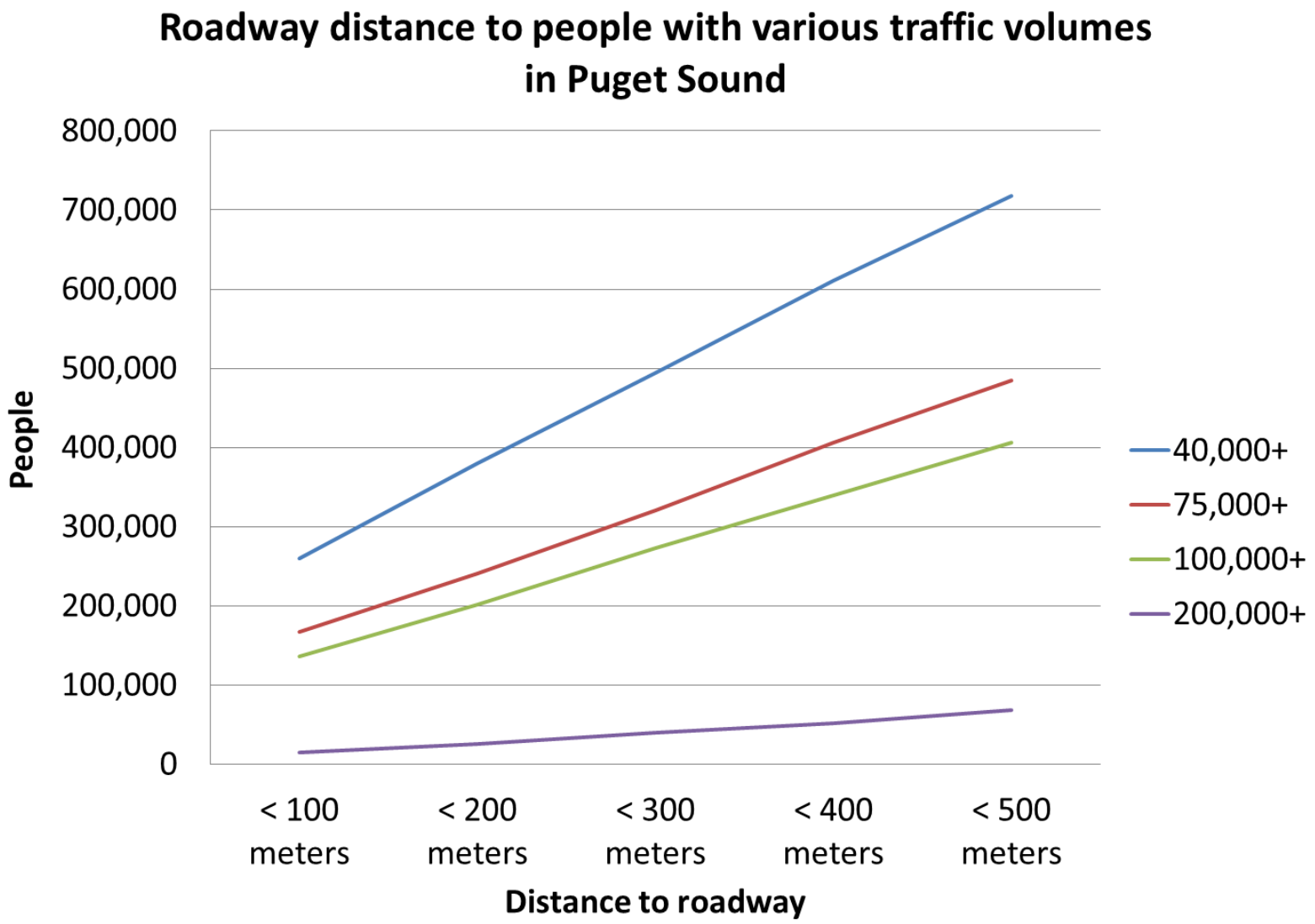
Adjust Transparency

0% 50% 100%

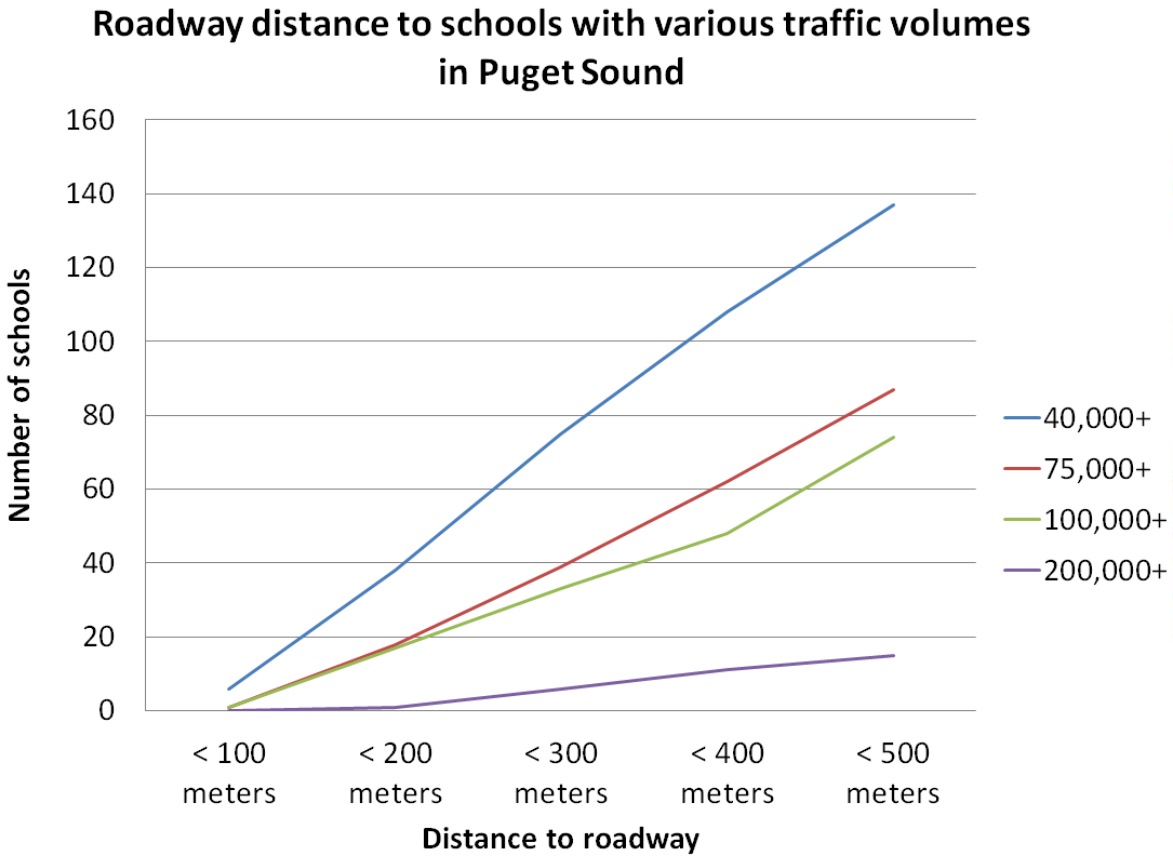
Select Layers to Display

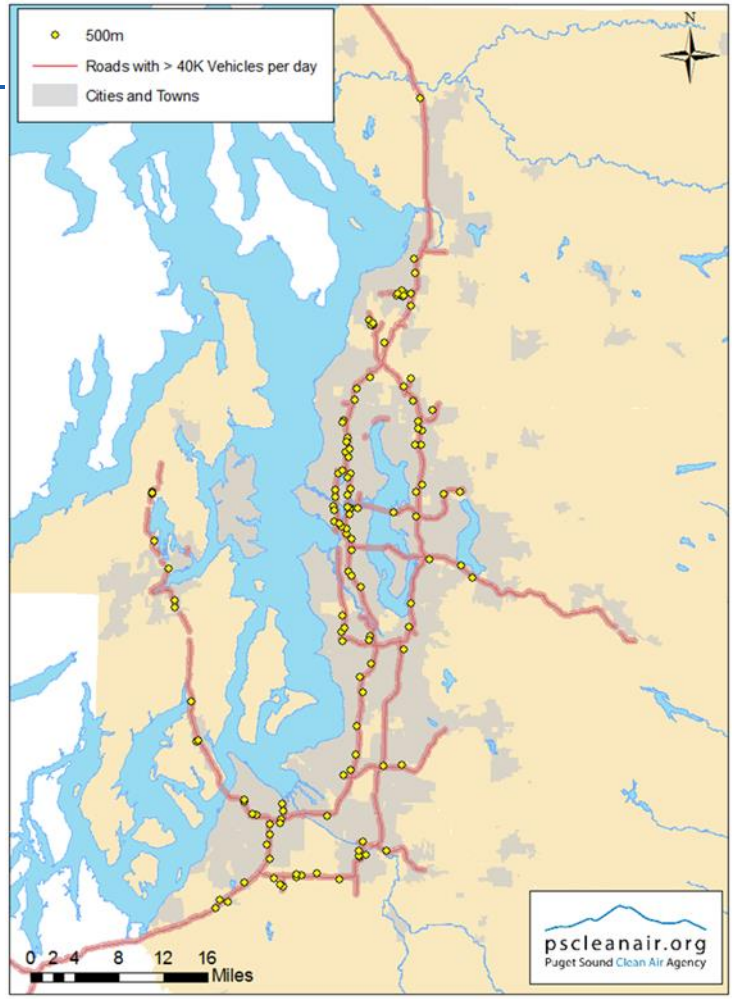
- ☑ Traffic Pollution Exposure Zones
- ☐ Care Facilities - Adult Family Homes
- ☐ Care Facilities - Assisted Living
- ☐ Care Facilities - Nursing Homes
- ☐ Child Care Centers
- ☑ K-12 Public Schools

Populations



Schools and daycares





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Press attention to schools near roads

- http://www.invw.org/article/exhaust-diesel-fumes-foul-1379
- http://www.invw.org/project/exhausted-at-school
- http://www.invw.org/article/king-5-investigators-cali-1400
- http://www.invw.org/article/officials-in-olympia-dc-d-1392

Future Trends

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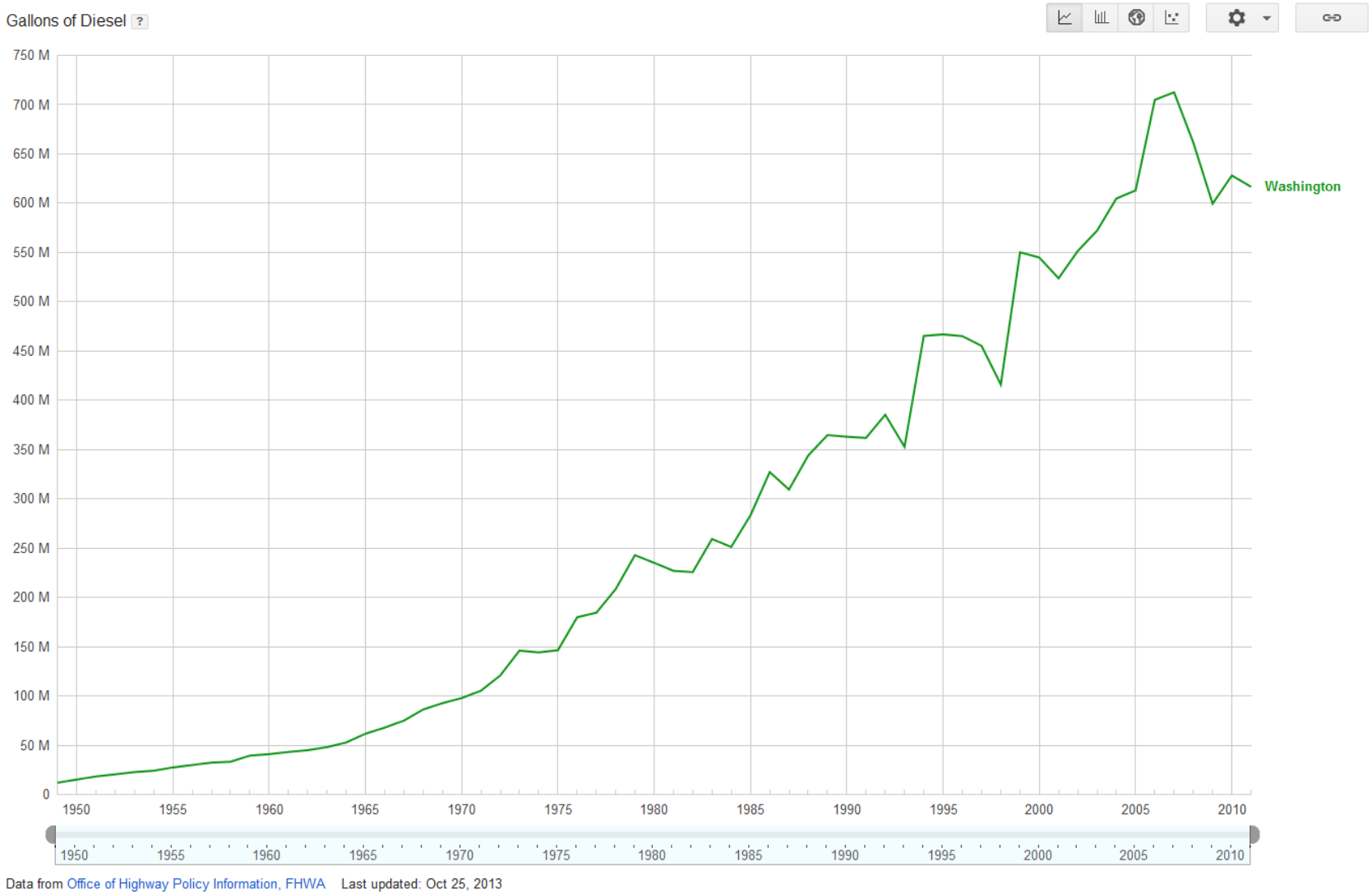
Gallons of Truck Diesel Burned in WA



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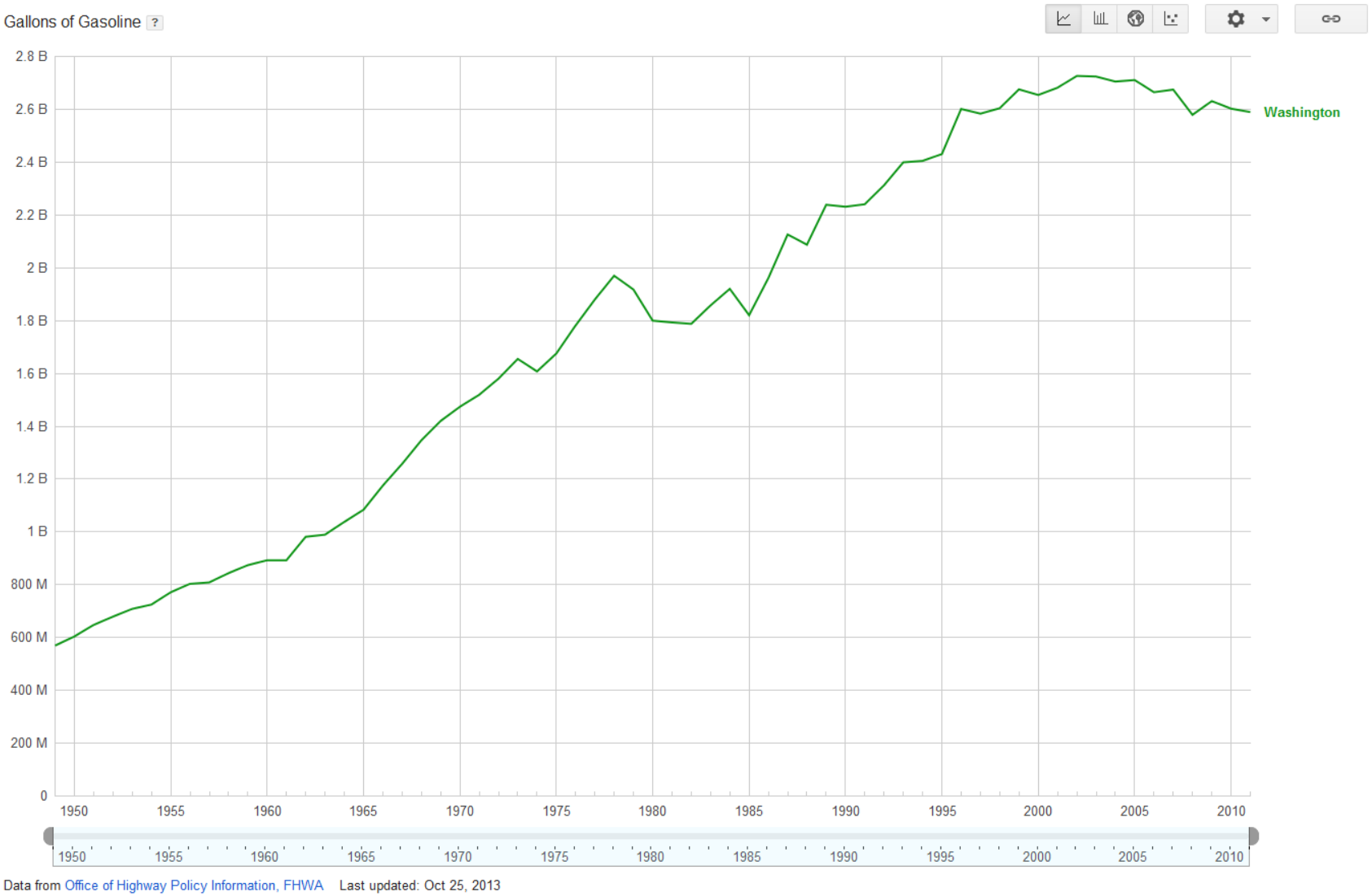
Gallons of gas attributed to highway use



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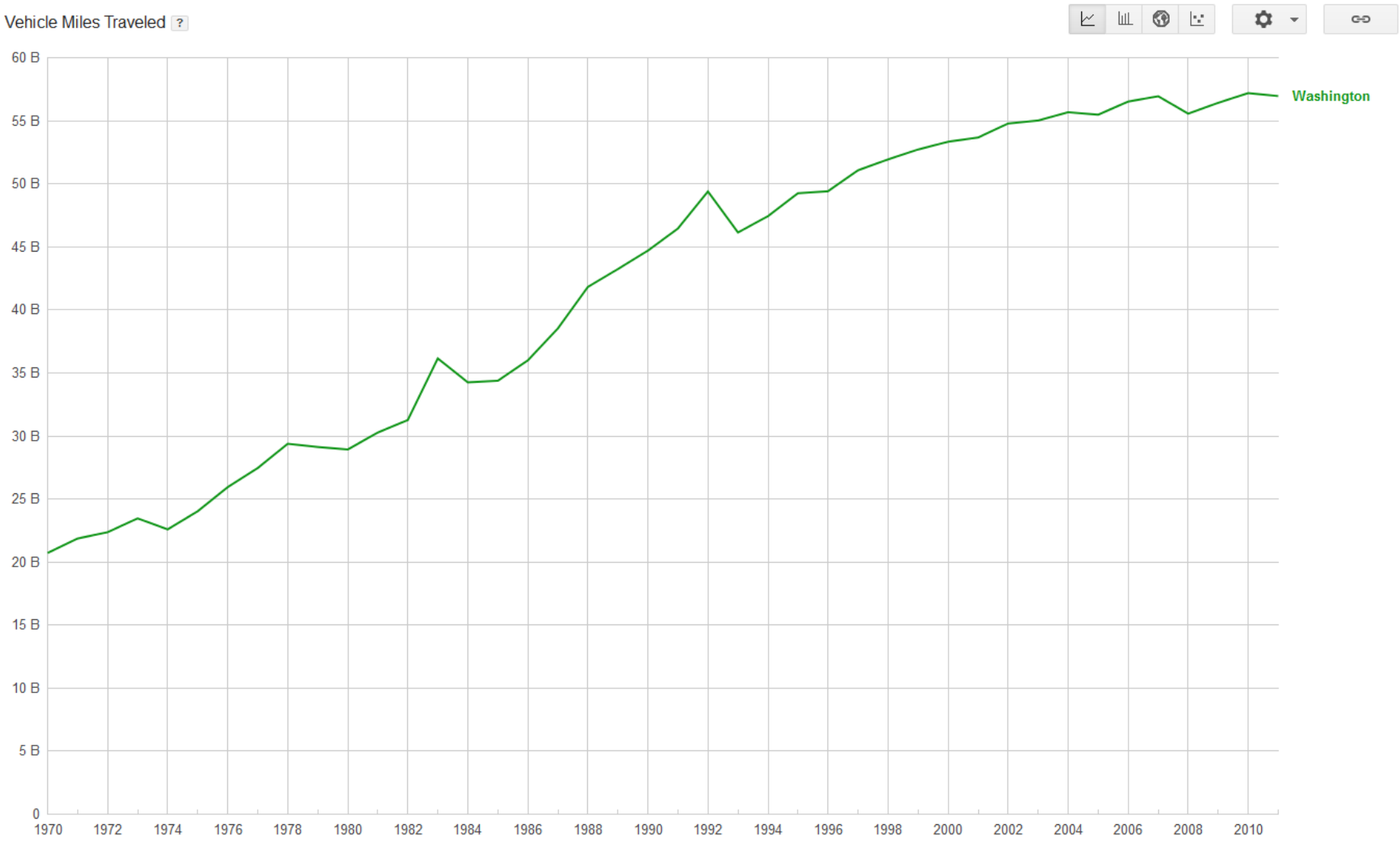
WA Vehicle Miles Traveled



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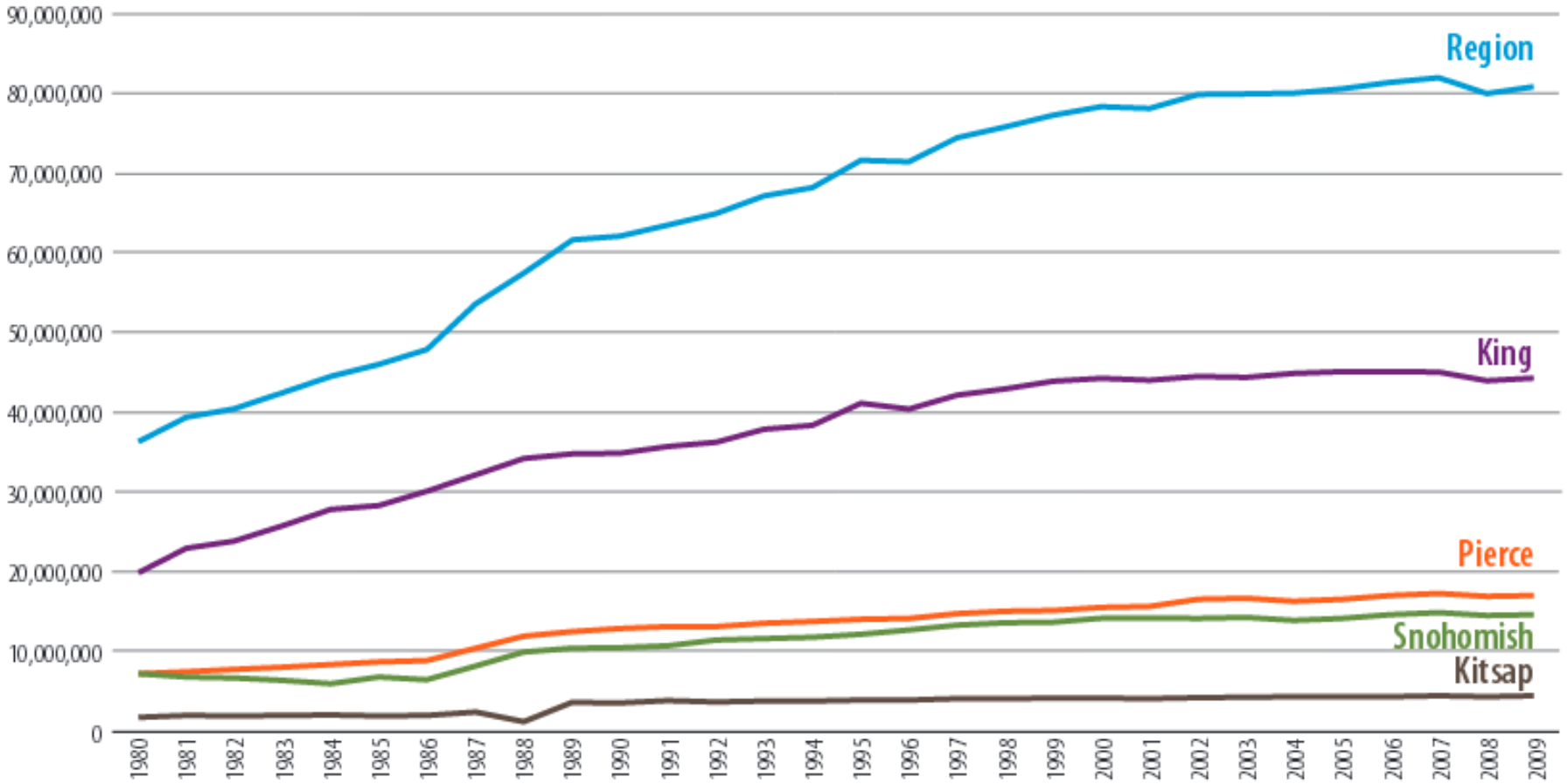
Puget Sound vehicle miles flat

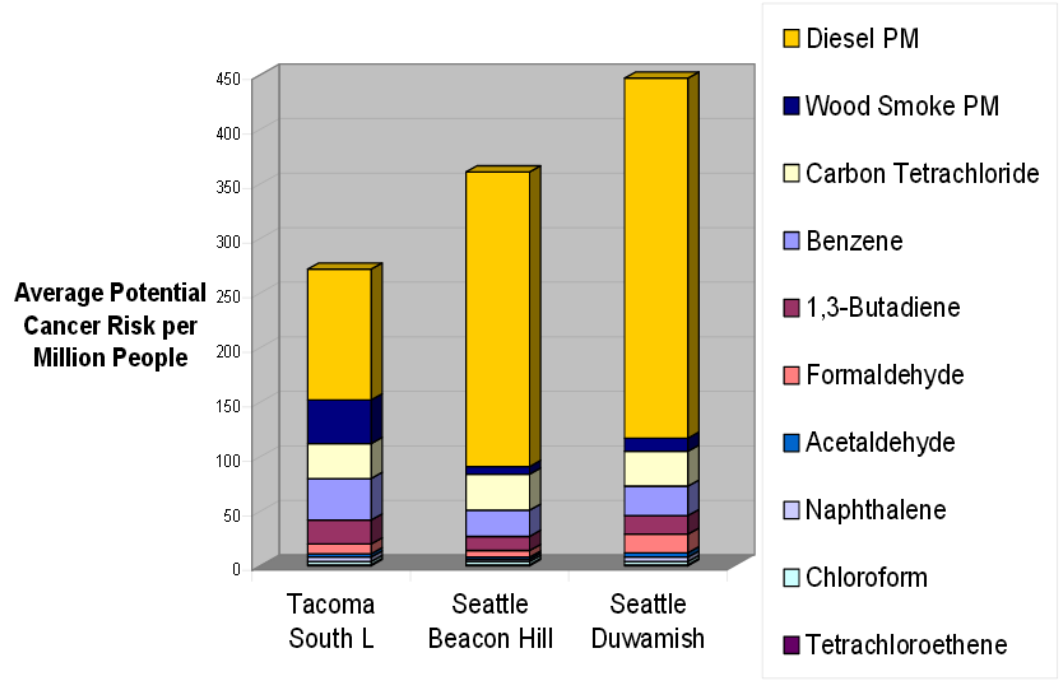
Figure 1. Daily VMT by County



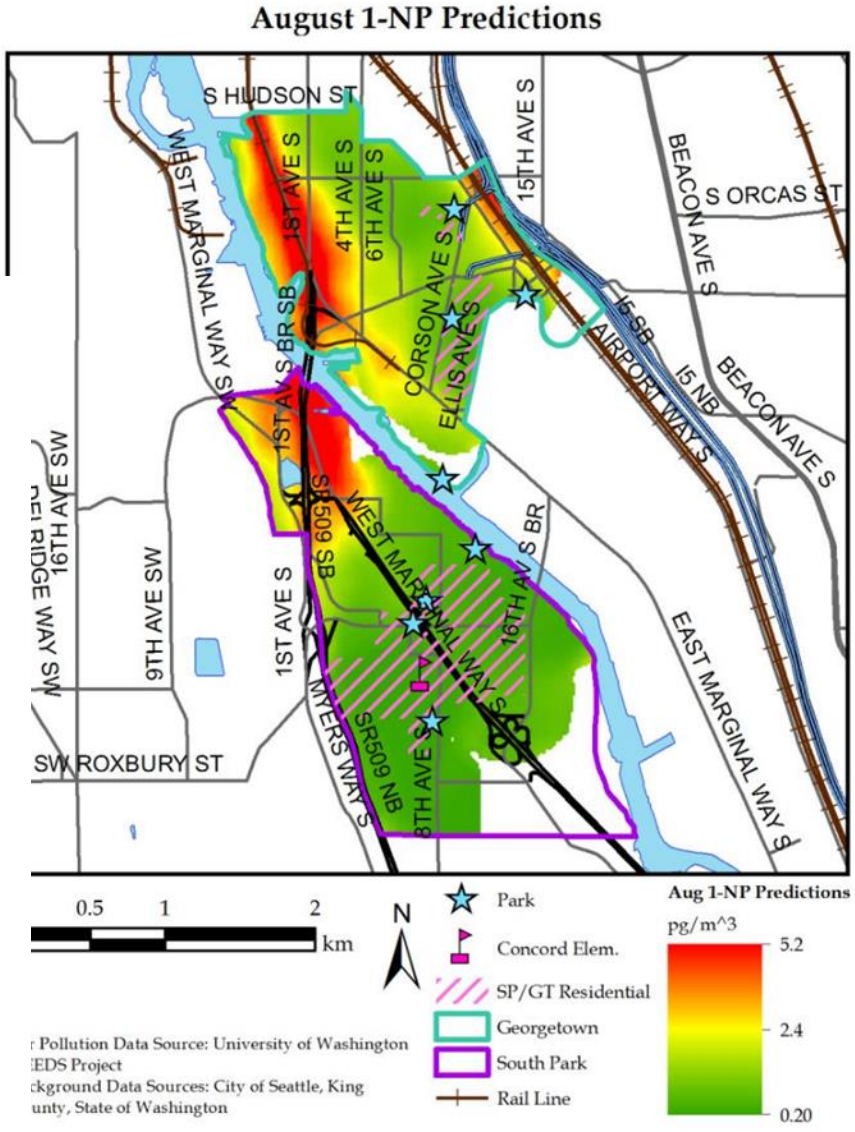
Diesel – cancer risk

- **UW DEEDS (2013)**
- **PSCAA/UW (2010)**

Figure B: Potential Cancer Risks with Diesel and Wood Smoke



Diesel and wood smoke particulate matter results are based on recent estimates from other studies.[2, 3]



Reducing Diesel Exhaust

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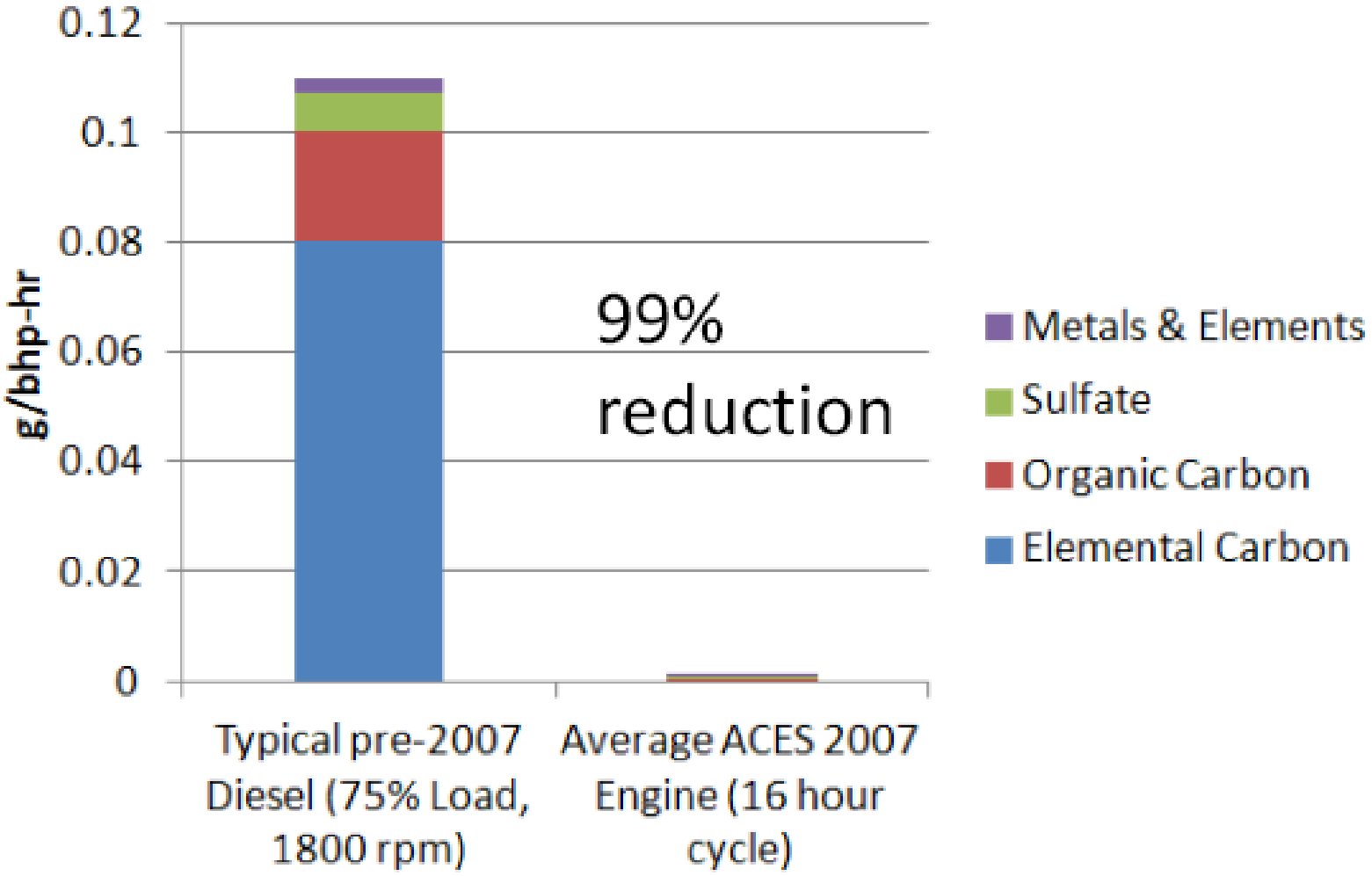
- **Northwest Ports Clean Air Strategy**

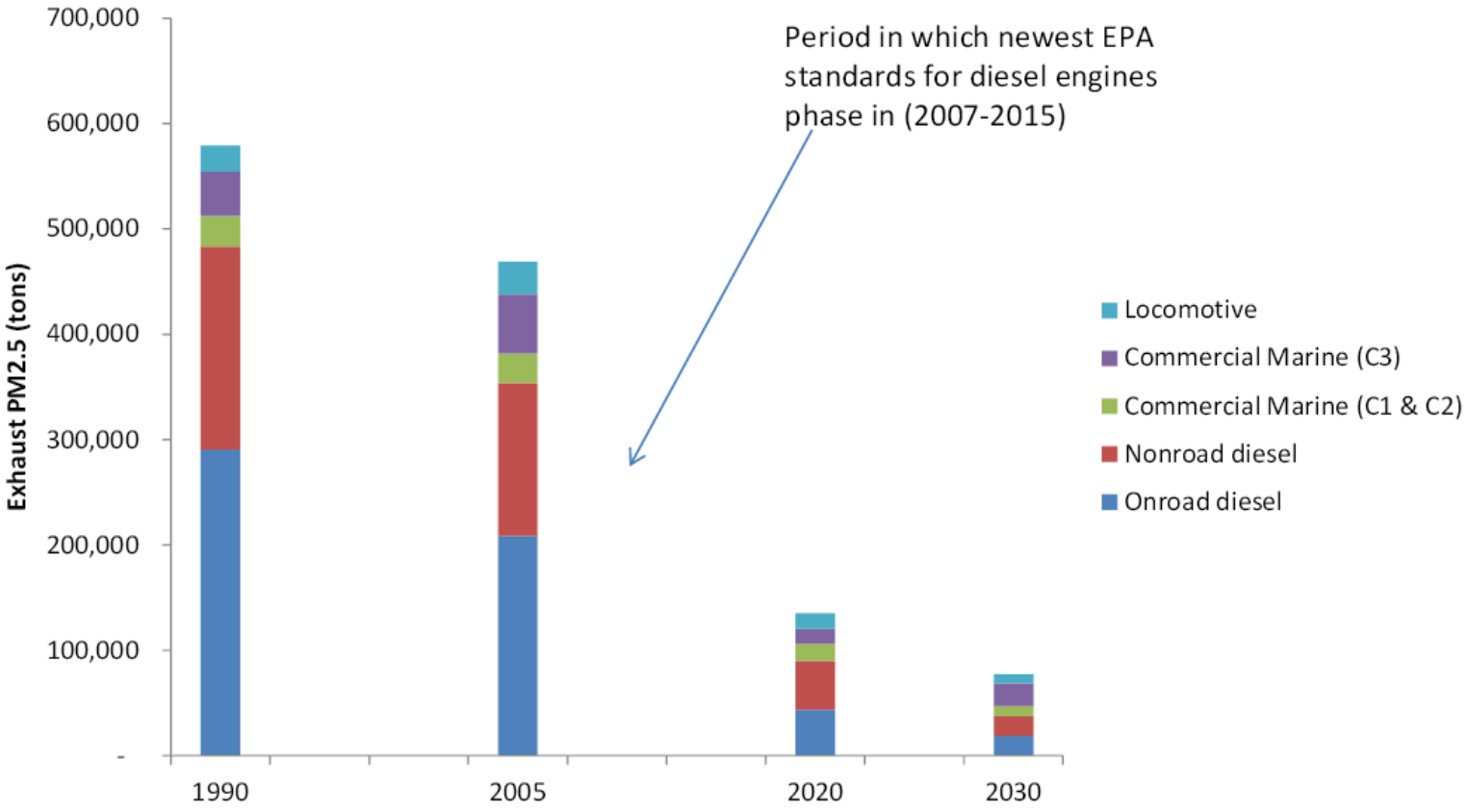
- **Diesel Solutions**
  - **ABC fuel program**
  - **ScRAPS**
  - **Retrofits**

New technology improvements



New technology improvements

Diesel $PM_{2.5}$ Emission Trends



Latest HEI publication

- **Newest diesel trucks show no lung cancer in mice**

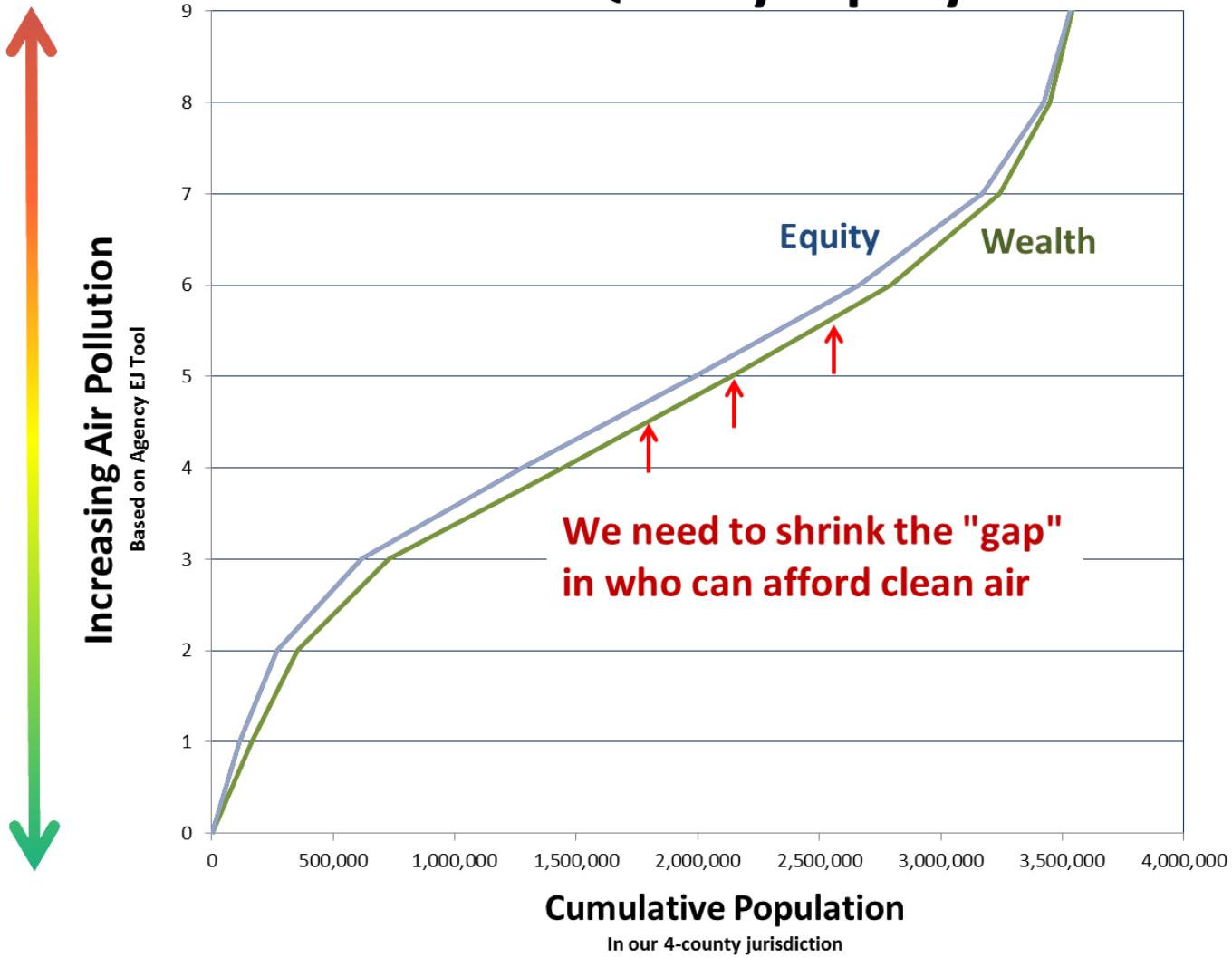
Health Effects Institute
101 Federal Street
Suite 500
Boston MA 02110-1817 USA
+1-617-488-2300
FAX+1-617-488-2335
www.healtheffects.org

FOR RELEASE TUESDAY, JANUARY 27, 2015
For More Information: Dan Greenbaum dgreenbaum@healtheffects.org; +1 617 488 2331

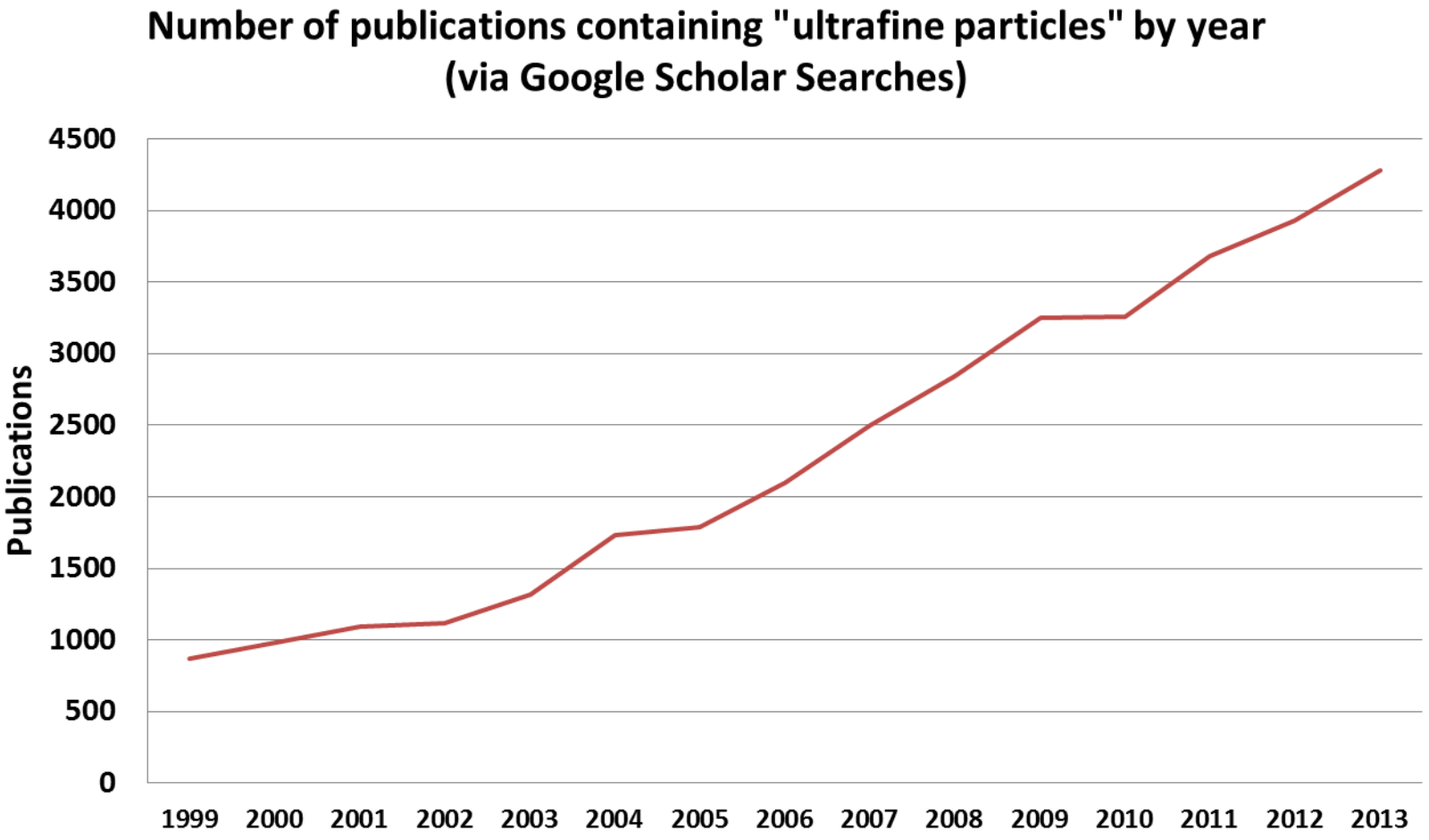
STUDY OF LIFETIME ANIMAL EXPOSURE TO NEW TECHNOLOGY DIESEL ENGINE EXHAUST FINDS NO LUNG CANCER

(Boston, January 27. 2015) The first study to conduct a comprehensive evaluation of lifetime exposure to new technology diesel exhaust (NTDE) has found no evidence of carcinogenic lung tumors. The Advanced Collaborative Emissions Study (ACES), issued today by the Health Effects Institute (HEI)[1] also confirmed that the concentrations of particulate matter and toxic air pollutants emitted from NTDE are more than 90% lower than emissions from traditional older diesel engines (TDE).

Air Quality Equity



UFPs are also not well understood



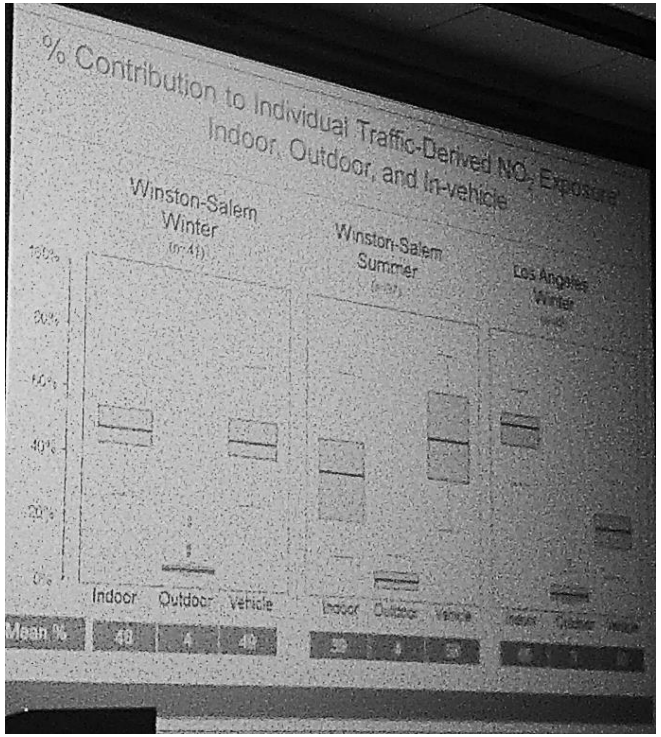
More to learn

"Relatively few studies have directly compared UFPs with other particle size fractions. These factors constrain our ability to draw definitive conclusions about the specific consequences of exposure to UFPs."

Exposure – where do people breathe?

- Studies show time in vehicle is large part

- Generally less exposure from time spent outdoors



How to reduce exposure

Mitigation

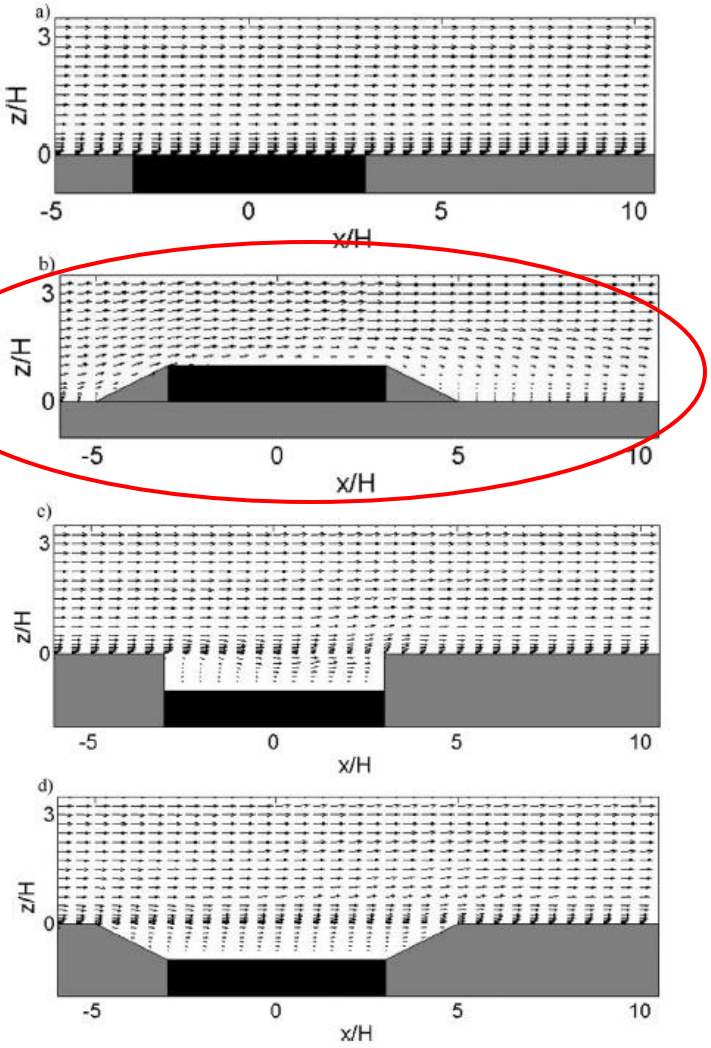
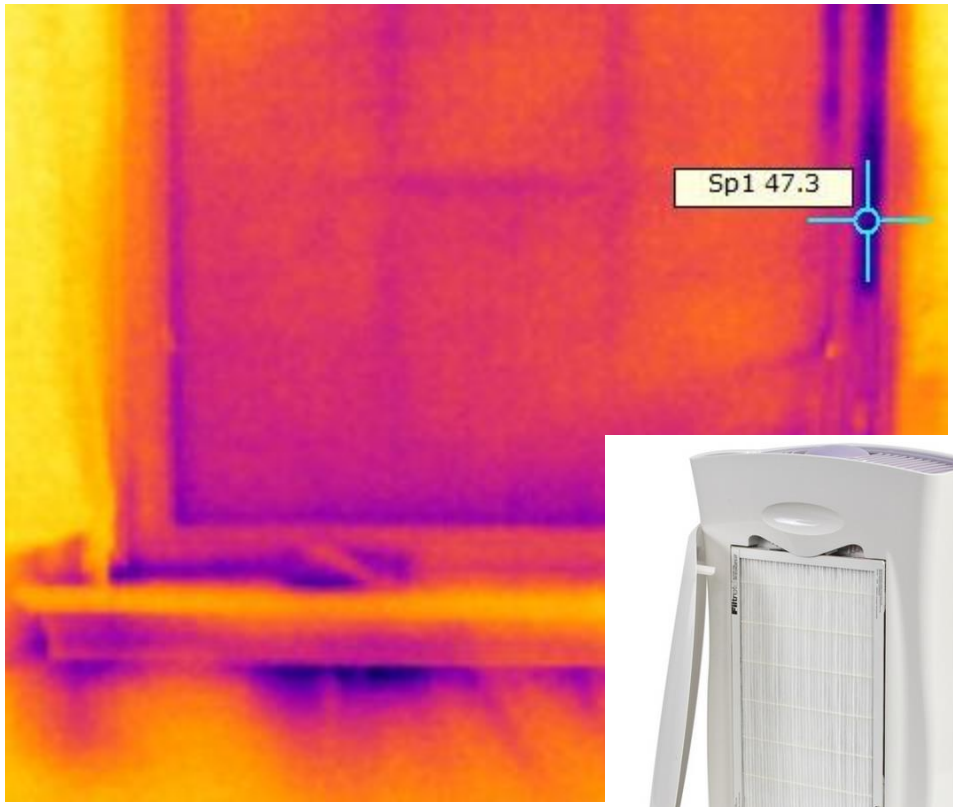


Fig. 3. Velocity vectors for a) Case A (level), b) Case B (elevated), c) Case C (depressed with straight edges), and d) Case E (depressed with angled edges). Origin is found in the center of the roadway at ground level, with the roadway extending from x/H = −3 to +3.

J.T. Steffens et al. / Atmospheric Environment 94 (2014) 74–85



How to reduce air pollution risk

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- Limit time spent near idling cars and trucks
- Review air quality forecasts before strenuous activities
- Continue to exercise outdoors, especially around midday
- Limit strenuous activities when air pollution is high
- Recycle the air in your car when on busy roads
- Continue to open windows in your home freely
- Consider purchasing a portable HEPA filtration unit for your home and replace your filters every three months

Questions?

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Erik Saganic

eriks@pscleanair.org, 206-689-4003

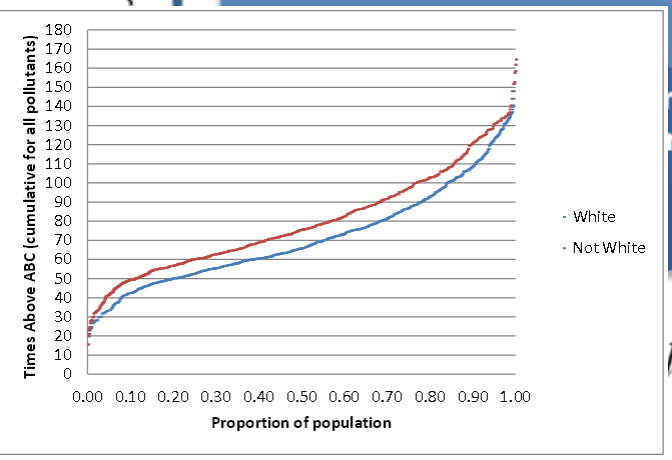
Portland

Disproportionate impact from all sources:

Higher → Lower

Higher Disproportionate impact by sour

Hispanic/Latino	Asian	African American/Black	Below Poverty
Residential Wood Burning	Cars and Trucks	Commercial Solvent and Fuel Use	Cars and Trucks
Construction and Non-Road Engines	Construction and Non-Road Engines	Construction and Non-Road Engines	Commercial Solvent and Fuel Use
Cars and Trucks	Residential Wood Combustion		
	mercial Solvent nd Fuel Use		



low income air toxics