

Relative risks in best spatial epidemiology studies on high mobile pollution exposures at residence:

Cardiovascular deaths - **50% + higher (solid)**

Lung cancer deaths - **50% + higher (solid)**

Childhood asthma - **50% + higher (solid)**

Childhood autism - **100% + higher (emerging)**

Direct traffic exposures (small acute studies):

Heart attacks - **3X higher** - but cyclists - **4X higher**

Cyclist dose - **4X to 6X higher** due to ventilation

EKG ST segment depression - **2X higher** - oxygen crisis in heart

Rapid cardiovascular signaling due to **diesel emissions particulates DEP**

Air toxics and garden vegetables:

Aerial plant to root PAH ratio - **4X to 6X higher**

I93 on berm

R38 at grade

Cardiovascular Disease and Lung Cancer relative risks appear to be similar for truck industry workers, diesel rail engineers and near highway residents - these elevated risks are not driven by PM2.5 mass, but may be driven by UFP

PM2.5 Particles <= 2.5 micrometers diameter

UFP Particles <= 100 nanometers diameter

PAH Polycyclic aromatic hydrocarbons

Any Questions? wigzamore@gmail.com

STEP www.somervillestep.org

CAFEH <http://sites.tufts.edu/cafeh/>

Please see New CAFEH Report - Improving Health in Communities Near Highways

Individual Exposure is determined by:

How big is the source - e.g., vehicles per day

Meteorology - sun, wind, temperature, etc.

Built or geographic ... protection or traps

How close are you, how many hours per day

Time activity, ventilation and metabolic rates

Work remains to refine these engineering / design elements that can be used for charrette focus.

Please see new CAFEH New Report: [Improving Health in Communities Near Highways](#)

All of the following are engineering tactics:

- Residential and school HEPA filtration and other protective building systems
 - 90 to 95% reductions possible, maybe 80% after human behavior included
- Air intake locations could be chosen more carefully
 - Good idea but little good quantification in literature
- Sound proofing through extra window glazing, insulation and other features
 - Large reductions possible as seen in FAA noise proofing

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All of the following are design tactics with potentially strong co-benefits:

- Land use buffers ala California ARB Handbook – distance between sources and receptors
 - 50% or greater exposure reductions from 500 foot buffers for sensitive uses
- Vegetation or built wall barriers to absorb or block pollution
 - 10 to 25% reductions possible, especially with height, but geometric trade-offs are complex
- Street trees, hedges and pleasant vegetation
 - -25 to +25% increases / reductions but also heat island and green space co-benefits
- Decking over of highways to link urban areas and block pollution
 - 20 to 50% reductions (rough est.) of long term urban design as in Back Bay, Freeway Park, etc.
- Urban design such as healthy placement of buildings and open space
 - 10 to 25% reductions (est.) but not much literature, site planning used by San Francisco
- Garden locations, including healthy vegetables
 - Small but strong literature, including from mainland China, about near highway air toxins
- Park locations for active recreation and for susceptible people
 - Important due to human ventilation, susceptible populations – children, seniors, co-benefits
- Active travel locations, including bicycling and walking paths (reductions of 50% possible)
 - Important because of human ventilation rates which yield high effective biological doses