Community Action to Promote Healthy Environments (CAPHE): Community Academic Partnership to Improve Air Quality in Detroit

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AMERICAN PUBLIC HEALTH ASSOCIATION MEETING

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5. Southwest Detroit Community Benefits Coalition

PRESENTER DISCLOSURE

Amy Schulz & Angie Reyes (Co-Presenters)

The following personal financial relationships with commercial interests relevant to this presentation existed in the past twelve (12) months:

NO RELATIONSHIPS TO DISCLOSE

PRESENTER DISCLOSURE

Amy Schulz & Angie Reyes (Co-Presenters)

Our presentation will include discussion of the "off-label" use of the following:

NO RELATIONSHIPS TO DISCLOSE

Partner Organizations & Partnerships

Community Action to Promote Healthy Environments CA-PHE — Working Together to Improve Detroit's Air

Detroit Community - Academic Urban Research Center

Community Action Against Asthma

DEQ

Healthy Environments Partnership

Detroit Hispanic Development Corporation

Sierra Club Founded 1892

sdev

Wayne State Law School

greendoor initiative

Celebrating 1995-2015

Detroiters Working for Environmental Justice

Fostering Clean, Healthy and Safe Communities

Air Quality in Detroit

Photo 2: Truck traffic, Detroit, Hannah Gordon, 6-18-15

Objective: To Inform a Public Health Action Plan to reduce environmental exposures and health risks

We examined:

1) Distribution of exposures and protective factors by population characteristics;
2) Associations of exposures and protective factors with cardiopulmonary mortality (CPM); and
3) Reductions in CPM with reductions in exposure and increases in tree canopy in the Detroit Metropolitan Area (DMA).

Methods: Data and Measures

Dependent Variable: Cardiopulmonary Mortality: (ICD-10 codes for cardiovascular disease, I10-I70, and respiratory disease, J00-J99). All deaths recorded in census tracts in Michigan, 2008-2012.

Independent variable (census tract level, rank ordered 1=low, 5=high):

Exposure and health risk: Diesel PM, cancer and respiratory risk from 2011 NATA data.

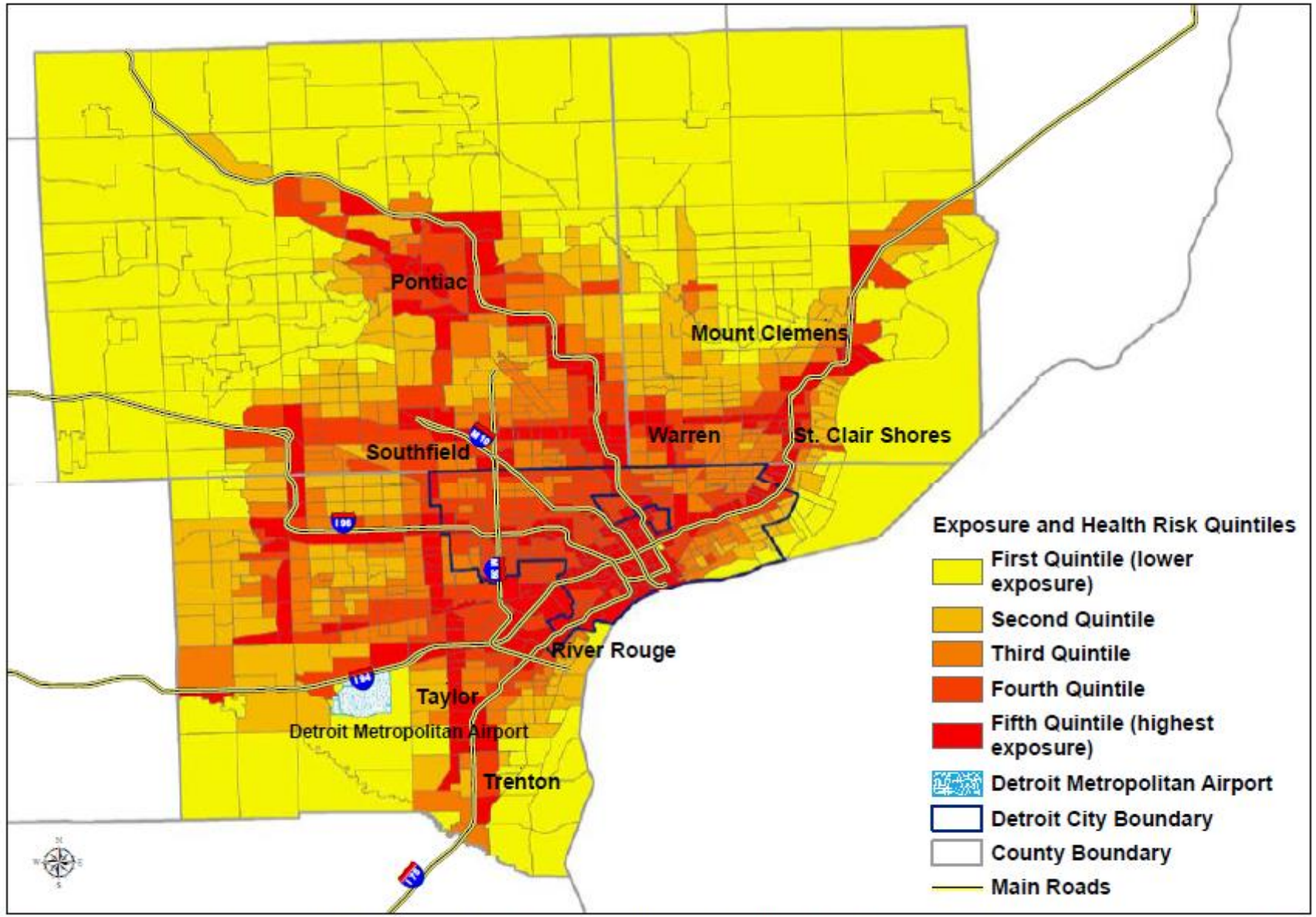
Population vulnerability: Percent people of color, poverty, renters, education<h.s., median household value, <5, >60, linguistic isolation

Tree canopy coverage: Percent tree coverage

Independent variable (individual level)

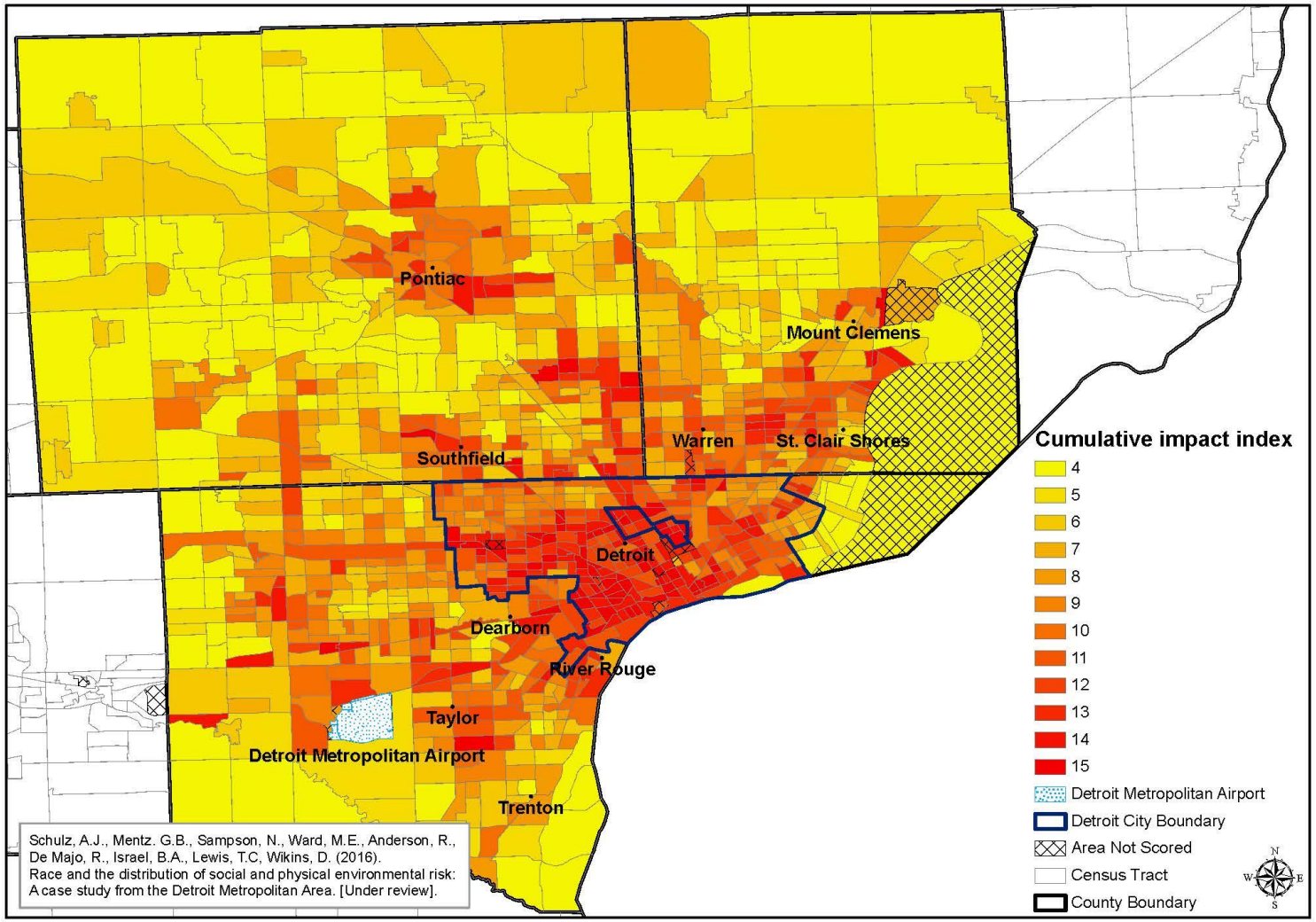
Proximity to heavily trafficked roadways: residential address <150 meters=1, >=150 meters=0

FIGURE 1: *Diesel PM exposure, cancer and respiratory risk attributable to air pollution in the Detroit metropolitan area.*



Cumulative impact polygons (CI) include: residential areas, child care facilities, health care facilities, schools and playgrounds. Exposure and Health risk include: 2011 NATA estimates of respiratory risk, cancer risk and diesel PM (non-cancer) concentration.

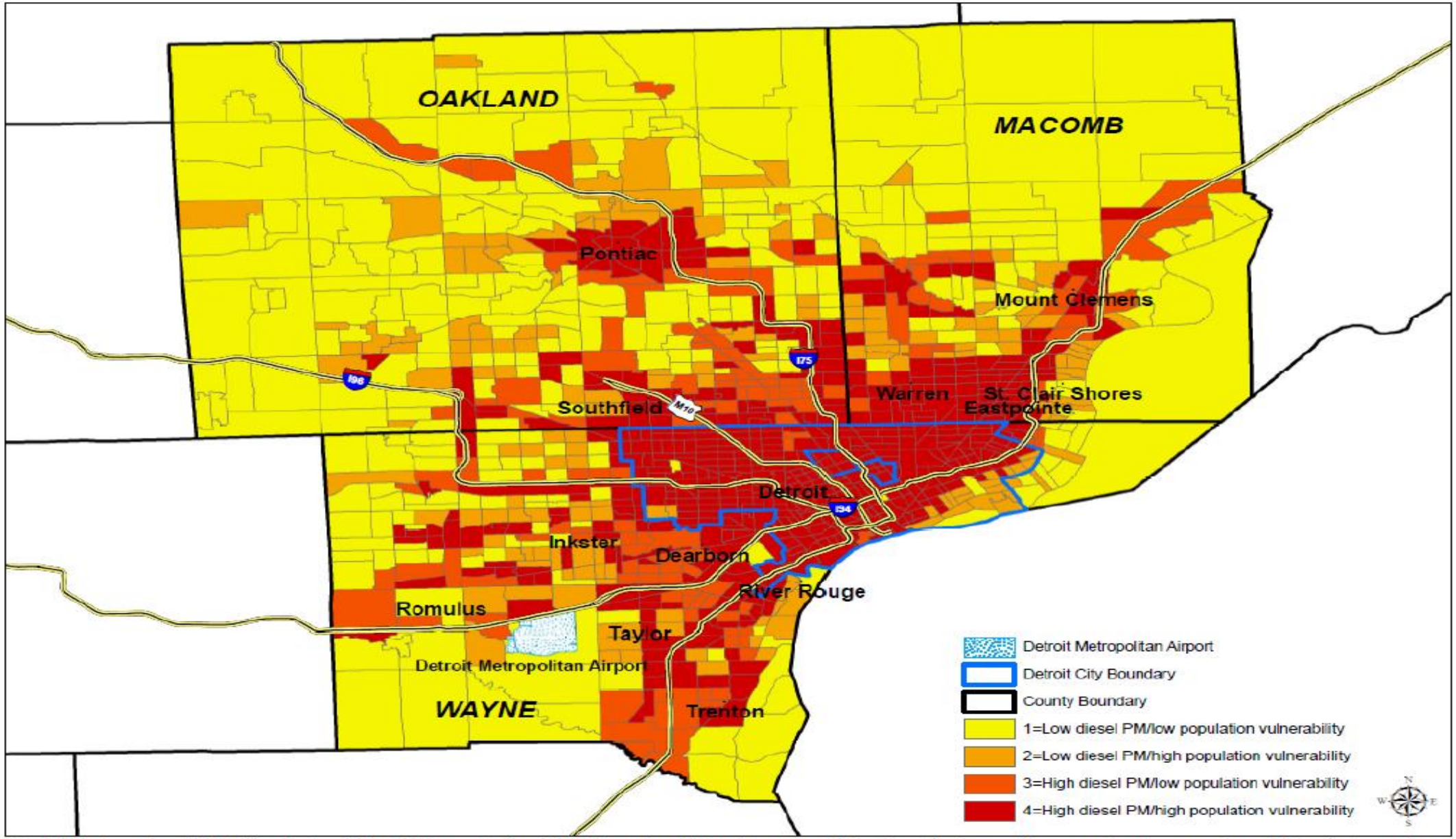
Cumulative Risk: Exposure + Vulnerability



Cumulative impact polygons (CI) include: residential areas, child care facilities, health care facilities, schools and playgrounds.
Total Cumulative Impact includes: Hazardous Facilities and Land Uses, Exposure and Helath Risk and Vulnerabilities

Schulz, Mentz, Sampson et al, 2016. Race and the distribution of social and physical environmental risk. Under review.

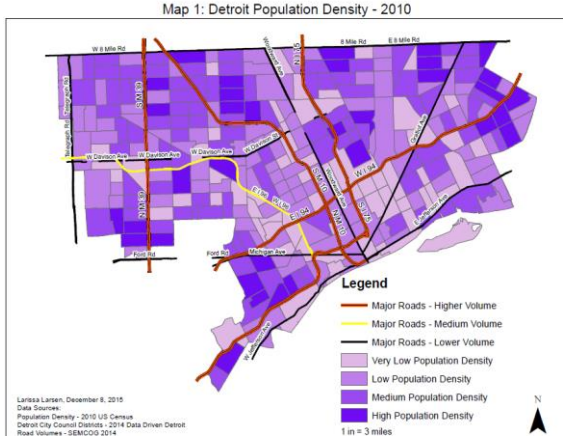
Figure 2: Diesel PM and Population Vulnerability Clusters mapped at the Census Tract Level, Detroit Metropolitan Area



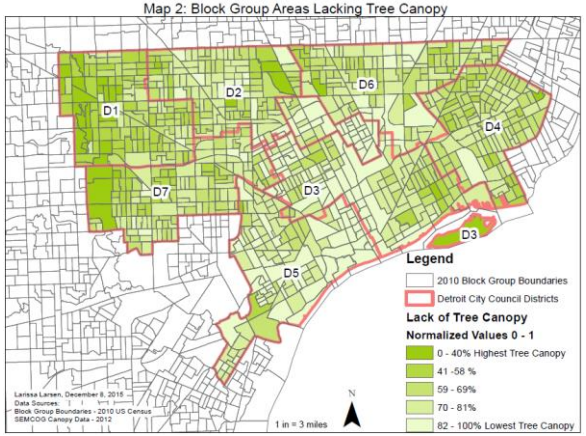
Diesel PM is drawn from 2011 NATA estimates of diesel PM concentrations; Population vulnerability includes percent below the national poverty line, percent renters, percent population of color, median house value (reverse coded), percent > age 24 with < high school completion; percent children <5, percent adults≥65, and linguistic isolation.

Prioritizing tree planting locations

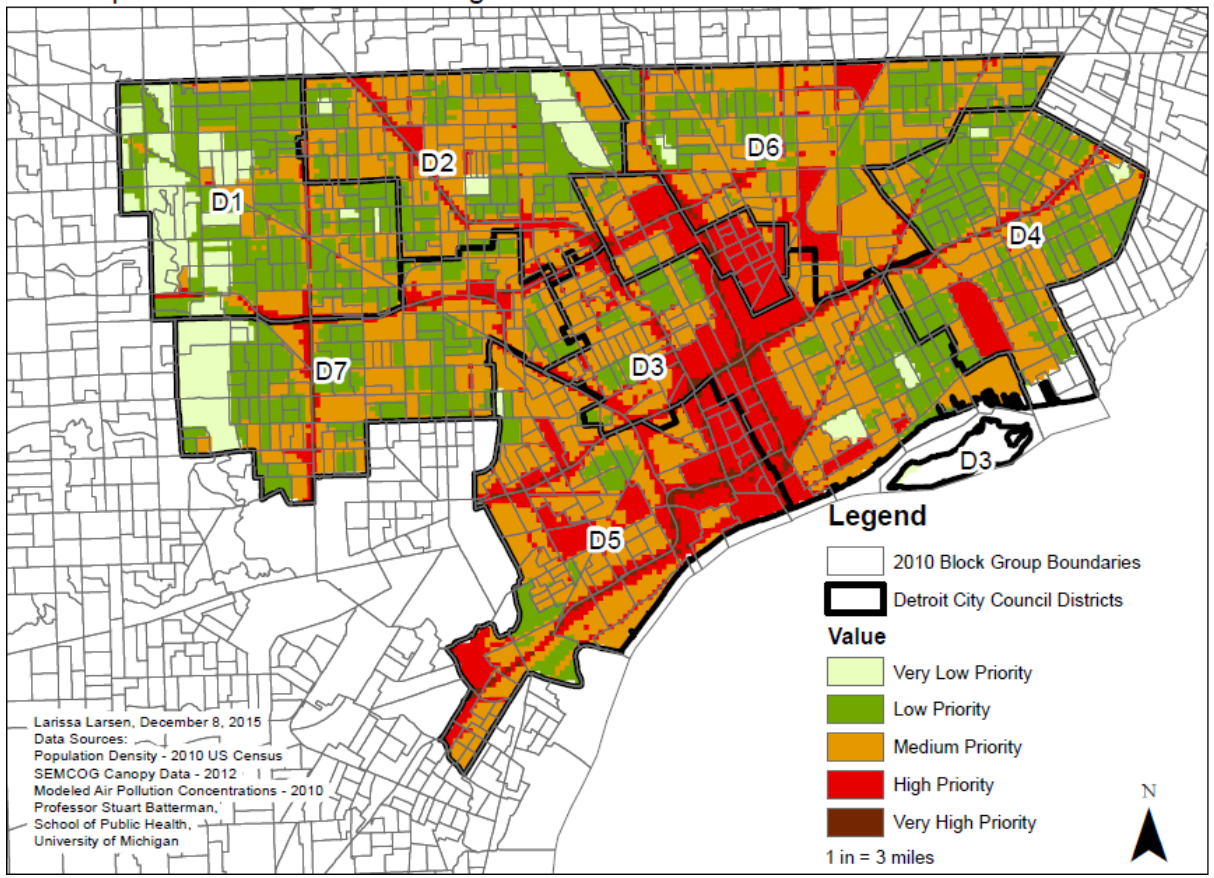
Map 1: Detroit Population Density - 2010



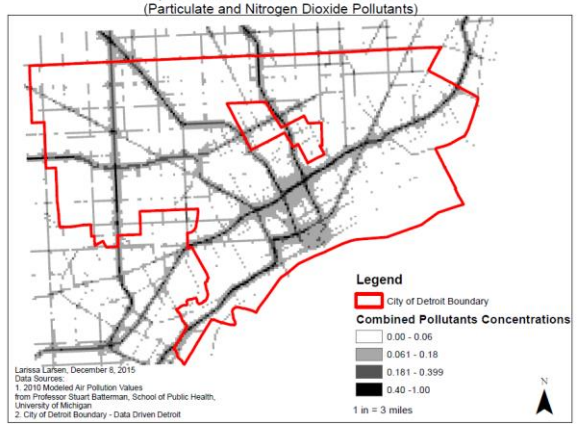
Map 2: Block Group Areas Lacking Tree Canopy



Map 4: Prioritized Tree Planting Areas to Enhance Vehicular Air Pollution Removal



Map 3: Vehicular Air Pollution Concentrations
(Particulate and Nitrogen Dioxide Pollutants)



Methods: Analysis

Random intercept multilevel, multivariate longitudinal analyses

$$Level\ 1 \qquad Prob(CPM = 1) = \phi,$$

$$\text{Log}[\frac{\phi}{(1-\phi)}] = \eta$$

$$\eta = \beta_0 + \beta_1 * (I_{<150}) + \beta_2 * (I_{\geq 150\ and < 300}) + \beta_3 * covariates\ \ldots$$

$$Level\ 2 \qquad \beta_0 = \gamma_{00} + u_0$$

Account for spatial variation as well as longitudinal trends

Cardiopulmonary Mortality regressed on exposure and health risk, social vulnerability, tree canopy coverage, and living within 150 meters of a heavily trafficked roadway, controlling for age, education, race and smoking as contributor to cause of death

	Model 1			Model 2			Model 3		
	Odds Ratio	Confidence Interval	p-value	Odds Ratio	Confidence Interval	p-value	Odds Ratio	Confidence Interval	p-value
INTRCPT2	0.73	(0.721,0.740)	<0.001	0.73	(0.717,0.736)	<0.001	0.73	(0.721,0.740)	<0.001
Level 2 (tract)									
Exposure score (1-5)									
2	1.00	(0.947,1.065)	0.88				1.00	(0.941,1.058)	0.94
3	1.04	(0.988,1.090)	0.14				1.03	(0.979,1.080)	0.27
4	**1.08**	**(1.028,1.136)**	**0.00**				**1.07**	**(1.012,1.121)**	**0.02**
5	**1.05**	**(0.998,1.101)**	**0.06**				1.03	(0.977,1.081)	0.29
Social vulnerability score (1-5)									
2	1.02	(0.972,1.068)	0.45				1.00	(0.956,1.056)	0.85
3	**1.08**	**(1.031,1.131)**	**0.00**				**1.06**	**(1.006,1.111)**	**0.03**
4	**1.13**	**(1.075,1.185)**	**<0.001**				**1.10**	**(1.044,1.158)**	**<0.001**
5	**1.19**	**(1.131,1.259)**	**<0.001**				**1.16**	**(1.092,1.224)**	**<0.001**
Ccanopy Tree score (1-5)									
2				**0.92**	**(0.890,0.959)**	**<0.001**	**0.95**	**(0.911,0.983)**	**0.00**
3				**0.96**	**(0.918,0.994)**	**0.02**	0.99	(0.949,1.027)	0.52
4				**0.90**	**(0.859,0.934)**	**<0.001**	**0.95**	**(0.909,0.992)**	**0.02**
5				**0.84**	**(0.805,0.886)**	**<0.001**	**0.92**	**(0.868,0.972)**	**0.00**
Level 1 (individual)									
Traffic: Living within 150 of a HWY and/or within 150 mts of a local road with traffic intensity >10,000 mvh/24hrs	**1.09**	**(1.032,1.153)**	**0.00**	**1.10**	**(1.040,1.162)**	**<0.001**	**1.09**	**(1.033,1.154)**	**0.00**

Health Impacts of Potential Actions

- Greatest reductions in Cardiopulmonary Mortality (CPB) achieved by reducing diesel PM to two lowest quintiles in all census tracts
- Increasing tree canopy coverage to the levels in the two highest quintiles achieved the second greatest reduction in CPM
- Creating buffers around heavily trafficked roadways (e.g. all residential areas >=150 meters from roadway) achieved some reduction in mortality, but less than the above two.
  - In part because relatively low population density within 150 meters of freeways.

CAPHE Public Health Action Plan Recommendations

1. Expand diesel retrofit & fleet & engine replacement efforts
2. Increase awareness of existing anti-idling efforts
3. Increase enforcement of existing anti-idling ordinances
4. Incentivize trucking, delivery and bus companies & drivers to minimize idling
5. Increase tree canopy coverage throughout Detroit City
6. Plant vegetative buffers and/or install sound walls where current minimum setbacks are not met
7. Adopt regulations to create minimum setbacks between people and pollution sources

Community Benefits Coalition

1. INSERT HERE THE MAP OF THE SW AREA WITH 150 METER BUFFER AND CHILDREN BELOW 5 AND DISCUSS HOW THIS MAP WAS USED AS PART OF THE COMMUNITY BENEFITS AGREEMENT

Partner Organizations & Partnerships

Community Action Against Asthma

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