HEI Jane Warren Award

2023 Cohort

The Jane Warren Award

The Jane Warren award supports early career graduate students and postdocs in attending and presenting at HEI's Annual Conference.

The award is named in remembrance of Dr. Jane Warren who led HEI's scientific activities as the Director of Science from 1999 until her retirement in 2008.

Winner Presentation

Dr. Falco J. Bargagli Stoffi

Harvard University

HARVARD UNIVERSITY

Who is Most Vulnerable ?

A Causal Machine Learning Approach for Environmental Justice

Falco J. Bargagli Stoffi

Francesca Dominici
Riccardo Cadei
Kwonsang Lee

Causal Rule Ensemble

HEI

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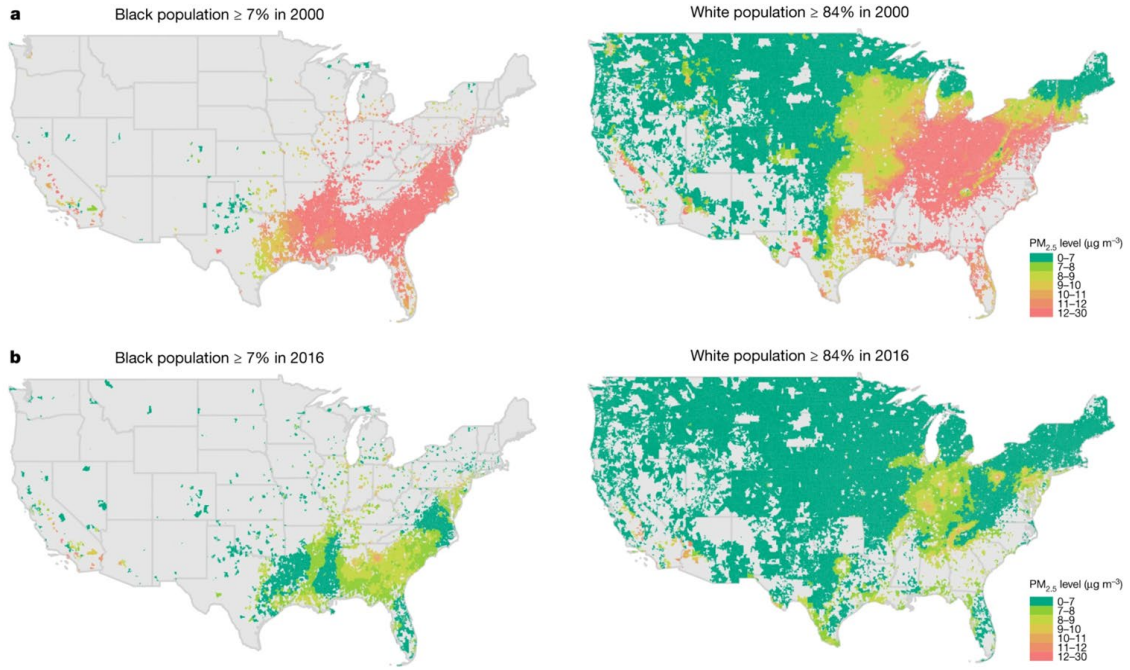
Environmental Justice

"No group of people should bear a disproportionate burden of environmental harms and risks"
Environmental Protection Agency (EPA-452/P -22-001, 2023)



Source: Jbaily et al. "Air pollution exposure disparities across US population and income groups." Nature 601, 228 –233 (2022).

Research Question

"*Which are the characteristics of people that are the most vulnerable to the negative effects of exposure to high-levels of air pollution (i.e.,above NAAQS)?*"

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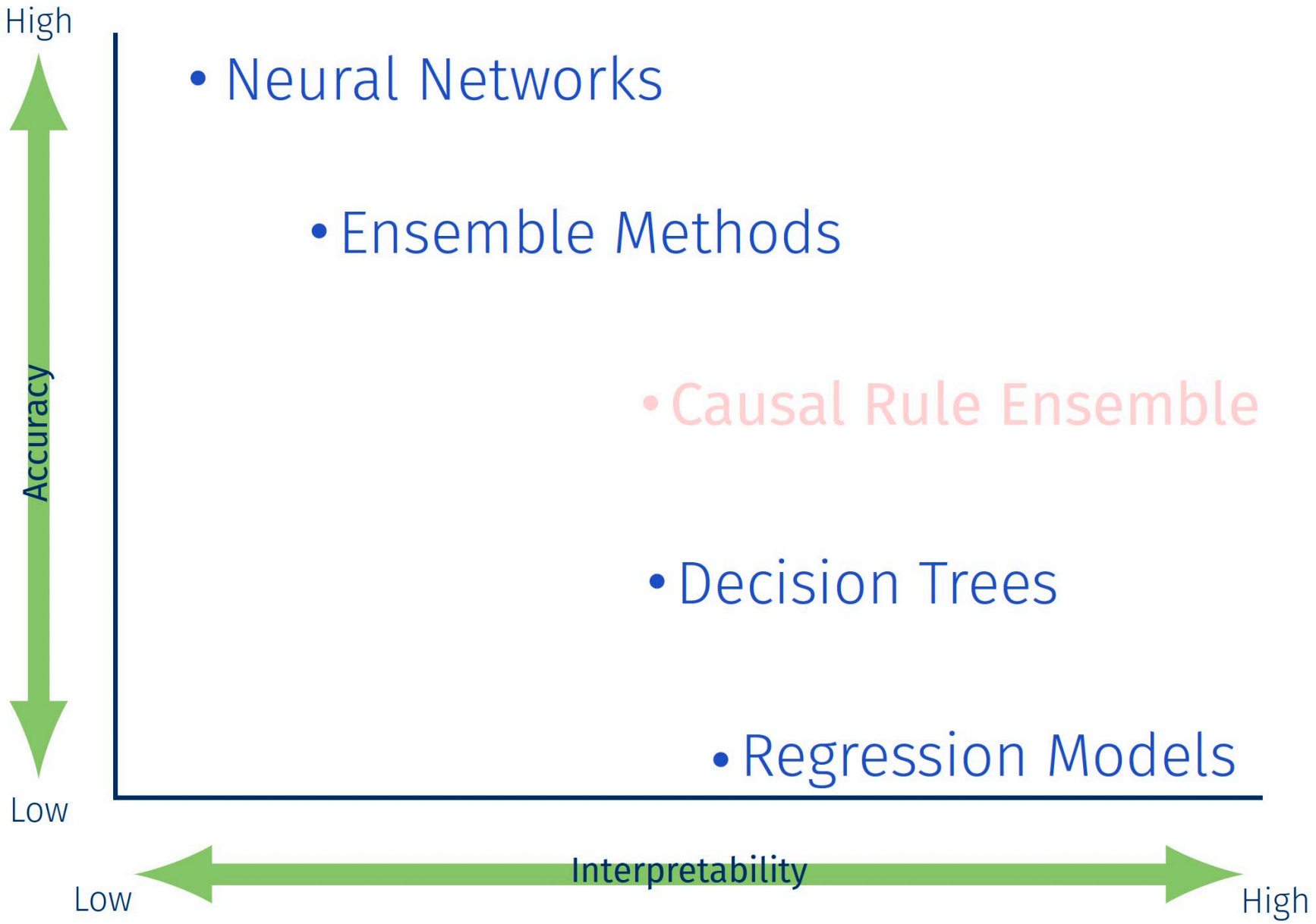
Methodological Challenge



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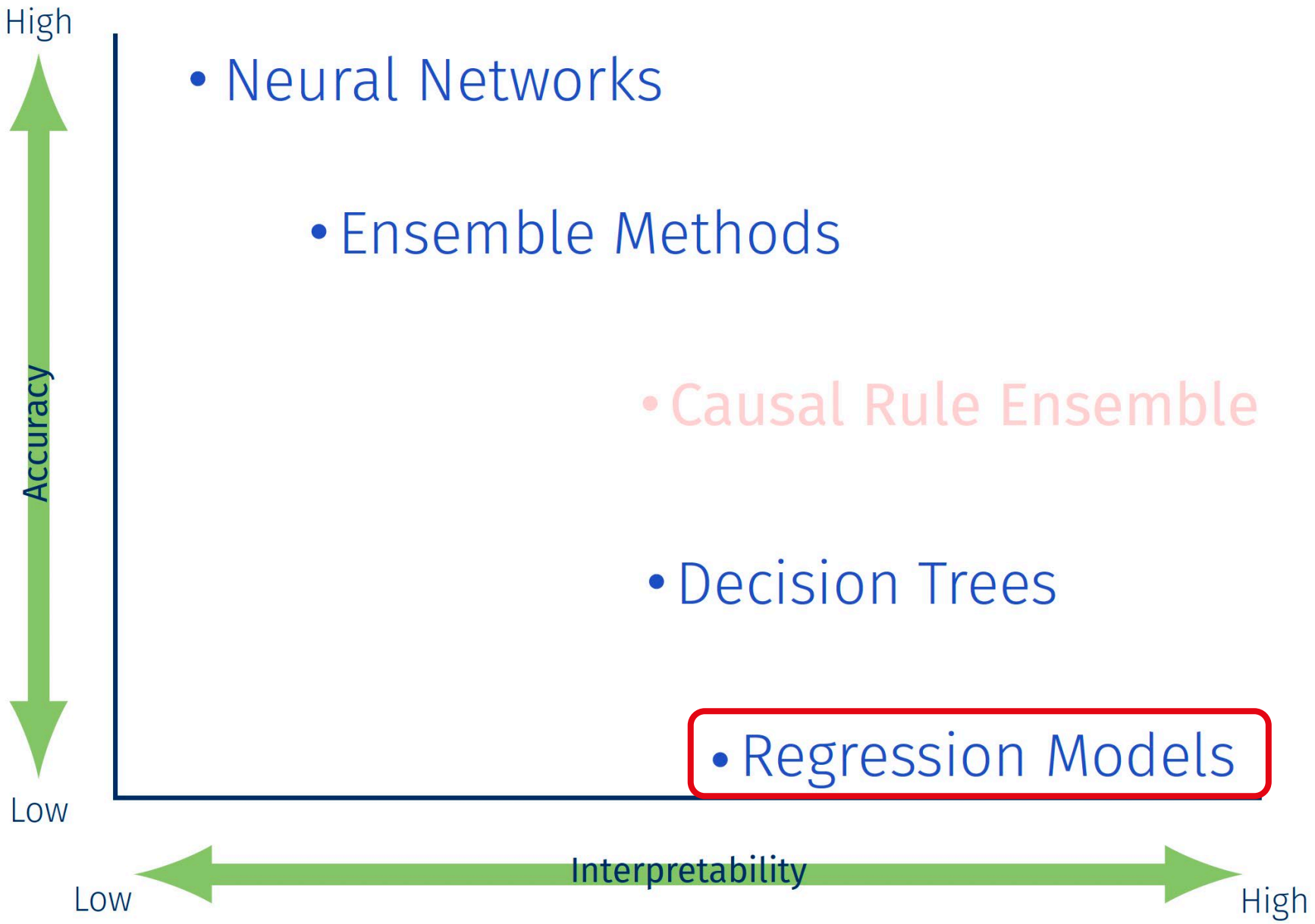
Methodological Challenge



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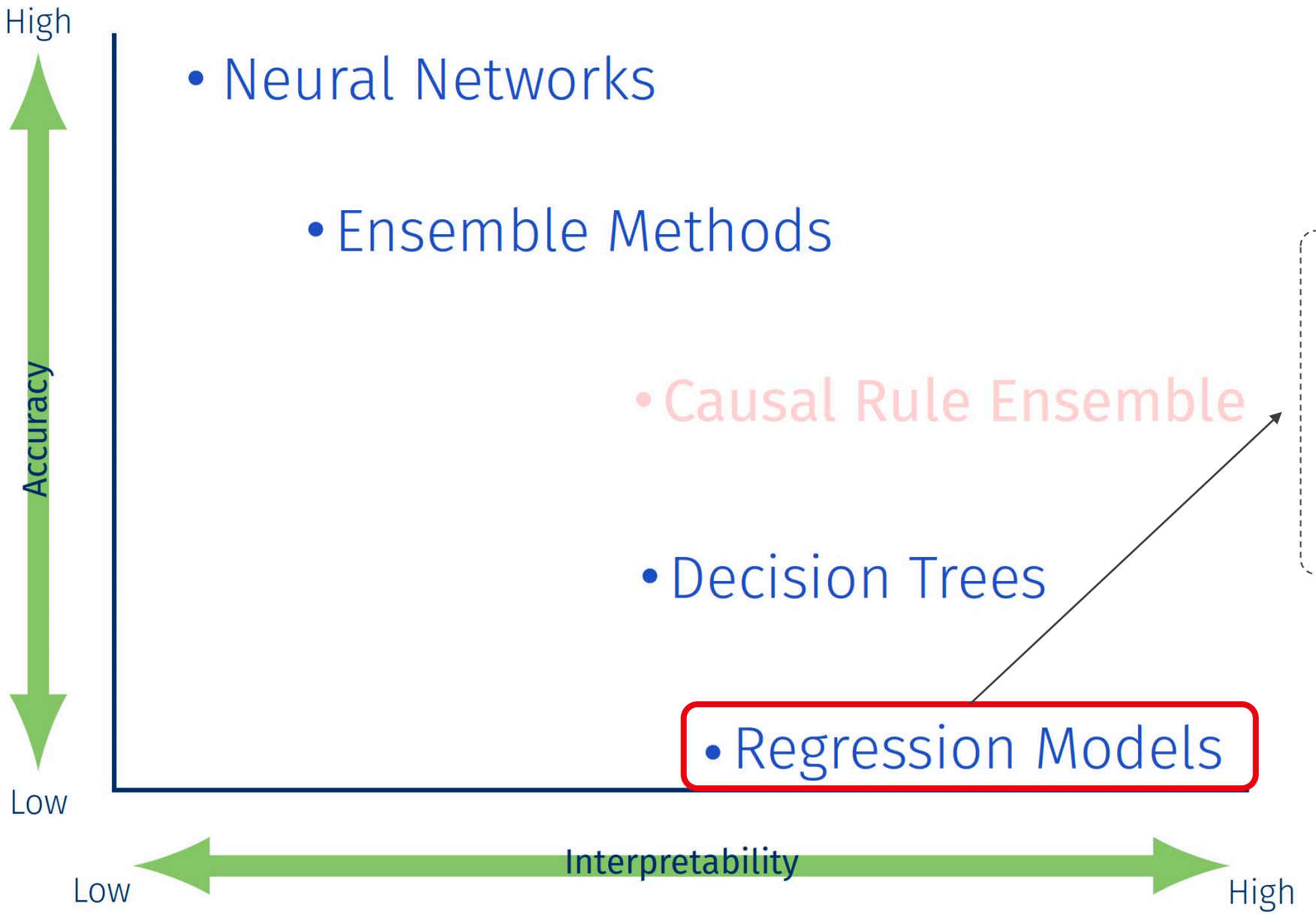
Methodological Challenge



- Highly interpretable, widely used in epidemiology

- Three main drawbacks:
  1. Previous knowledge
  2. Cherry-picking
  3. Not data-driven

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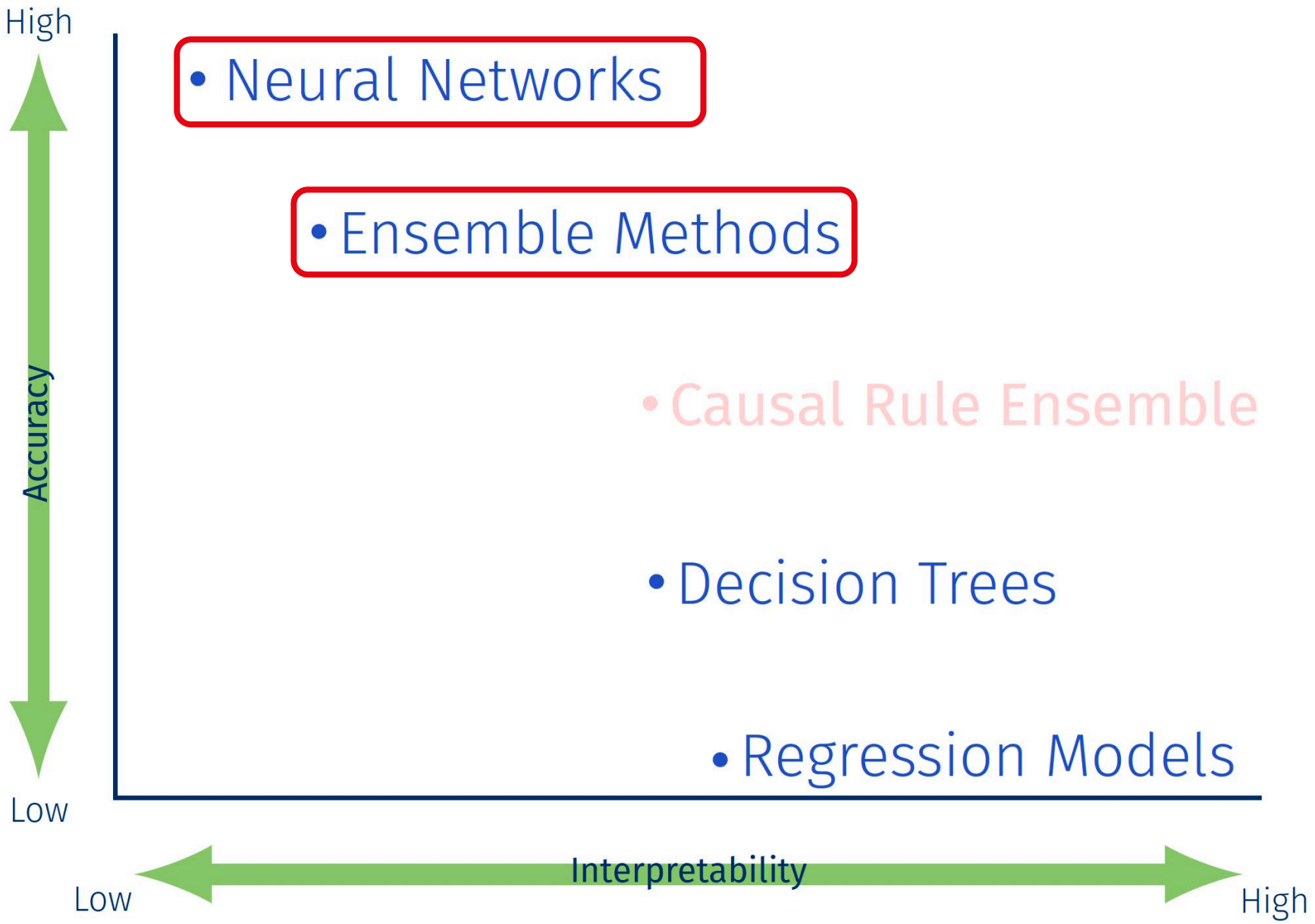
Methodological Challenge



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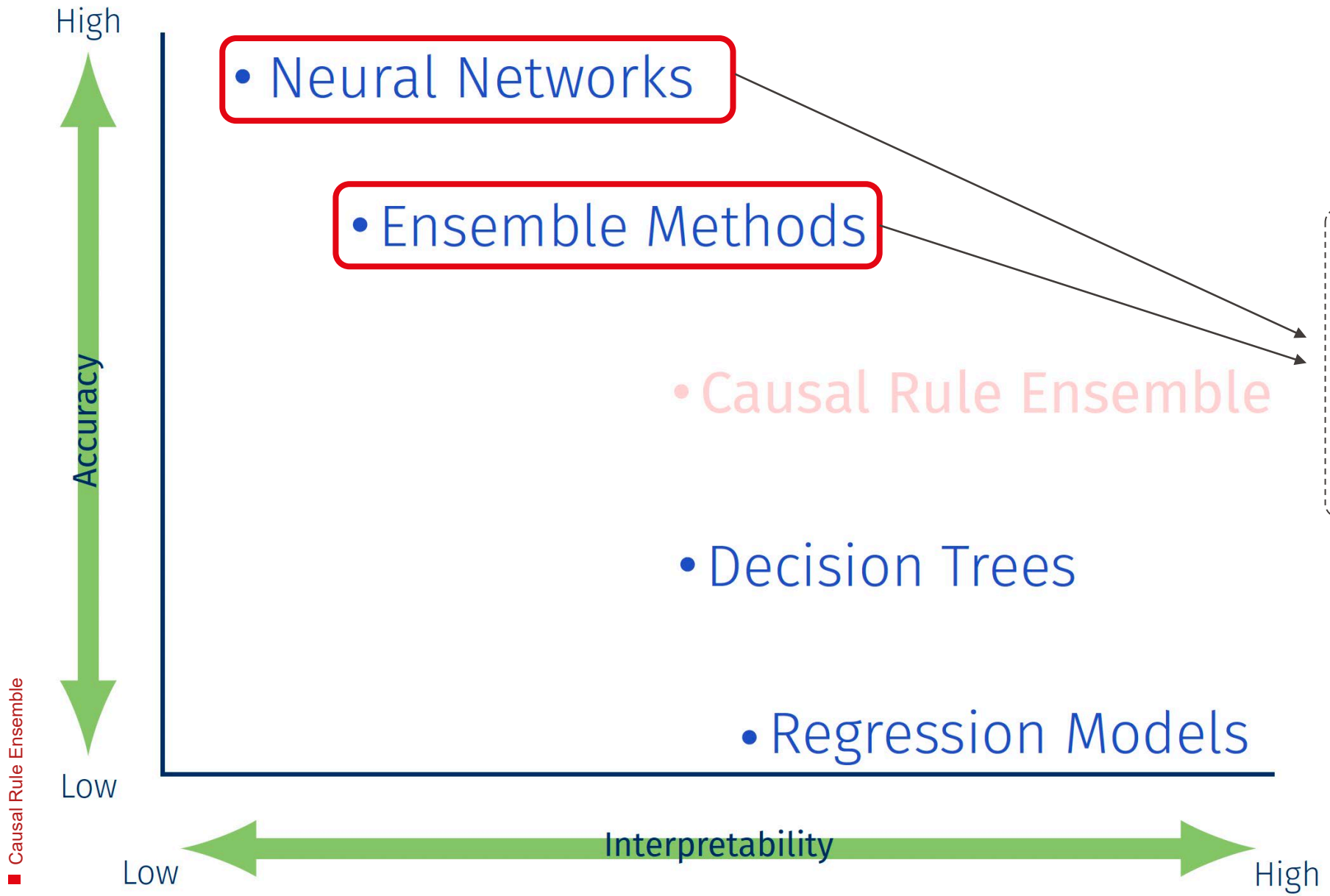
Methodological Challenge



- Data-driven and highly accurate

- Two main drawbacks :
  1. Not interpretable
  2. Computationally burdensome

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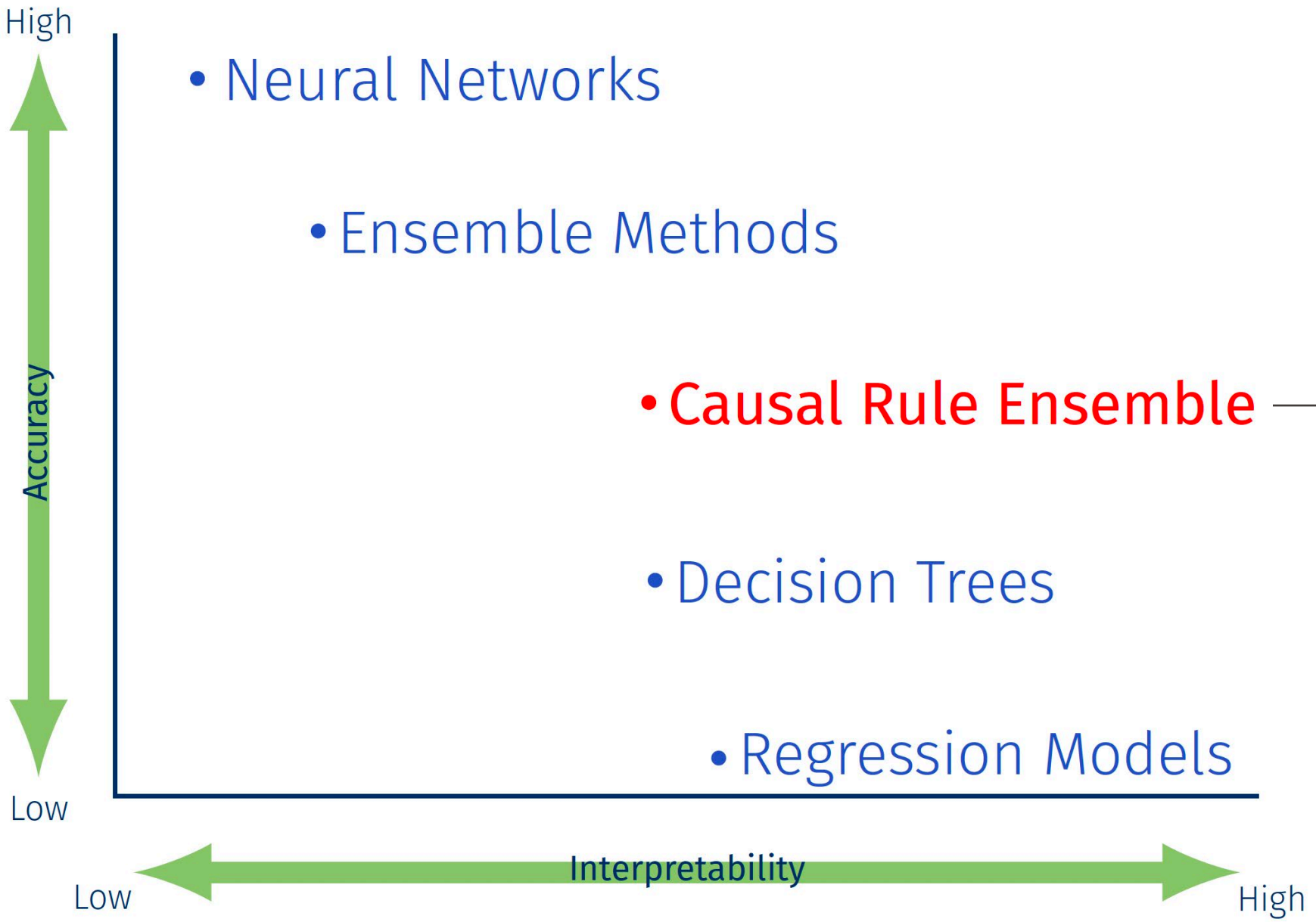
Methodological Challenge



1. Data-driven
2. Interpretable
3. Computationally efficient
4. No prior knowledge
5. No cherry-picking

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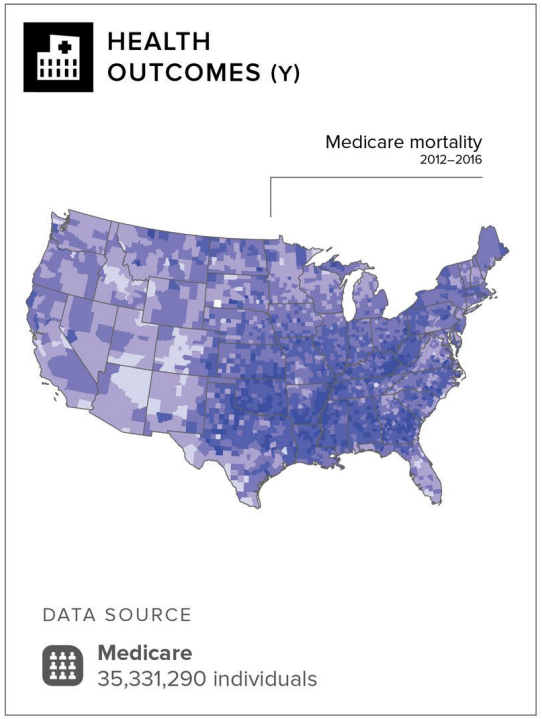
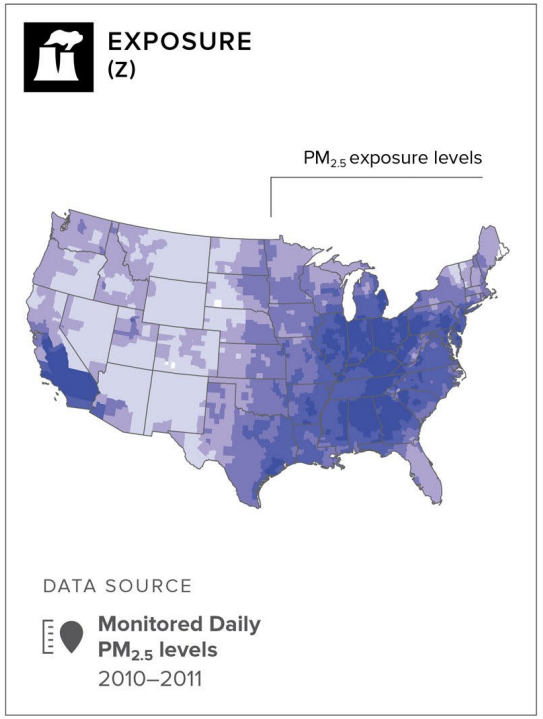
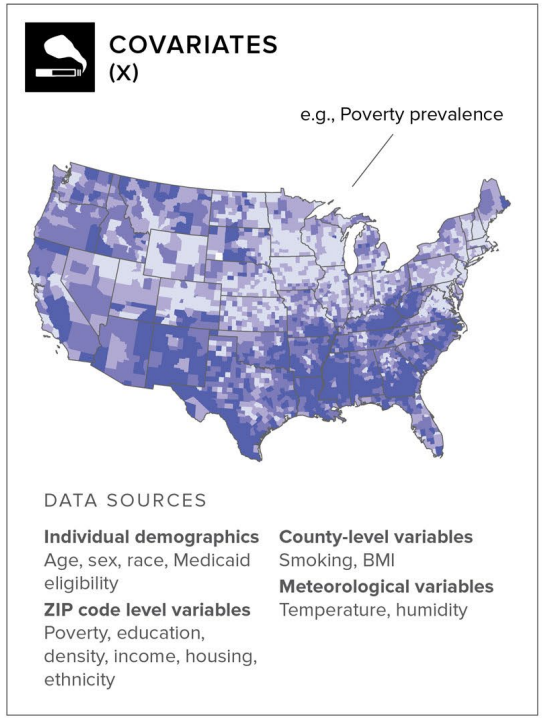
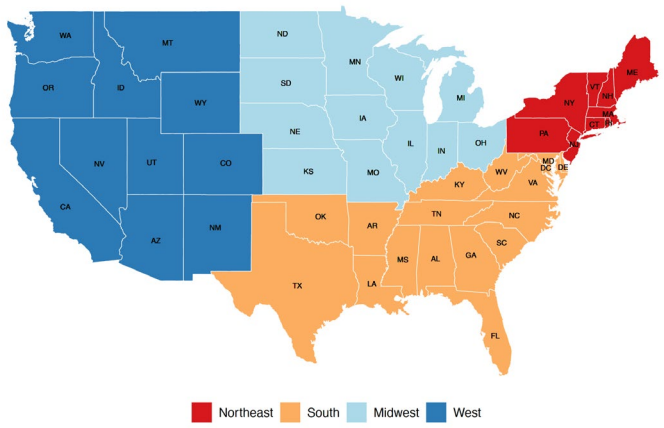
Who Is Most Vulnerable ?









Increased risk for:

i. **Rural** communities in the Northeast , Midwest and South,
ii. **Black** communities in the South,
iii. **Low -SES** in the West and South,
iv. **Low -income** in the Northeast .

Potential **survival bias** for some minority groups

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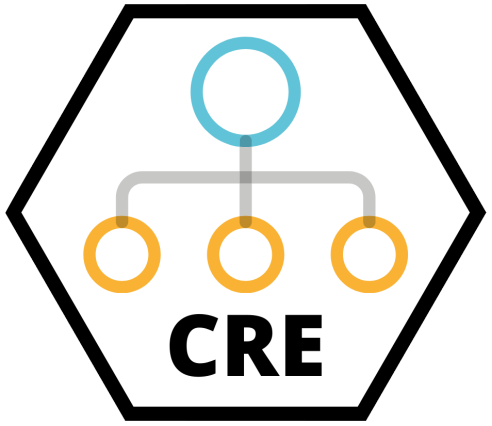
Resources



Website

Methodological Paper

Open-source R Package

Reproducible Code

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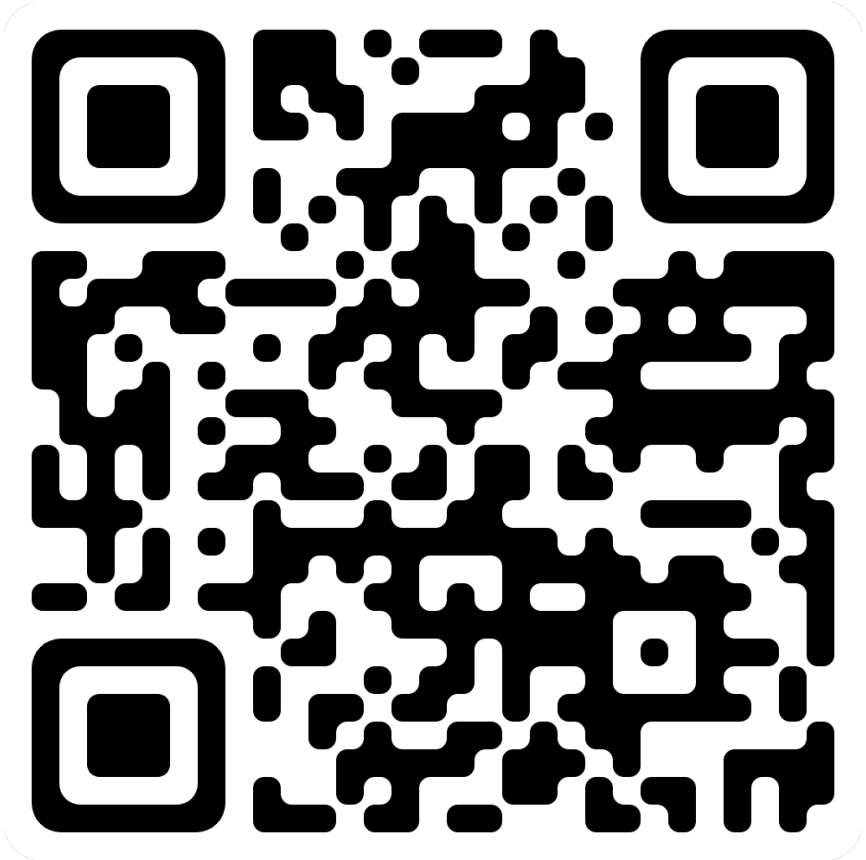
Resources



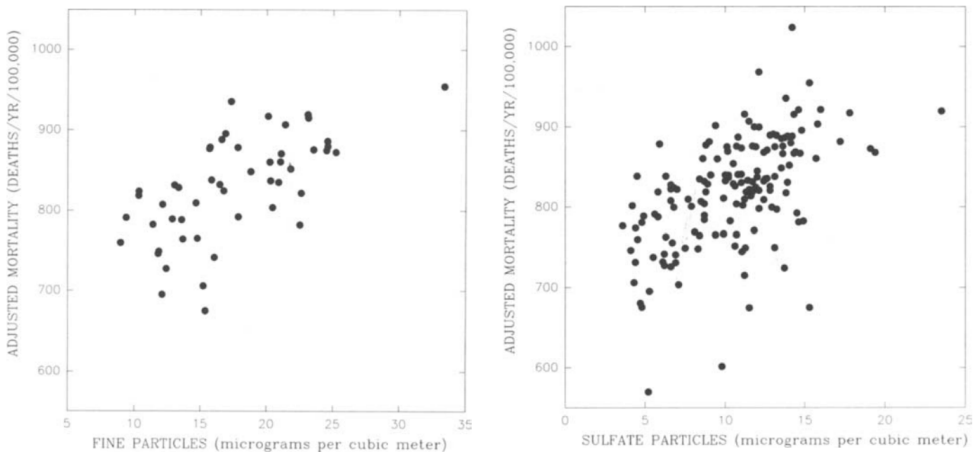
Scan me

Linktree

Winner Presentation

Sabrina S. Chow

Emory University



Pope et al. (1995)

EMORY | ROLLINS SCHOOL OF PUBLIC HEALTH

American Cancer Society®

HERCULES EXPOSOME RESEARCH CENTER

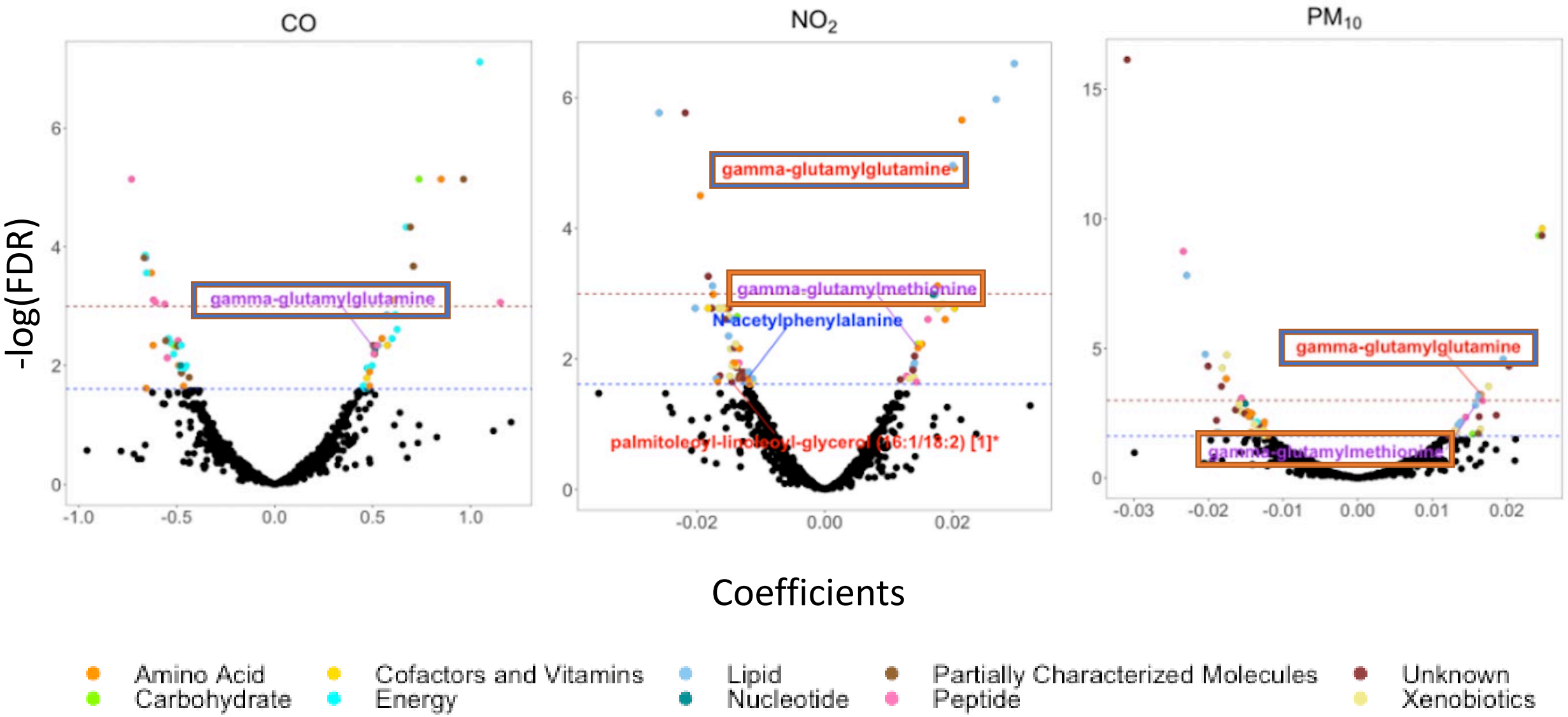
The Role of Metabolic Perturbations in Mediating the Effects of Ambient Air Pollution on Lung Cancer in the Cancer Prevention Studies (CPS)

Sabrina Chow, BS, MPHc

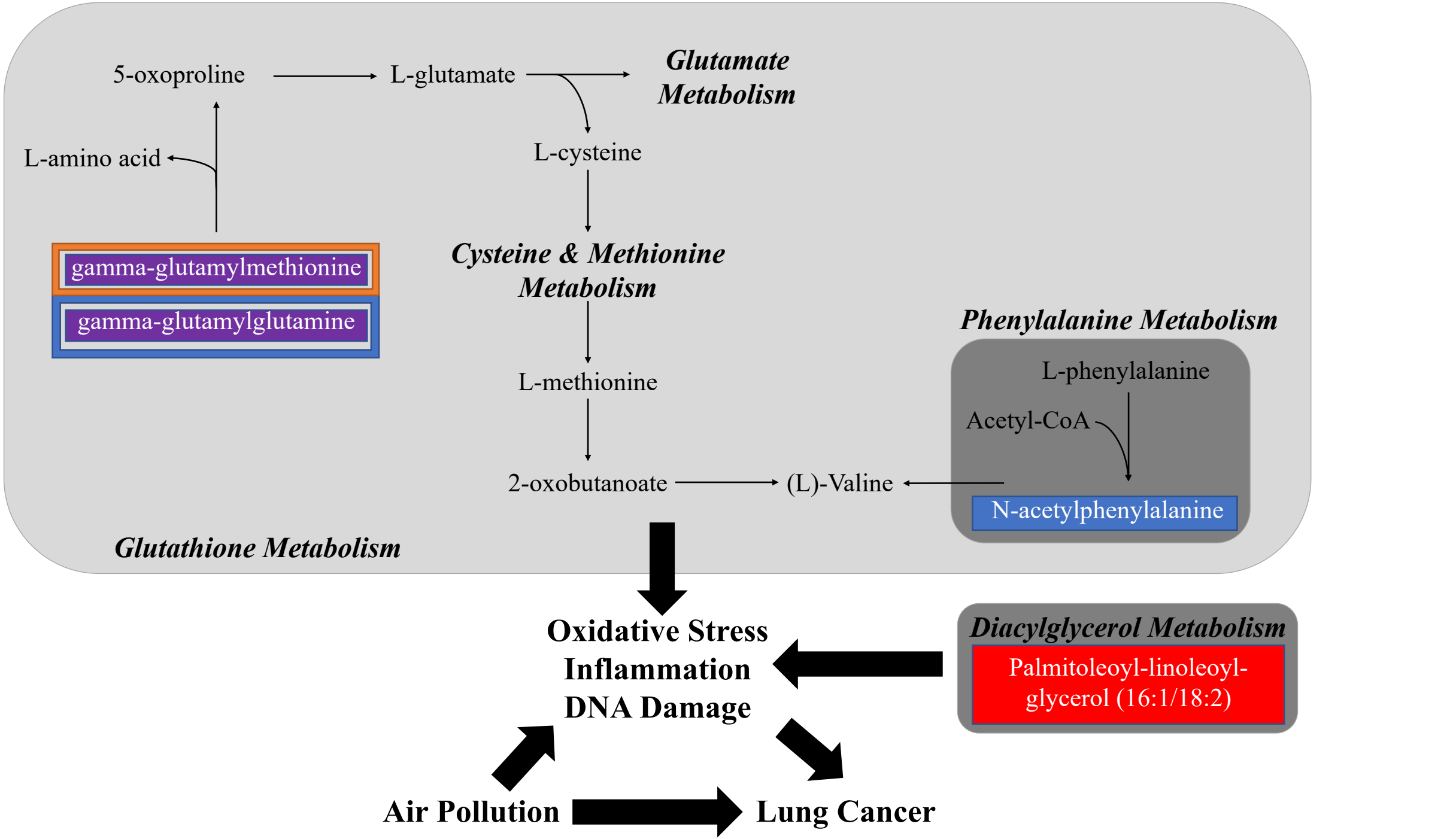
Rollins School of Public Health, Emory University

HEI

Air pollutant	FDR q < 0.2		
	Air Pollution Model	MITM	HDMA
CO Exposure	62	1	1
NO_2 Exposure	90	3	2
O_3 Exposure	44	0	1
PM_{10} Exposure	72	0	1
$PM_{2.5}$ Exposure	124	0	1
SO_2 Exposure	16	0	0



Red: MITM; Blue: HDMA; Purple: MITM and HDMA


5-oxoproline
L-glutamate
Glutamate Metabolism
L-amino acid
L-cysteine
gamma-glutamylmethionine
gamma-glutamylglutamine
Cysteine & Methionine Metabolism
L-methionine
Phenylalanine Metabolism
L-phenylalanine
Acetyl-CoA
2-oxobutanoate
(L)-Valine
N-acetylphenylalanine
Glutathione Metabolism
Oxidative Stress
Inflammation
DNA Damage
Diacylglycerol Metabolism
Palmitoleoyl-linoleoyl-glycerol (16:1/18:2)
Air Pollution
Lung Cancer

Winner Presentation

Libby Koolik

University of California, Berkeley

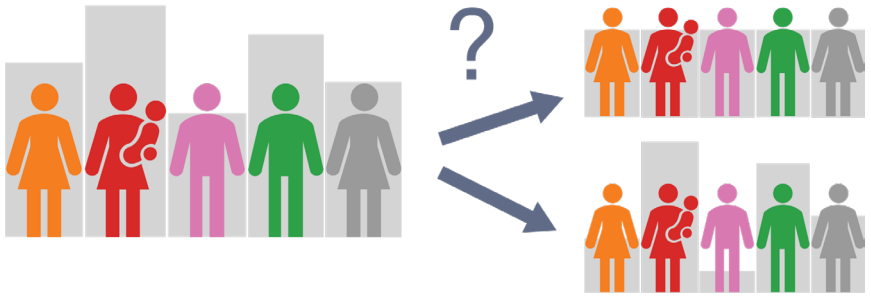
Racial-Ethnic Disparities in Exposure to $PM_{2.5}$ from California's On-Road Mobile Sources Remain After Decades of Emissions Controls

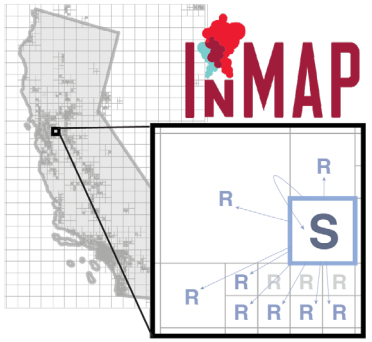
Libby Koolik[1], Álvaro Alvarado[2], Amy Budahn[2], Laurel Plummer[2], Julian D. Marshall[3], and Joshua S. Apte[1]

[1] University of California, Berkeley
[2] California Office of Environmental Health Hazard Assessment
[3] University of Washington

Have reductions in mobile source emissions in California contributed to a reduction in $PM_{2.5}$ exposure disparities for communities of color?

Systemic racism has led to disparately higher exposures of $PM_{2.5}$ for people of color in California.





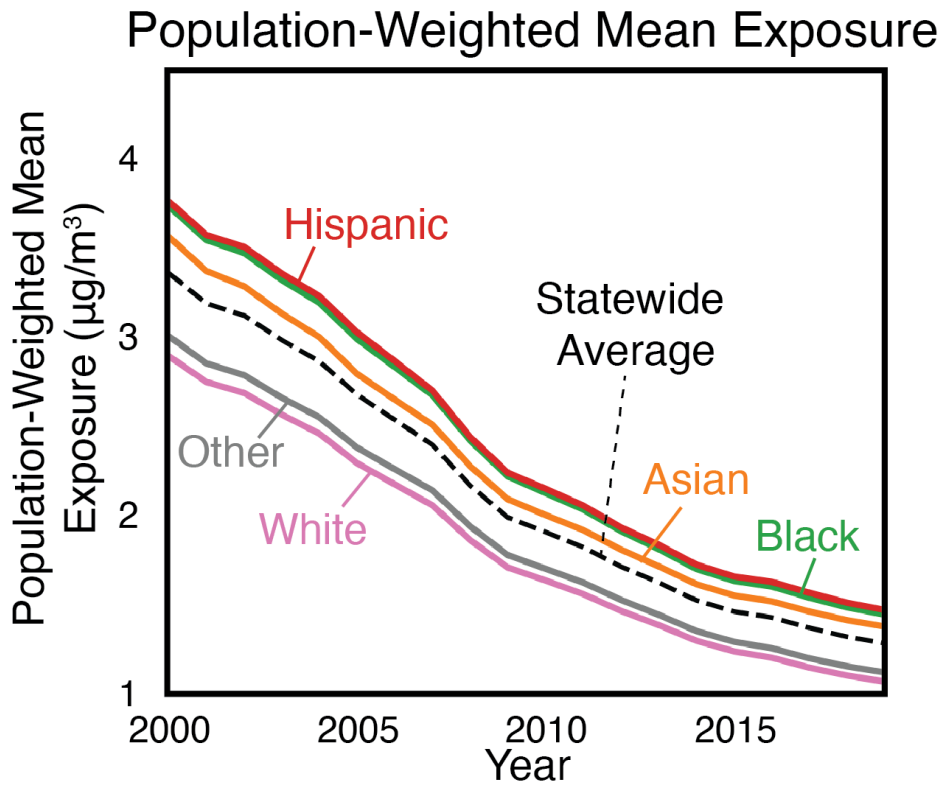
Emissions of on-road mobile sources from state regulatory model.

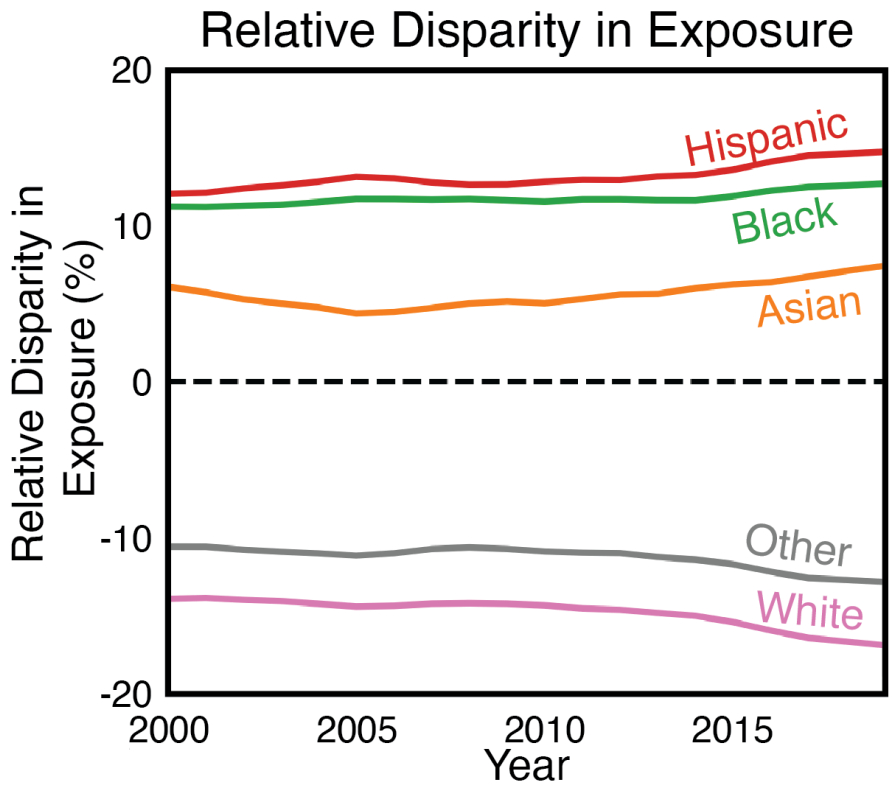
$PM_{2.5}$ concentrations estimated through custom tool based on InMAP Source-Receptor Matrix.

Exposures estimated and compared to assess differences across race-ethnicity.

Libby Koolik et al., *in prep*

Exposure concentrations have decreased, but relative disparities in exposure have increased somewhat for people of color.





Libby Koolik et al., *in prep*

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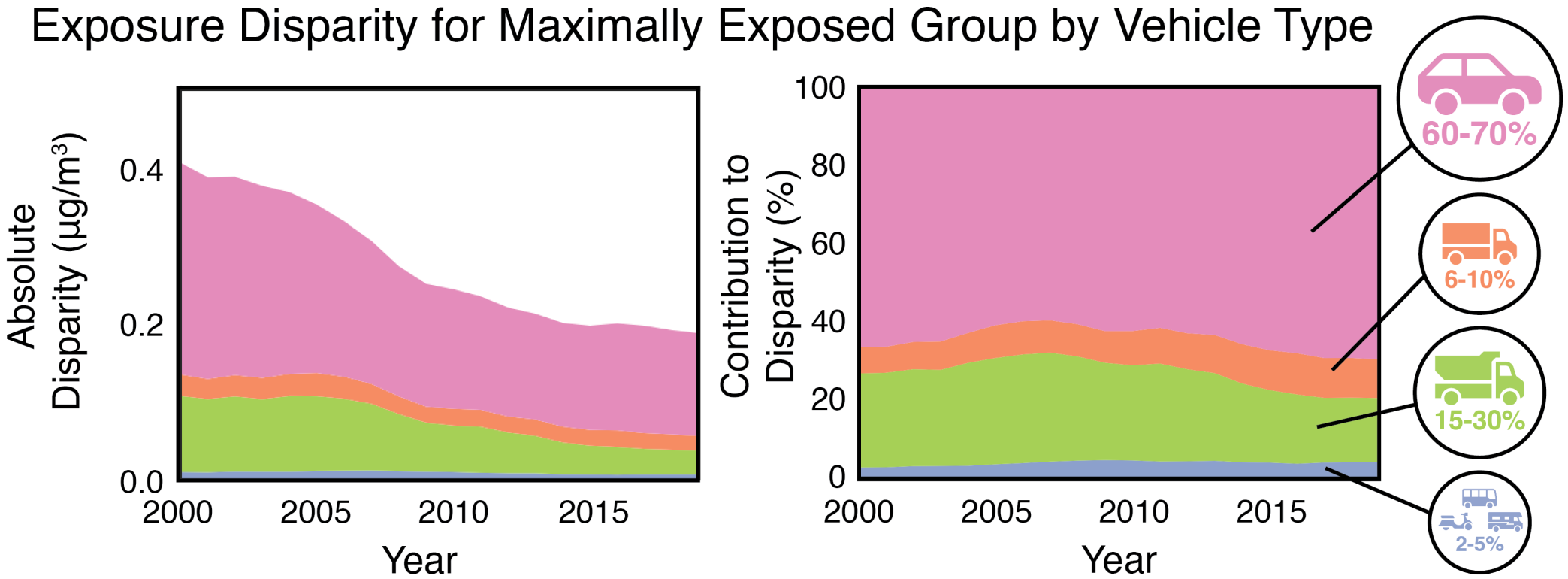


Libby Koolik et al., *in prep*

Reducing emissions will not necessarily reduce exposure disparities without attention to the underlying factors leading to the disparity.

Winner Presentation

Alina McIntyre

Boston University

Portable Air Cleaner (PAC) Usage and Particulate Matter Exposure Reduction in an Environmental Justice Community: A Pilot Study

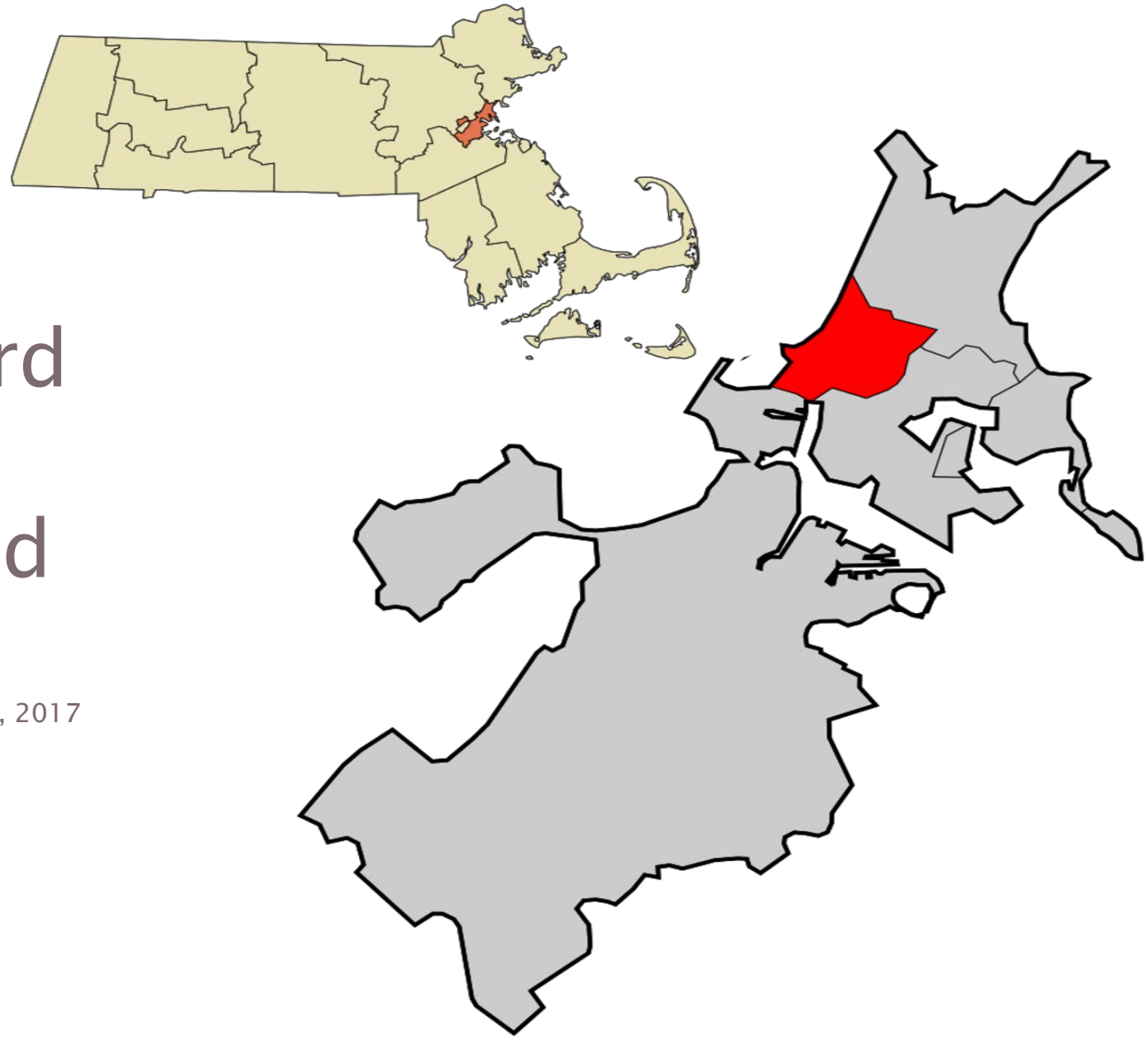
McIntyre, AM.[1], Scammell, MK.[1], Kinney, P.[1], Khosla, K.[1], Benton, L.[2], Bongiovanni, R.[2], Milando, C.[1]

1. Boston University School of Public Health, Boston, MA, USA; 2. GreenRoots, Inc., Chelsea, MA, USA

BOSTON UNIVERSITY

Chelsea ranks third in Massachusetts for asthma-related hospitalizations

Massachusetts Environmental Public Health Tracking, 2017



Neris

All of my children have asthma, we have lived with prescriptions for pumps and machines and because of this, **it's really important to have air – clean air!** …Chelsea is really far too contaminated. It is really bad. **We need more air filters, including in our neighborhood.**

Image and quote from *COVID-19 in Chelsea: A Glance Into One of the Hardest Hit Cities And the Role of Intersecting Social Determinants of Health.* GreenRoots, Inc.

Goal: implement PAC efficacy pilot in partnership with GreenRoots, Inc

Recruitment and education

HOBO

HEPA filter

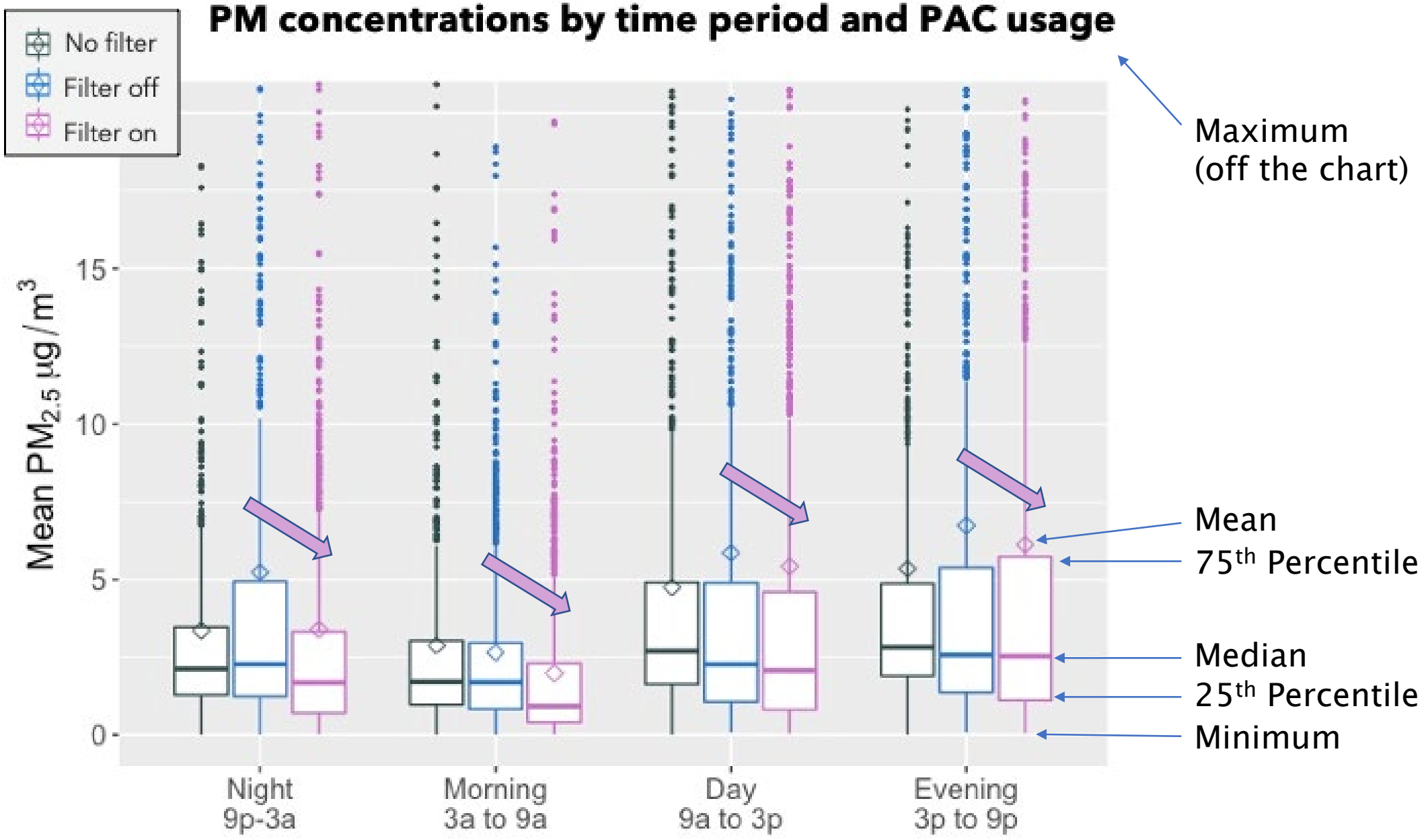
QUANTAQ

Survey

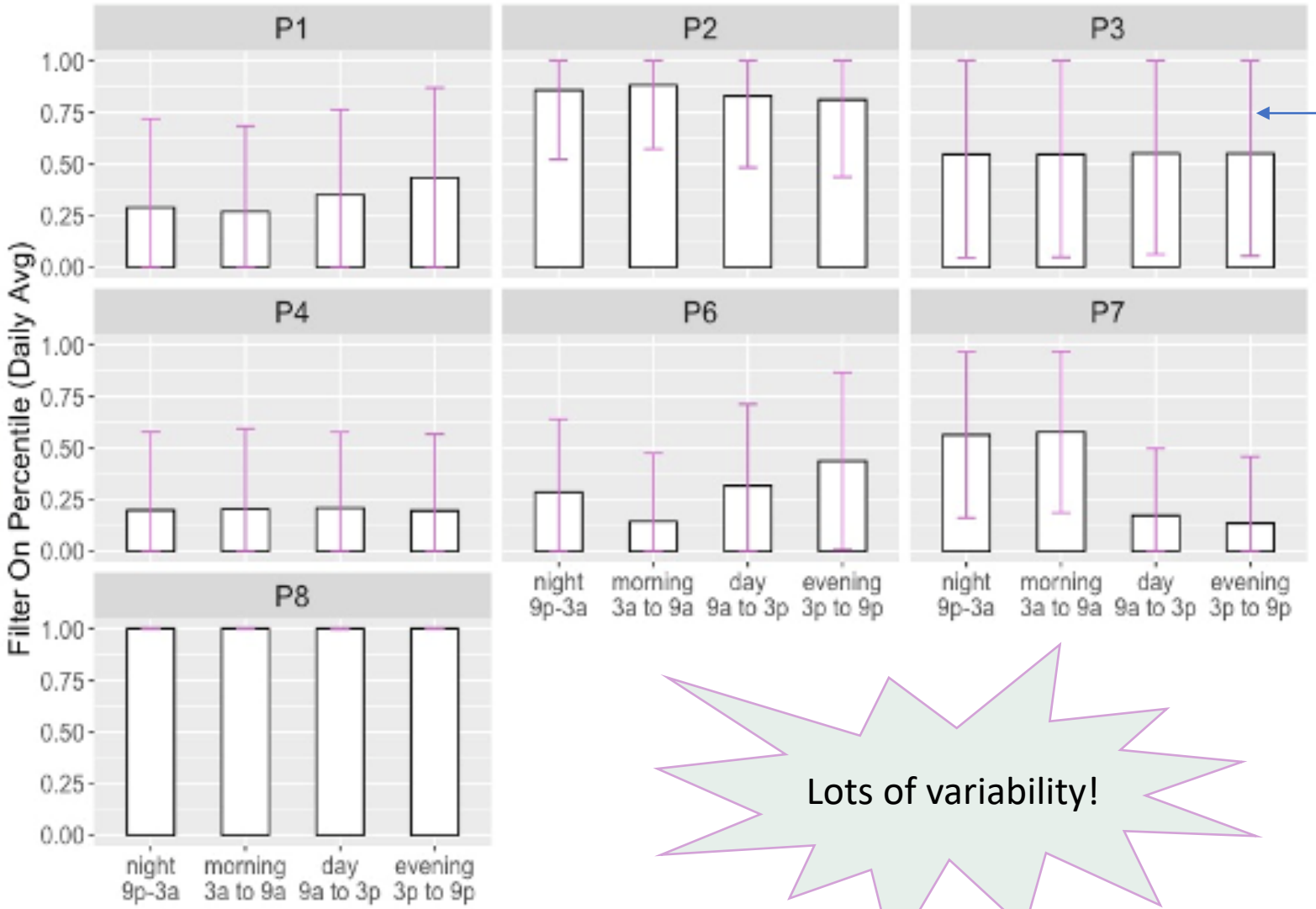
How does PAC usage impact particulate matter (PM) concentrations?

$$PM = PAC\ usage + time\ trends + temperature + relative\ humidity + outdoor\ PM + household_i + e$$

PACs significantly decreased PM when filters were turned on vs. turned off, though we observed **large variability** in PM concentrations and PAC usage


PM concentrations by time period and PAC usage
No filter
Filter off
Filter on
Mean PM2.5 µg/m3
0
5
10
15
Night
9p-3a
Morning
3a to 9a
Day
9a to 3p
Evening
3p to 9p
Maximum
(off the chart)
Mean
75th Percentile
Median
25th Percentile
Minimum

PAC usage by time period and participant



Standard deviation

Lots of variability!

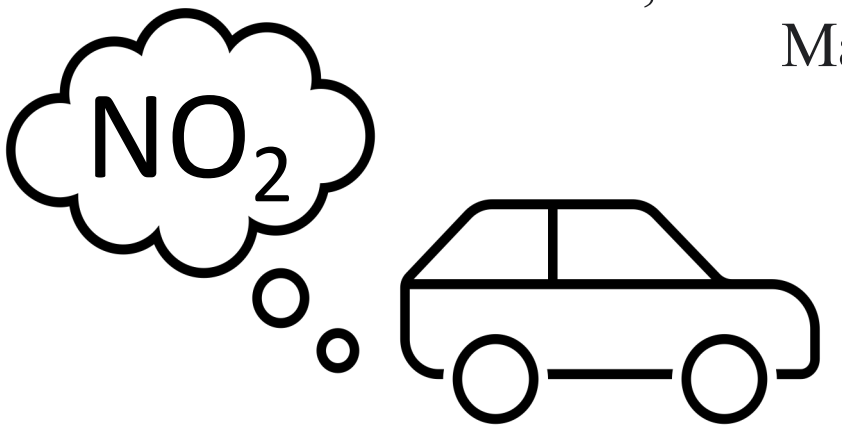
Winner Presentation

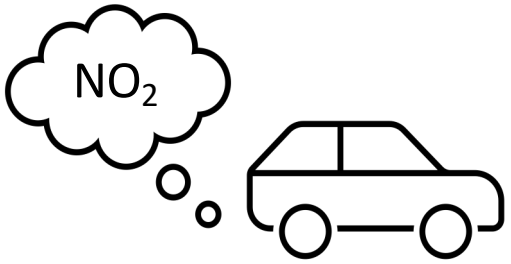
Jenni A. Shearston

Columbia University

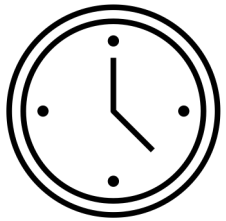
Can traffic-related air pollution trigger myocardial infarction within a few hours of exposure? Identifying hourly hazard periods

Jenni A. Shearston, Sebastian T. Rowland, Tanya Butt, Steven N. Chillrud, Joan A. Casey, Donald Edmondson, Markus Hilpert, Marianthi-Anna Kioumourtzoglou

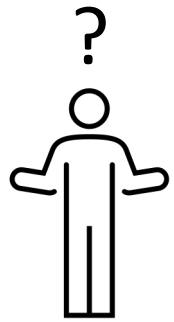




Air pollution from traffic can trigger heart attacks.



It's not clear how soon after being exposed to traffic a heart attack might occur.

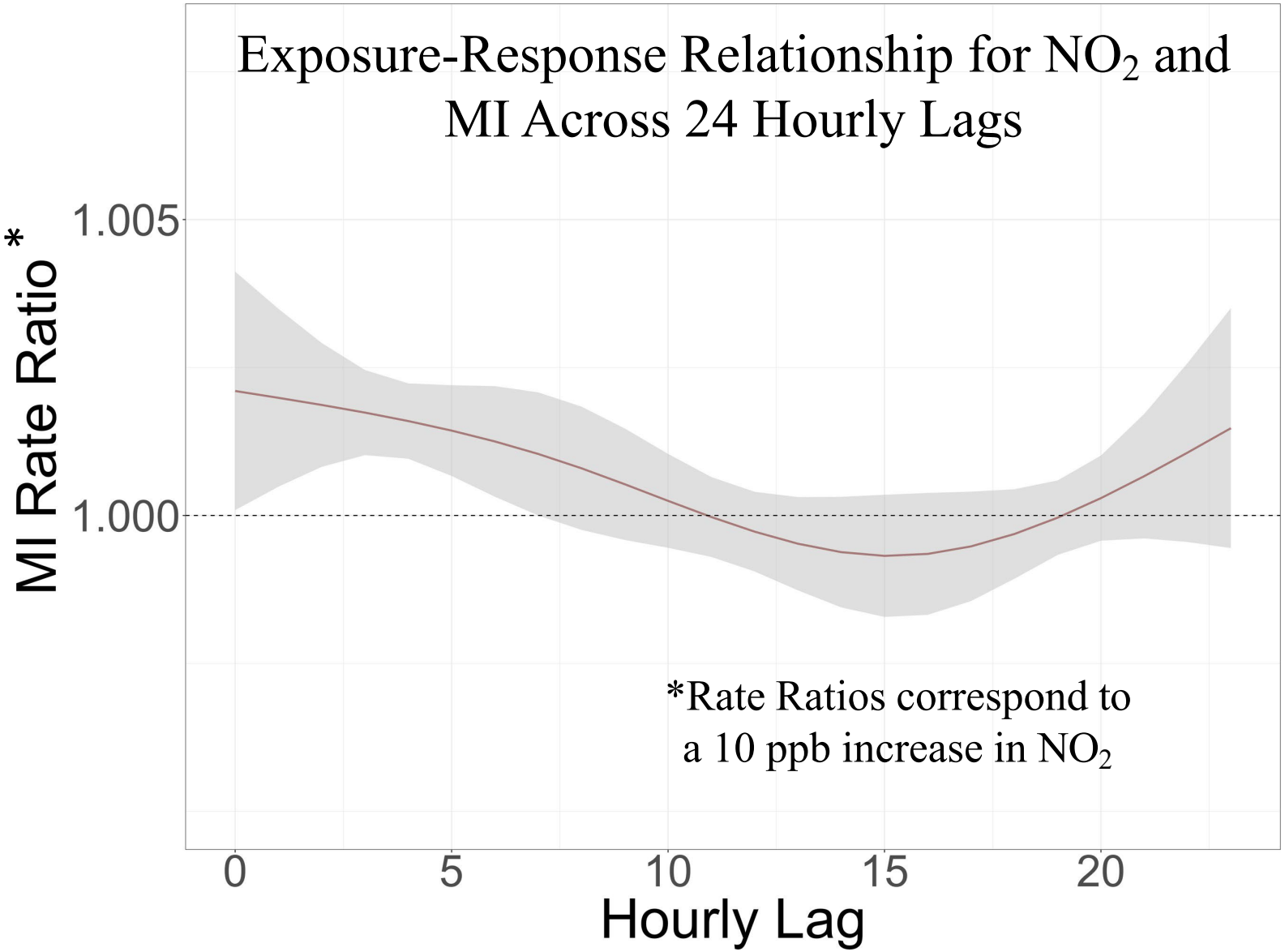


It's also not clear if exposure to even 1 or 2 hours of traffic pollution, at lower concentrations, can trigger a heart attack.

This information is critical to ensure hourly air pollution standards protect health.

Objective: Characterize the hourly hazard period for heart attacks (MI) after short-term NO_2 exposure in a US state with NO_2 levels below the air quality standard

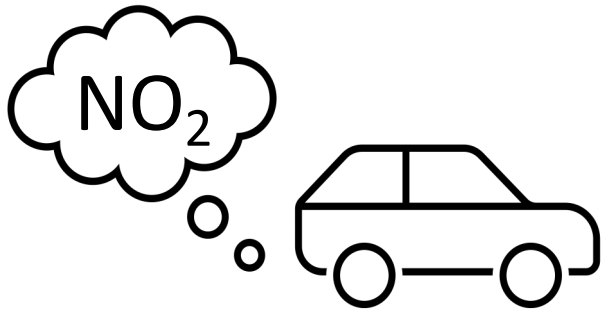
We found that traffic pollution can trigger a heart attack within six hours of exposure, even at concentrations below the current quality standard.



Our findings suggest that current hourly air quality standards may be insufficient to protect cardiovascular health.

Mean NO_2 concentration in our study period (2000-2015):
23.2 ppb

Current air quality standard:
100 ppb
(98^{th} Percentile of 1-hour daily max concentrations, averaged over 3 years)



Winner Presentation

Dr. Matt Shupler

Harvard University, University of Liverpool

Put your money where the stove fits: Using household air pollution measurements to prioritize locations for clean cooking intervention in sub-Saharan Africa

CLEAN Air Africa

Global Health Research Group

Matt Shupler

April 30, 2023

FUNDED BY
NIHR National Institute for Health and Care Research

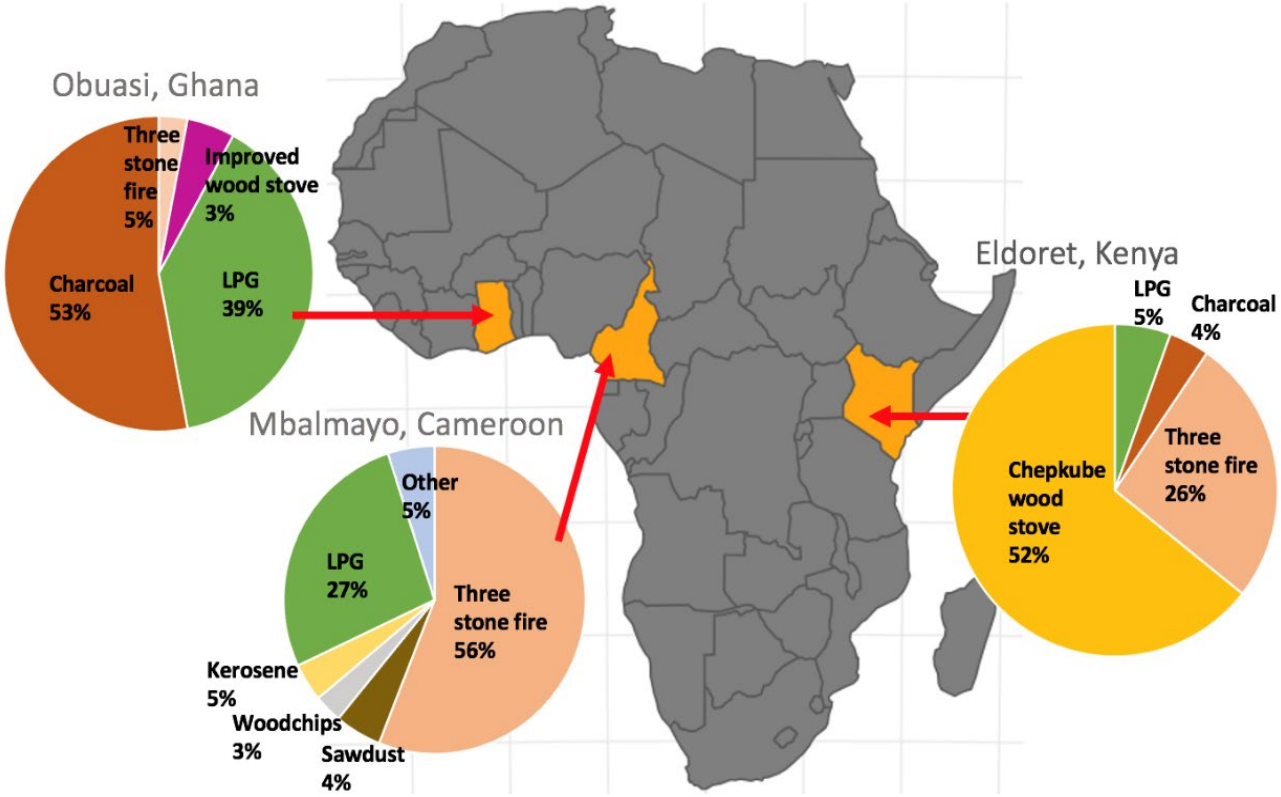
UKaid from the British people

24-hour household air pollution
$PM_{2.5}$ monitoring

Kitchens, cooks and children (<5)

(n=80 per community)

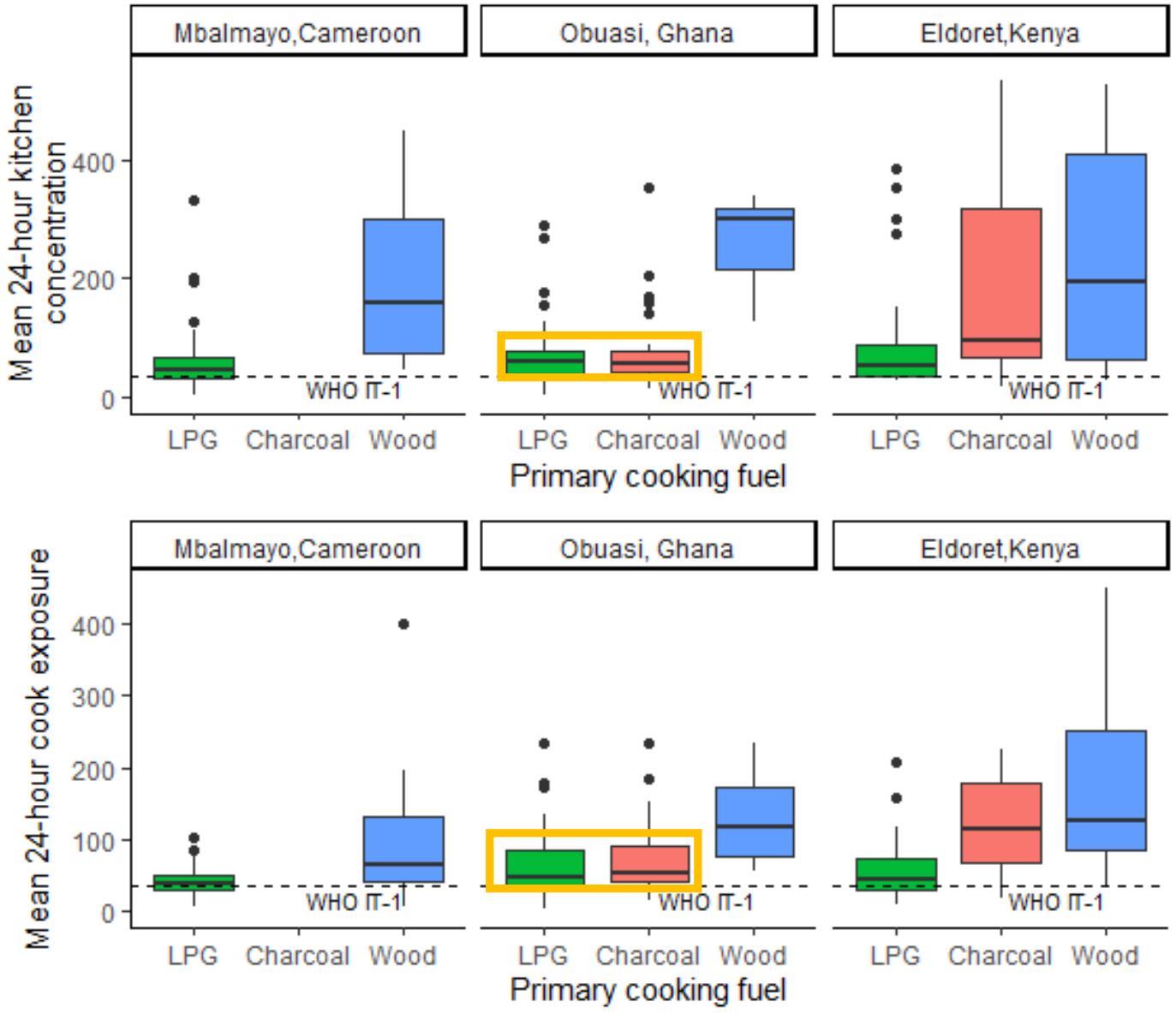
(40 LPG and 40 biomass)



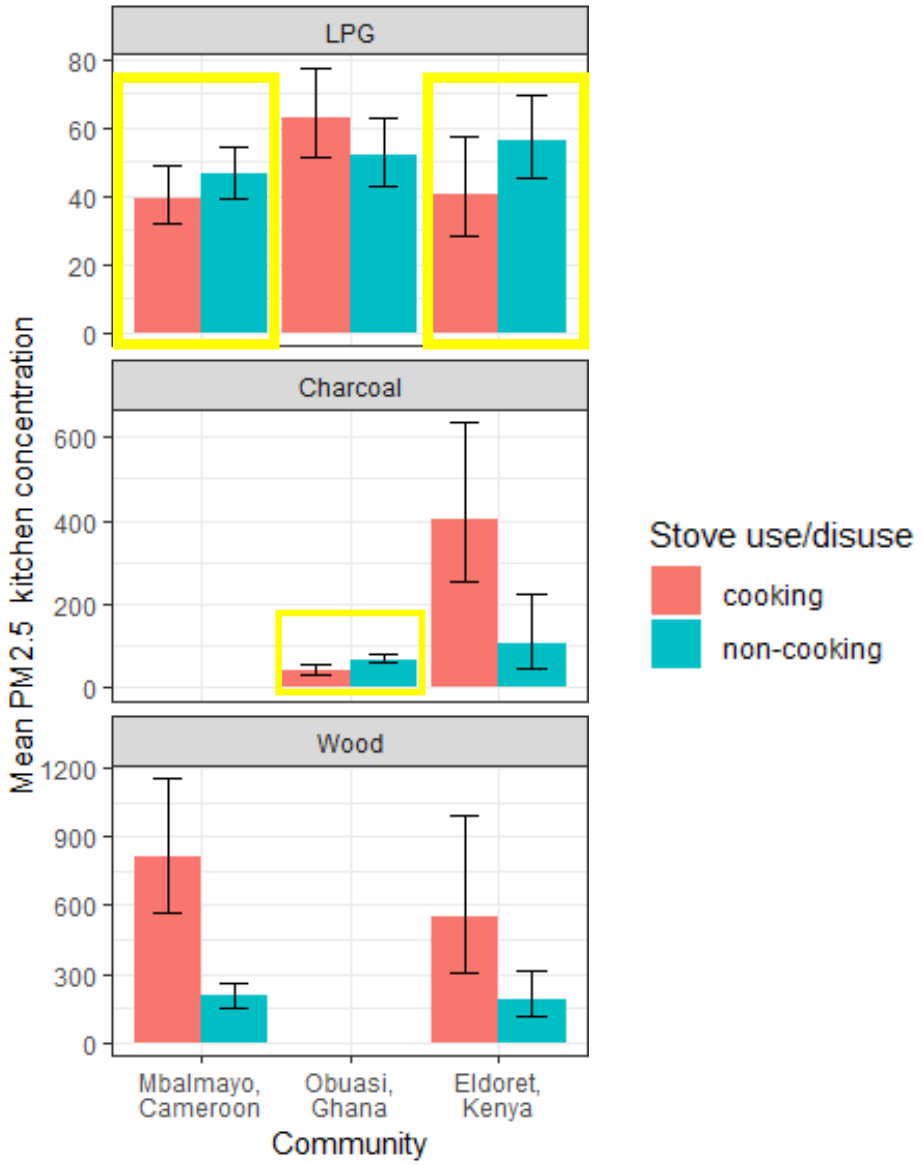
Kitchen monitoring

Cook monitoring

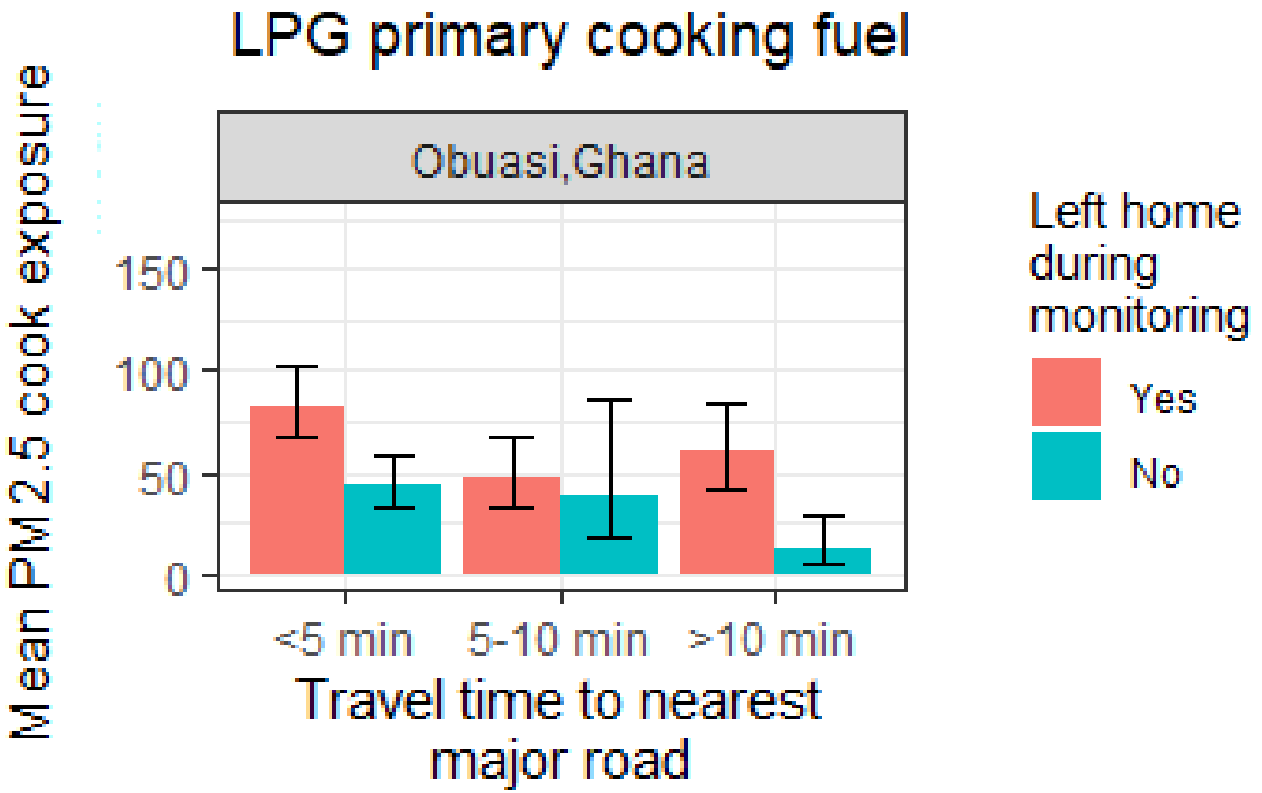
Average 24-hour $PM_{2.5}$ concentrations by primary fuel type & community



Average $PM_{2.5}$ kitchen concentrations during cooking and non-cooking periods



Average $PM_{2.5}$ cook exposures among households using LPG by proxies of ambient $PM_{2.5}$ exposure



Thank You Jane Warren Award Winners

Falco J. Bargagli Stoffi
Harvard University

Sabrina S. Chow
Emory University

Libby Koolik
University of California, Berkeley

Alina McIntyre
Boston University

Jenni A. Shearston
Columbia University

Matt Shupler
Harvard University, University of Liverpool