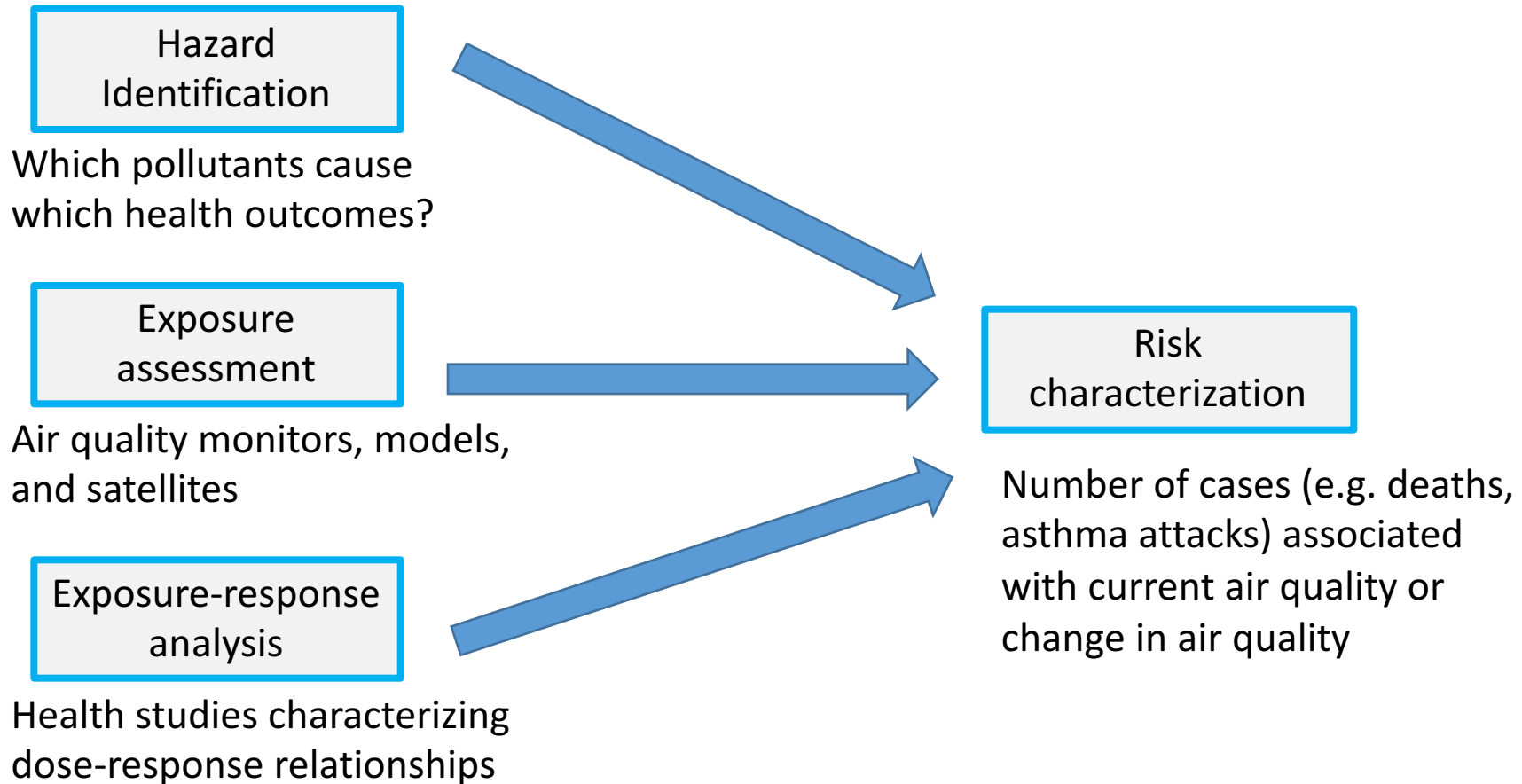


NASA HAQAST Hi-Res Tiger Team: Neighborhood-scale air pollution health impact assessment

Susan Anenberg, PhD
George Washington University

September 28, 2018
Stakeholder telecon

Risk assessment framework



Health impact function

$$\Delta Mort = (1 - e^{-\beta \Delta X}) \times Pop \times y_0$$

Attributable fraction

Baseline cases of disease

Annual cases of health outcome that are attributable to the pollutant

Epidemiologically-derived concentration-response factor

Concentration

Population exposed

Baseline disease rate

Estimated impacts of PM_{2.5} in the U.S. at county scale

PM_{2.5} associated with 130,000 - 320,000 premature deaths in the U.S. in 2005 (5.4% of all deaths nationwide)

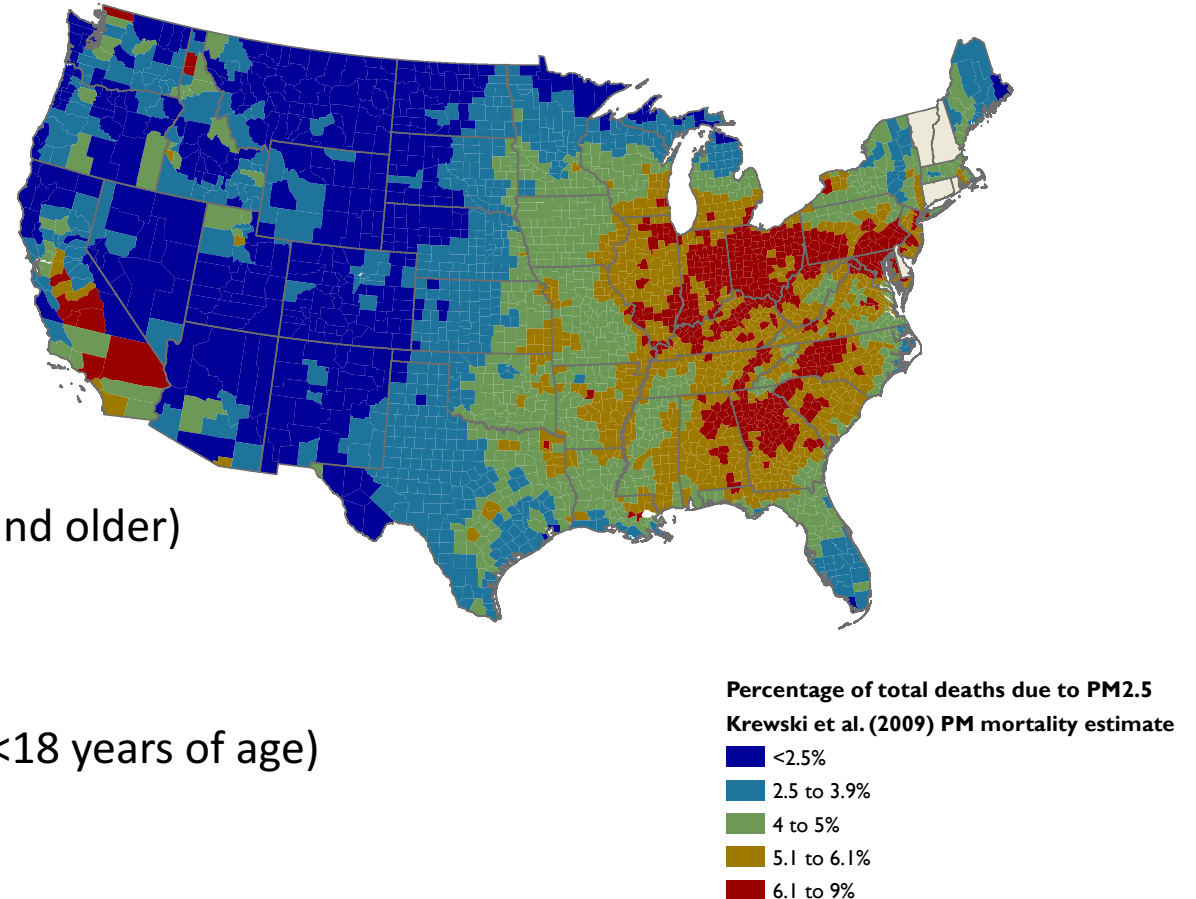
Other Effects:

Adults:

- 18,000,000 lost work days (age 18-65)
- 180,000 heart attacks (age 17 and older)
- 83,000 cases of chronic bronchitis (age 26 and older)
- 62,000 hospitalizations for cardiovascular effects (age 17 and older)
- 30,000 hospitalizations for respiratory effects (all ages)

Children:

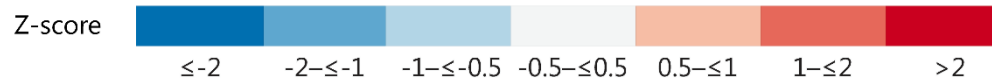
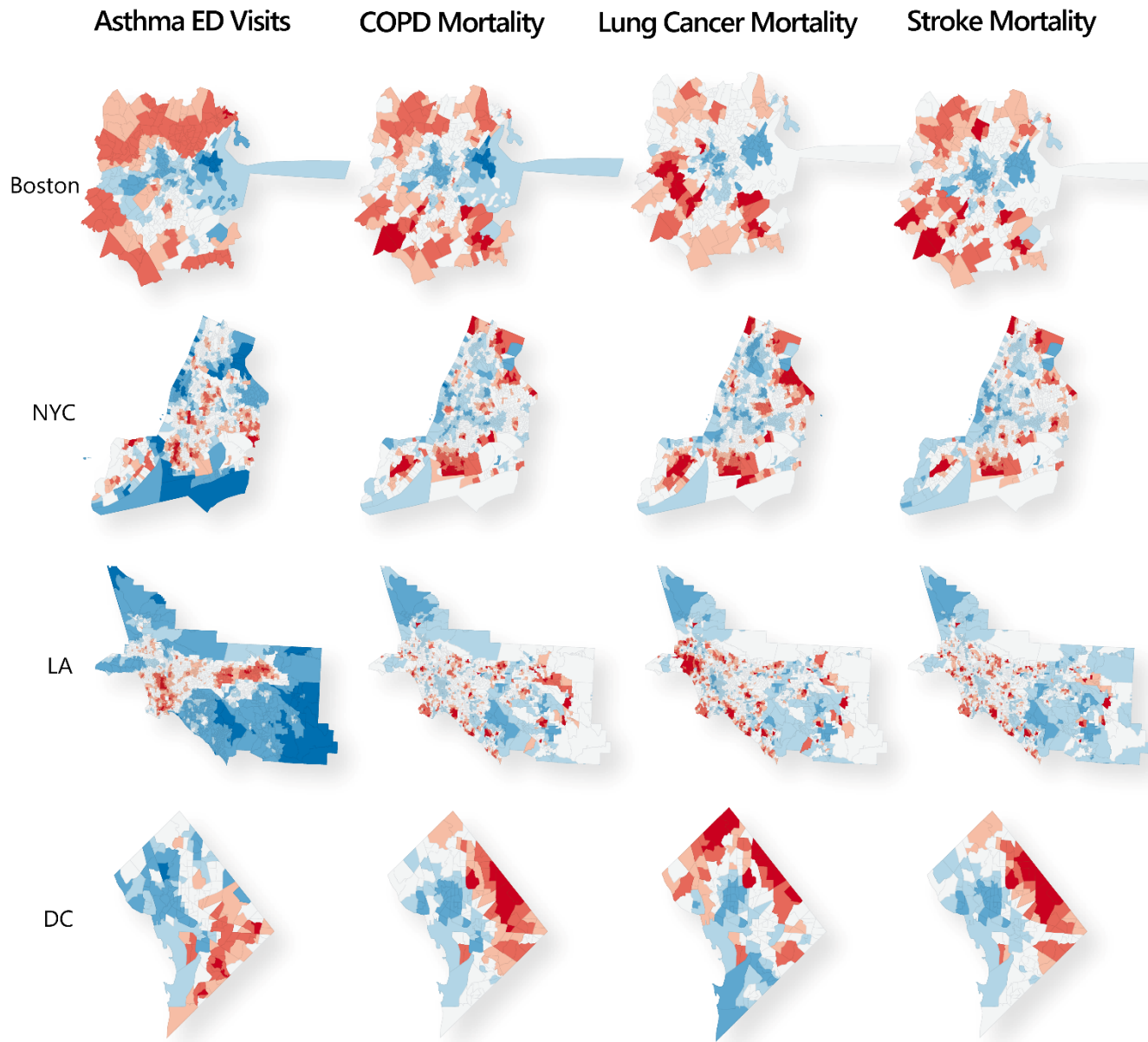
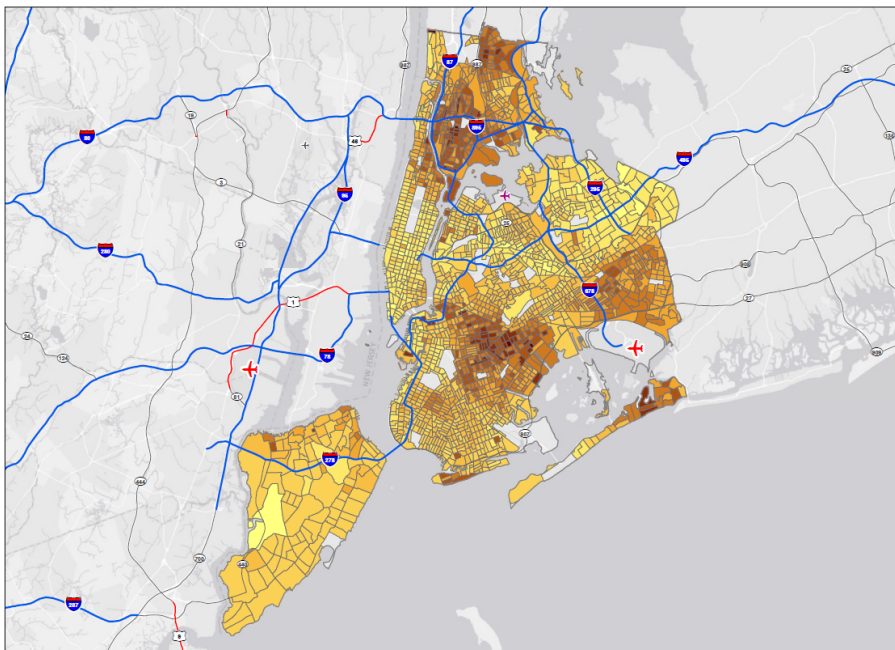
- 110,000 emergency department visits related to asthma (<18 years of age)
- 200,000 cases of acute bronchitis (age 8-12)
- 2,500,000 cases of exacerbation of asthma (age 6-18)



PM_{2.5}-attributable health impacts at census tract level

z-scores: # of standard deviations from mean

Disease rates vary within cities (CDC 2018)

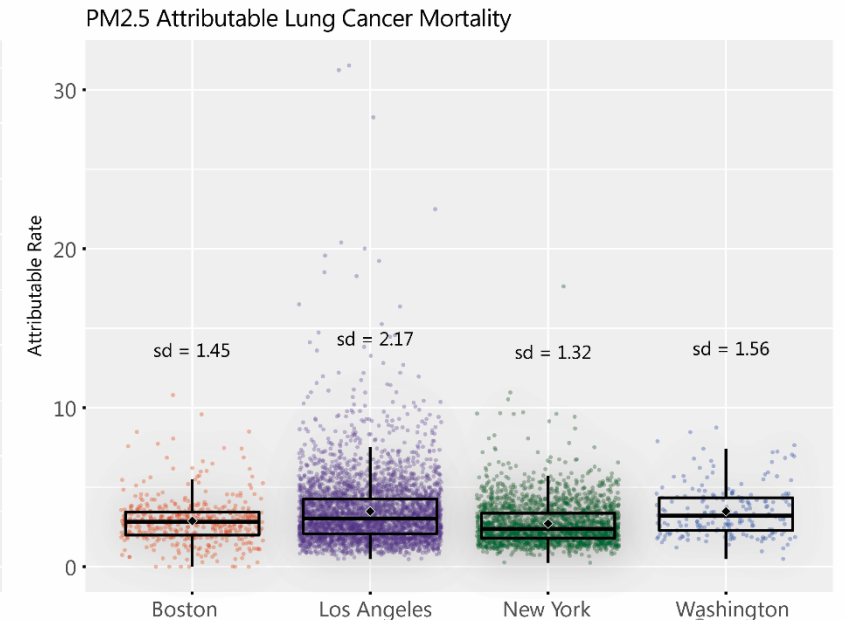
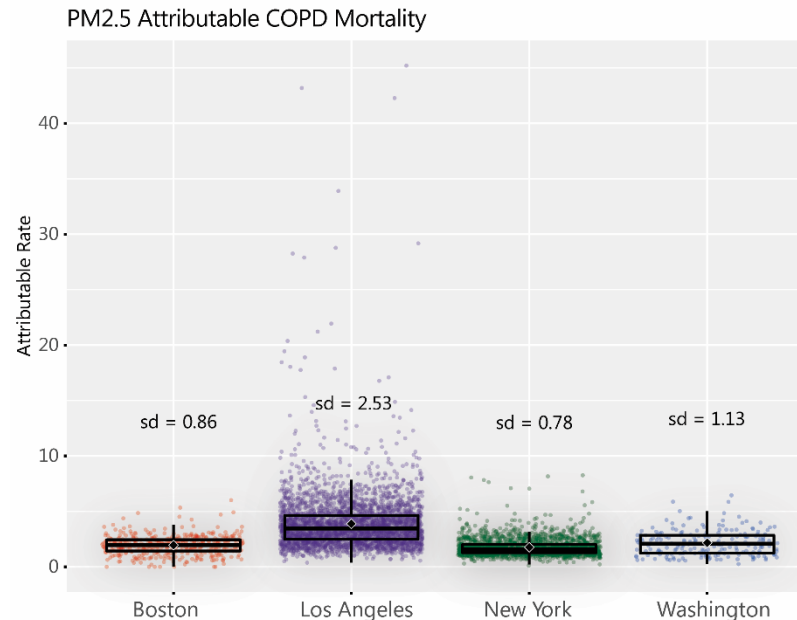
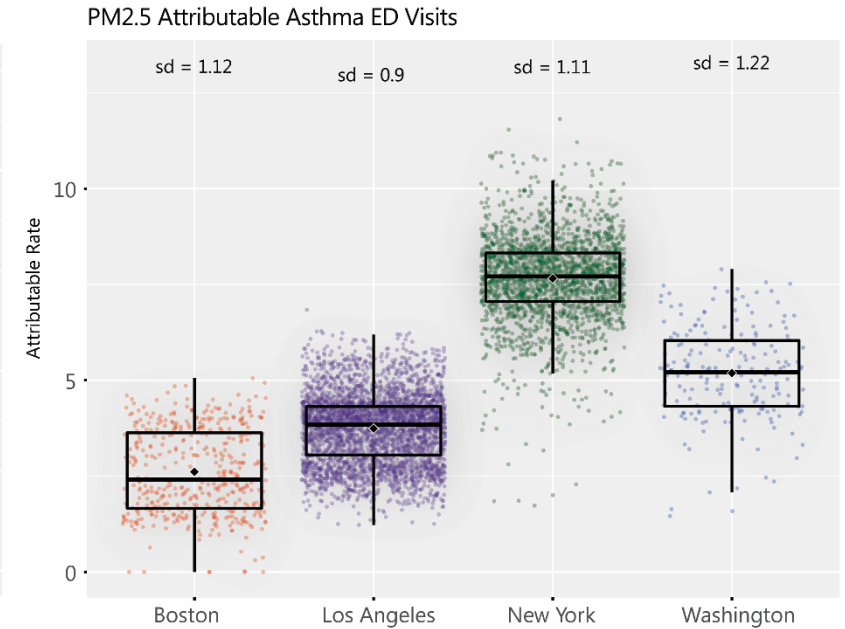
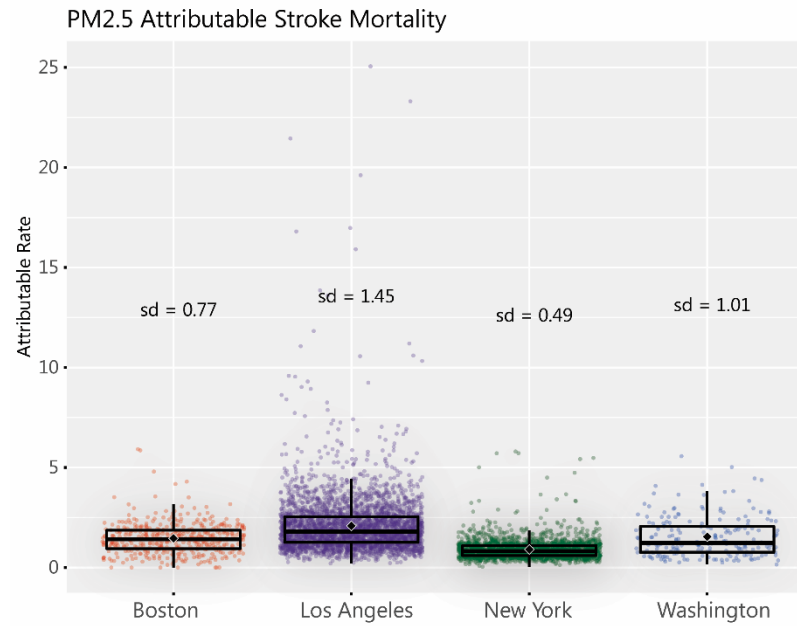


Preliminary results. Do not cite or quote.

PM_{2.5}-attributable health impact rates (cases per 100,000)

Intra-city variability often exceeds inter-city variability

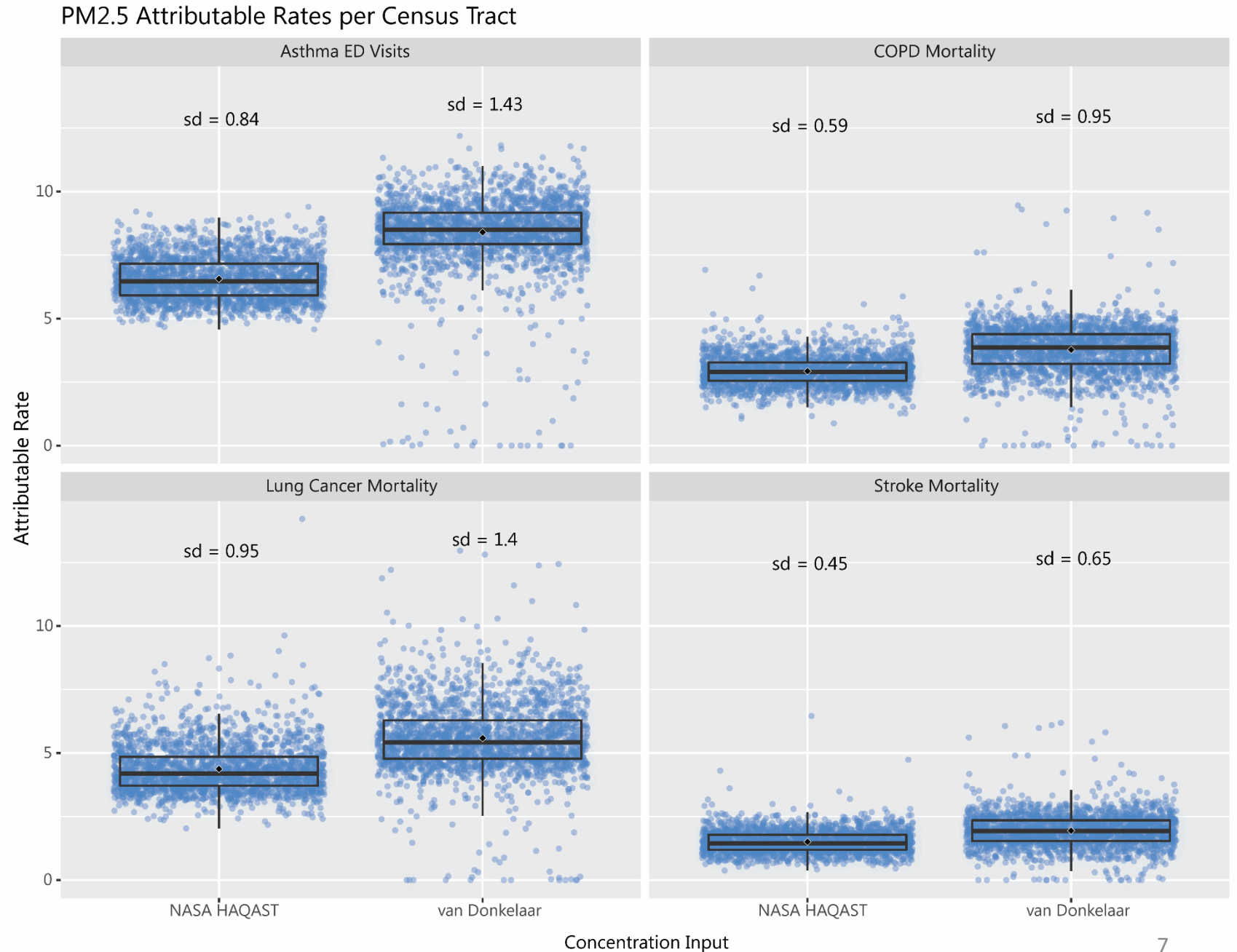
Preliminary results. Do not cite or quote.



NYC comparison using two different PM_{2.5} datasets

Different concentration estimates give different health impact results

Preliminary results. Do not cite or quote.

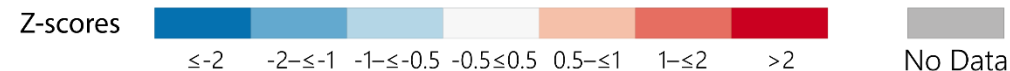
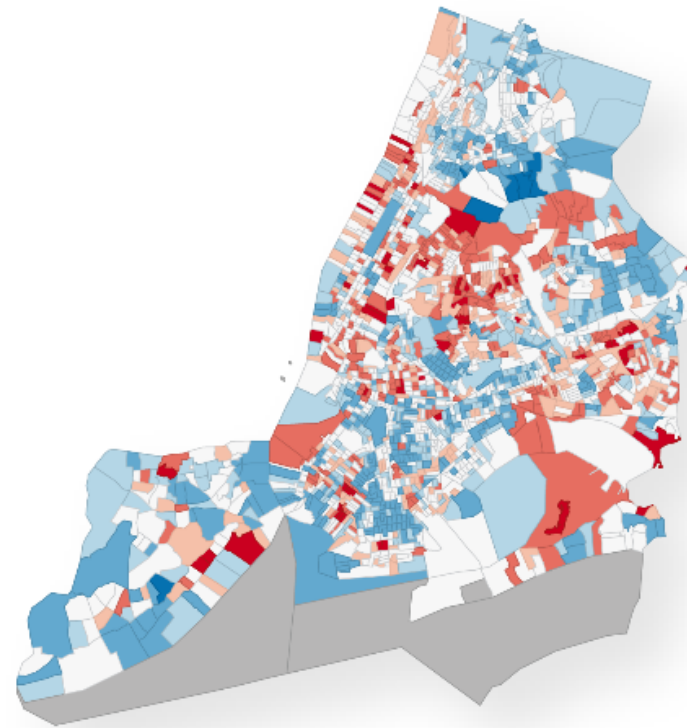
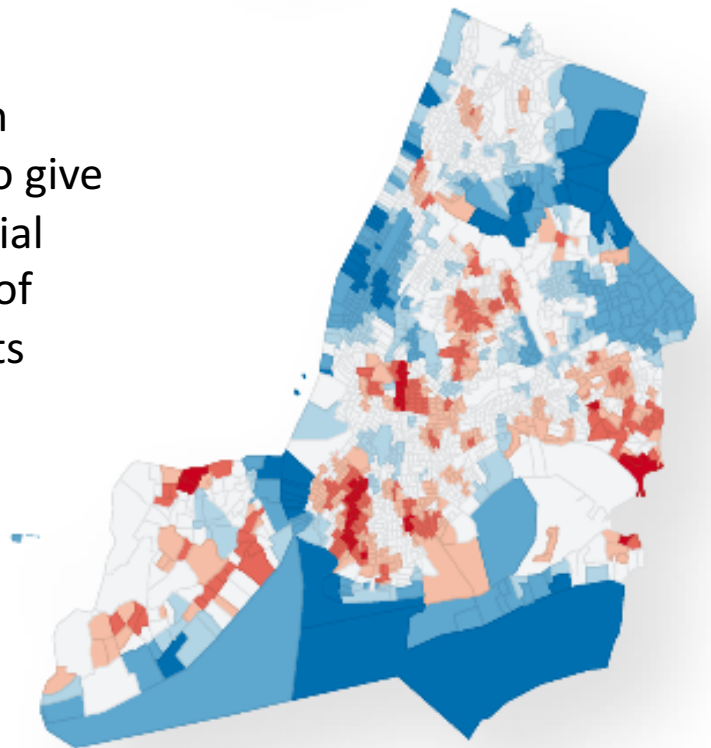


Hot spots of PM_{2.5}-attributable asthma emergency department visits in NYC

Global PM_{2.5} dataset
(van Donkelaar et al. 2016)

New HAQAST PM_{2.5} dataset

Different concentration estimates also give different spatial distributions of health impacts



Preliminary results. Do not cite or quote.

Summary

- We estimated health impacts attributable to $PM_{2.5}$ at the census tract level in 4 U.S. cities: Boston, DC, Los Angeles, and NYC
- Intra-city variability in $PM_{2.5}$ health impacts often exceed inter-city variability
- Different concentration estimates gives different magnitudes and spatial patterns of $PM_{2.5}$ health impacts
- This type of analysis can inform city efforts to target air pollution mitigation actions, reduce health inequities

Extra

Air pollution epidemiology

