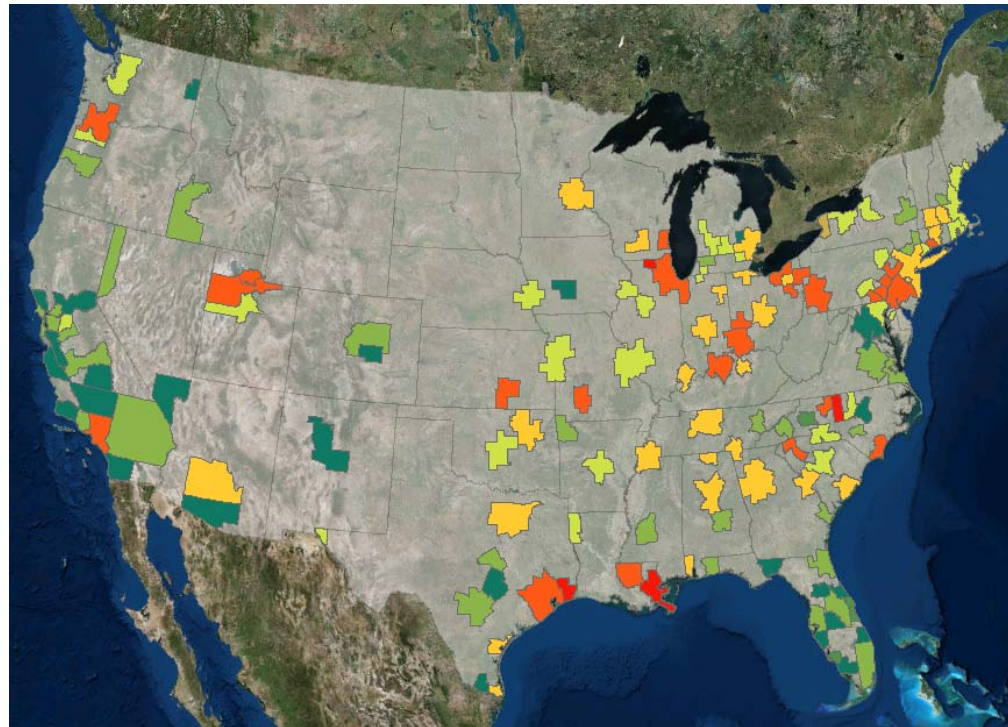Data Trends: A Closer Look

Is social inequality associated with worsening environmental quality?

Evidence from U.S. Metropolitan Areas

Justin Scoggins, Data Manager
Madeline Wander, Senior Data Analyst
USC Program for Environmental & Regional Equity (PERE)

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USC PERE / CSII

Our mission is to conduct research and facilitate discussions on issues of environmental justice, regional equity, immigrant integration—and the social movements that drive them.

Our work is rooted in the three R's: Reach, Relevance, and Rigor

USC PERE / CSII

We seek direct collaborations with community-based organizations in research and other activities, trying to forge a new model of how university and community can work together for the common good.

SOCIAL INEQUALITY AND ENVIRONMENTAL QUALITY
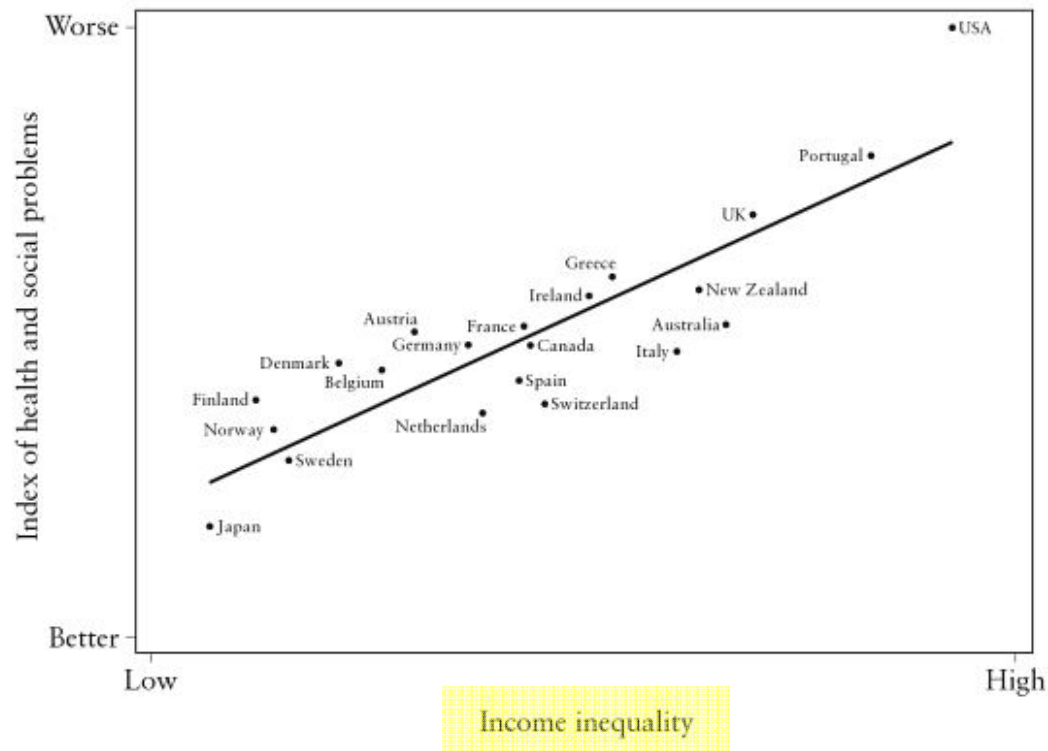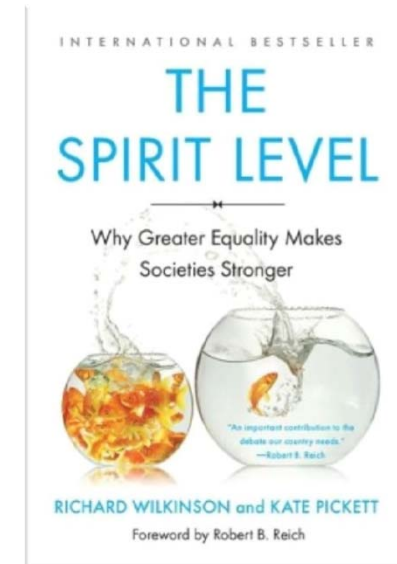
Unequal societies are less healthy.

Figure 2.2 *Health and social problems are closely related to inequality among rich countries.*

Wilkinson & Pickett (2009) *The Spirit Level*
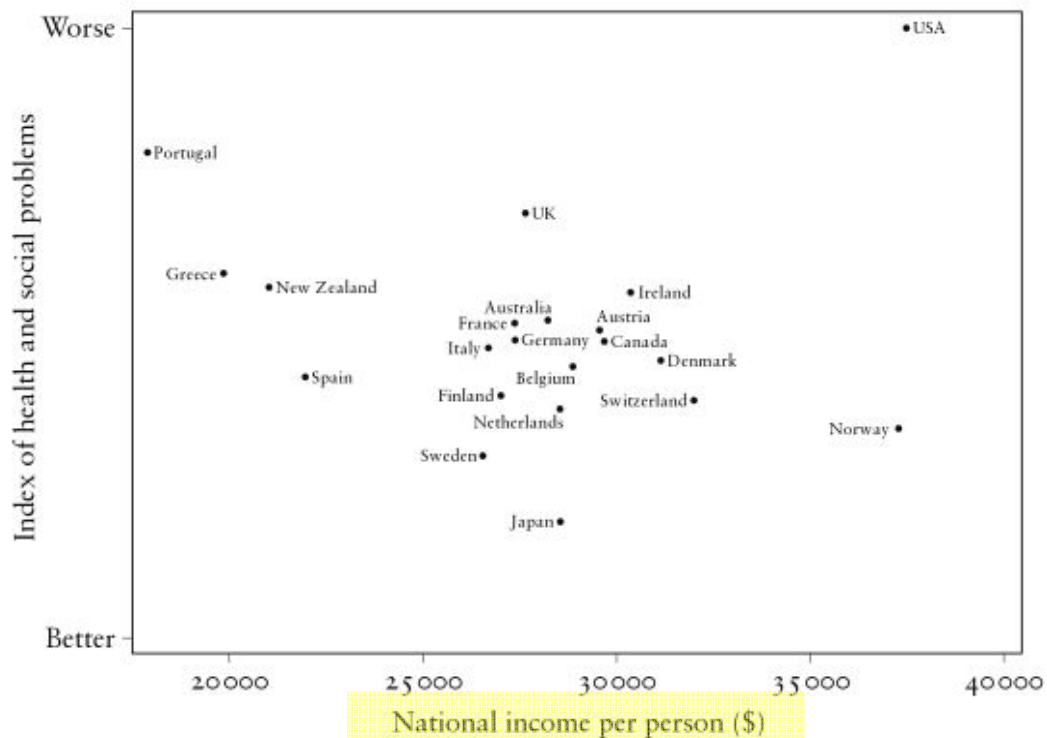
And income doesn't tell the whole story.

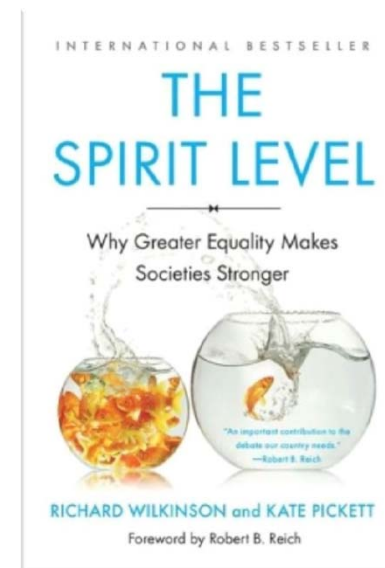Figure 2.3 *Health and social problems are only weakly related to national average income among rich countries.*

Wilkinson & Pickett (2009) *The Spirit Level*

INSPIRATION FOR THIS WORK

Unequal societies also have lower economic growth.

More inequality seems to spell less sustained growth.
(years in growth spell)
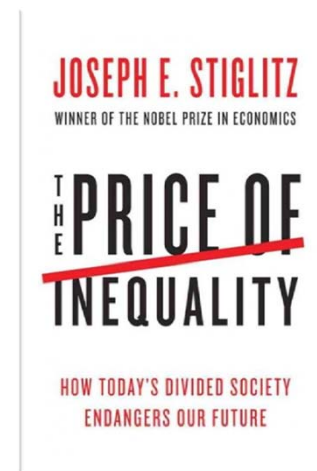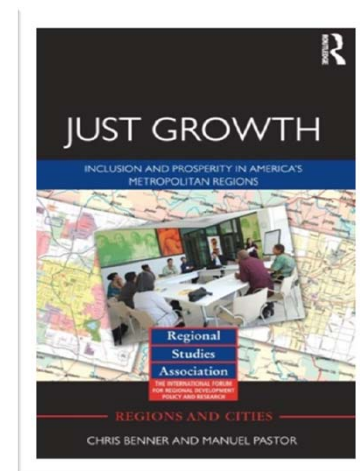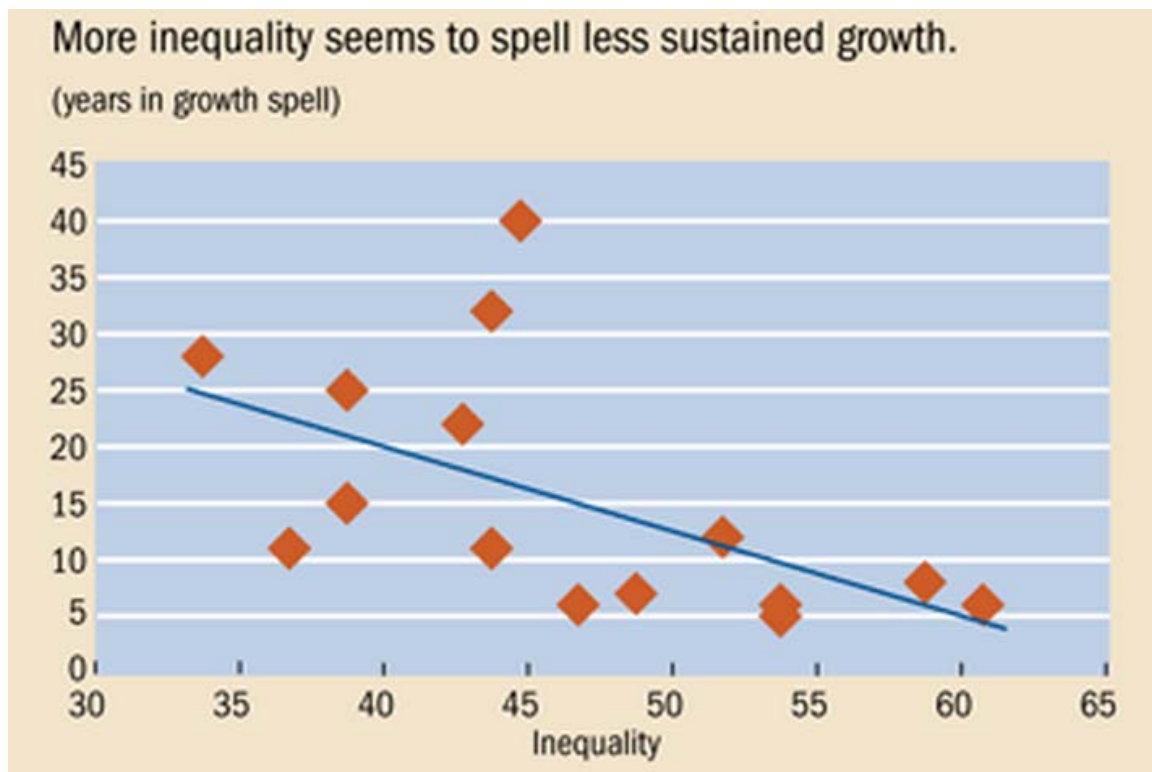
Left: Data is from 1950 to 2006; Berg & Ostry (2011) *Finance & Development*

RESEARCH QUESTION

So, we want to know: **Is there an analogous relationship between inequality and the quality of the environment?**

We hypothesize that social inequality is associated with poorer environmental quality.

TWO PHASES OF OUR ANALYSIS

- Literature review – broad evaluation of the theory and evidence linking inequality with environmental quality

- U.S. metro-area analysis – regression modelling of the dynamic relationship between inequality and environmental quality across the largest 150 metropolitan areas in the U.S.

The Haves, the Have-Nots, and the Health of Everyone: The Relationship Between Social Inequality and Environmental Quality

Lara Cushing,[1] Rachel Morello-Frosch,[2] Madeline Wander,[3] and Manuel Pastor[3]

[1]Energy and Resources Group; [2]Department of Environmental Science, Policy, and Management, and the School of Public Health; University of California, Berkeley, California 94720; email: lara.cushing@berkeley.edu, rmf@berkeley.edu

[3]Program for Environmental and Regional Equity, University of Southern California, Los Angeles, California 90089; email: mwander@dornsife.usc.edu, mpastor@dornsife.usc.edu
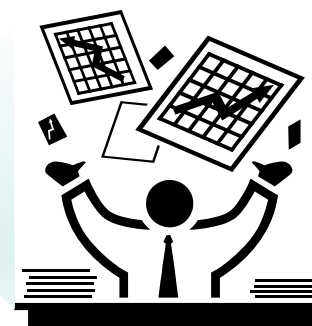
LITERATURE REVIEW: GOALS

Goals of literature review:

- Summarize theories on causal pathways
- Synthesize the empirical evidence
- Inform future work

We employed a broad definition of social inequality:

- Income or wealth (e.g. landholdings)
- Political power (e.g. civil liberties)
- Environmental hazard or risk (e.g. inequality in health burden of air pollution)
- Racial/ethnic inequality (e.g. segregation)

LITERATURE REVIEW: SCOPE

Number of Studies

- 57 peer-reviewed publications, book chapters or white papers
- Some look at several environmental outcomes, resulting in 117 "sub-analyses"

Scales of Comparison

- Econometric comparisons between countries predominate
- 21 papers look at inequality at smaller scales (states, counties, metro areas, villages, or groups of individuals)
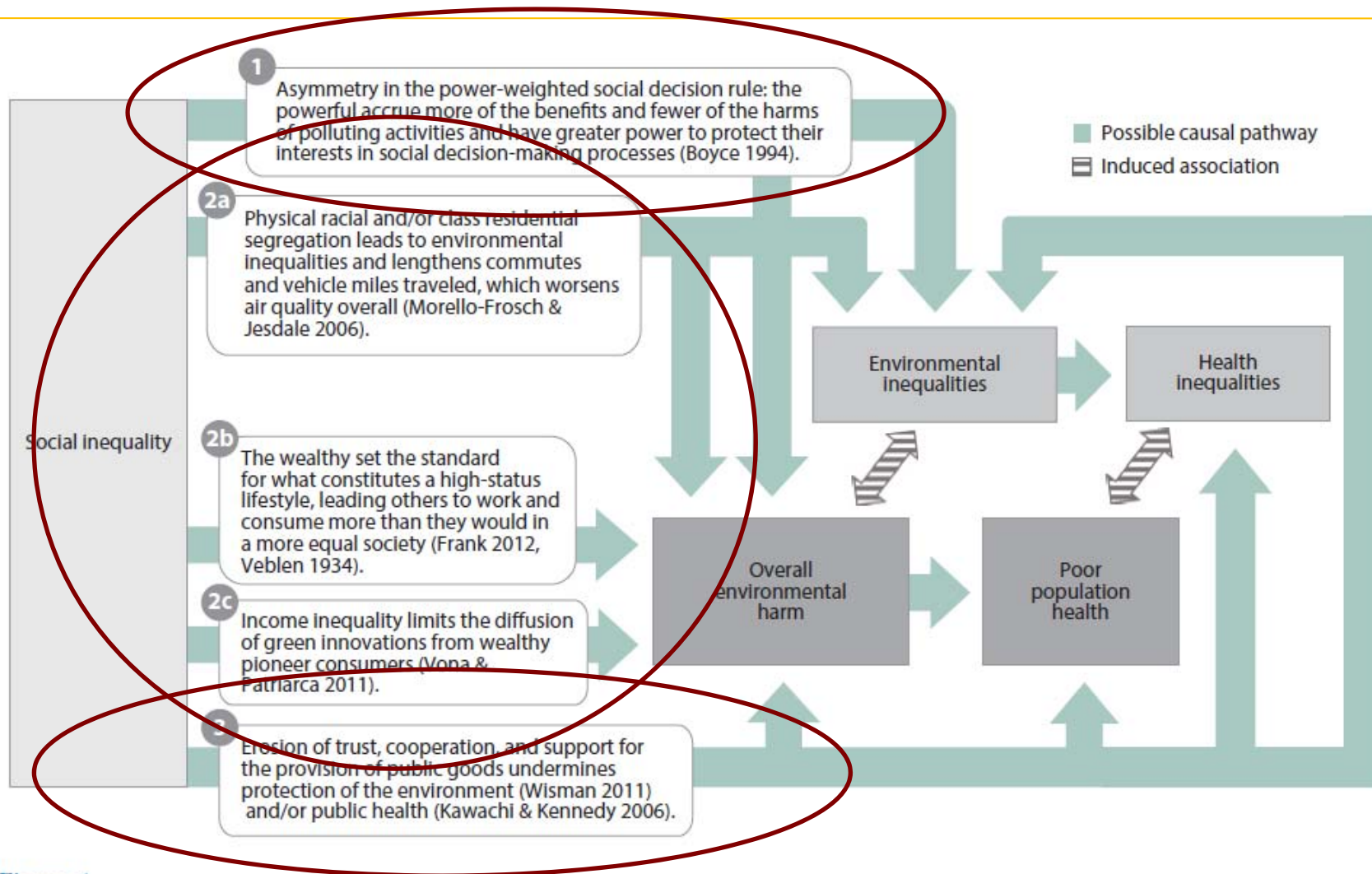
Figure 1

Explanations for a contextual or spillover effect of social inequality on the environment relate to (1) asymmetries in political power, (2) the relationship between inequality and the environmental intensity of consumption, and (3) the erosion of social cohesion and cooperation.

Source: Cushing, Morello-Frosch, Wander, & Pastor (2015) Ann. Rev. Public Health

How many sub-analyses support our hypothesis?

Ratio of *sub-analyses* (N=117) that:

1) at least conditionally support the equality sustainability hypothesis *vs.*

2) do not support the hypothesis or are inconclusive.

	Type of inequality				
	Income / Wealth (I)	Political power (P)	I & P	Environmental	Racial/ ethnic
Within countries (N=29)	10 : 2	3 : 0	2 : 1	3 : 0	5 : 3
Between countries (N=85)	15 : 14	13 : 10	19 : 14	-	-
Between groups of countries (N=3)	1 : 1	1 : 0	-	-	-

Do results differ by outcome?

Number of *sub-analyses* that support our hypothesis (N=117)

	Type of outcome					
	Air pollution (not CO_2)	CO_2	Water quality	Forests, soil & biodiversity	Environmental commitments & policies	Other composite measure
Yes	15	2	13	9	8	4
Conditionally	7	3	3	2	4	2
No	6	6	6	3	2	3
Inconclusive	10	2	5	-	2	-

LITERATURE REVIEW: CONCLUSIONS

1. Evidence supporting equality/sustainability hypothesis may in turn explain link between inequality and poorer health outcomes

2. Social inequality may degrade environment through asymmetries in political power that affect who experiences benefits and harms of pollution, by increasing environmental intensity of consumption, or decreasing social cohesion and cooperation to protect common resources

3. Evidence strongest for within-country studies and localized air pollutants as well as markers of access to safe water and sanitation

4. More research is needed, including more within-country studies and longitudinal analyses to help rule out unobserved confounding variables

U.S. METRO AREA ANALYSIS: EVIDENCE

Negative cross-sectional relationship between environmental quality & inequality found in:

➢ Ash et at. 2012 (minority discrepancy in and average exposures to air toxics)

➢ Jesdale et al. 2013 (segregation and heat-risk related land cover)

➢ Morello-Frosch & Jesdale 2006 (segregation and cancer risk from air toxics)
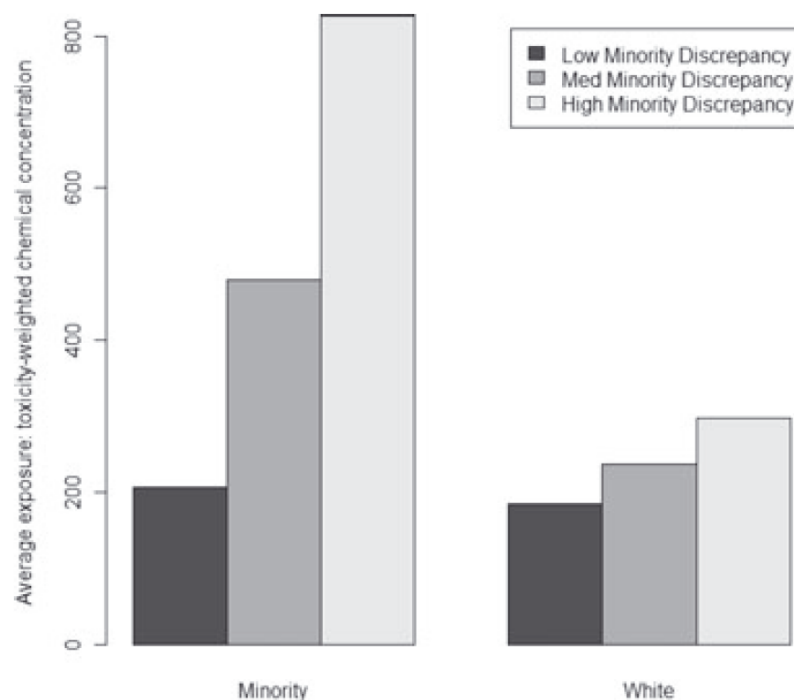
Ash, Boyce, Chang & Scharber (2012)

Soc. Sci. Quart.

U.S. METRO AREA ANALYSIS: APPROACH

How are initial levels of inequality associated with changes in environmental quality in the U.S.?

Approach:

- Analyze a wide variety of inequality measures across largest 150 metropolitan areas

- Estimate the longitudinal relationship between initial (base year) levels of inequality and subsequent changes in environmental quality

U.S. METRO AREA ANALYSIS: DATA

Measure of Environmental Quality

➤ RSEI modelled toxic concentration values

➤ Longitudinally consistent (same model, chemicals & industries over time)

➤ Examine period from 1998-2000 (avg) through 2008-2010 (avg)

Measures of Inequality

➤ Environmental (overall, by race and poverty status)

➤ Economic (overall, by race)

➤ Spatial (segregation by race/income)

➤ Political fragmentation

U.S. METRO AREA ANALYSIS: DATA

Measures of inequality included in analysis

Measures of inequality included in analysis	
Environmental Inequality: Overall (4 measures)	Share burden for most exposed 10% of population*
Environmental Inequality: by race (12 measures)	Concentration index* Difference in means* Difference in means for the most exposed 10% of population (POC - white)*
Environmental Inequality: by poverty (12 measures)	Concentration index* Difference in means* Difference in means for the most exposed 10% of population (poor - nonpoor)*
Income inequality: overall (3 measures)	Poverty rate, 1999 Gini coefficient for household income, 1999 80/20 household income ratio, 1999
Income inequality: by race (2 measures)	Difference in logged median wage for full-time workers (white - POC), 1999 Difference in median household income (white/Asian - Black/Latino), 1999
Spatial inequality (4 measures)	Dissimilarity index for POC, 2000 Multigroup segregation index, 2000 Poverty concentration, 2000 Ratio of principal city(ies) to suburban poverty rate, 2000
Political fragmentation (1 measure)	log of Metropolitan Power Diffusion Index, 1997

*Each measure calculated separately for (1) 1998-2000 average RSEI toxic concentration value; (2) 2005 NATA cancer risk; (3) 2005 NATA respiratory hazard;(4) 2005 NATA neurological risk.

Note:"POC" stands for people of color and includes all people who do not self-identify as non-Hispanic white.

Basic Model

For largest 150 metro areas, regress end year (2008-10) average toxic concentration on the base year (1998-00) level along with measures of inequality and controls.
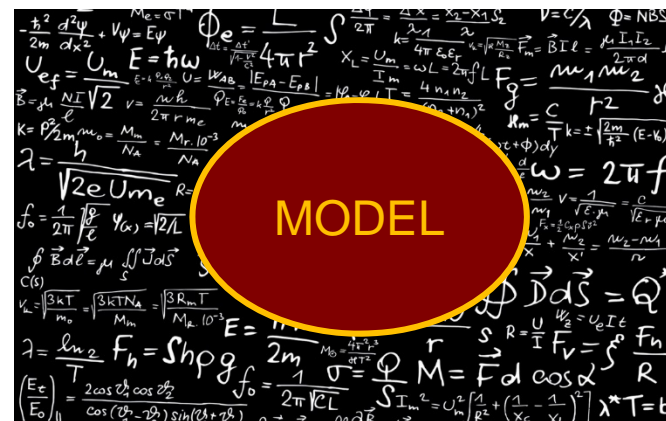
$$ToxCon_t = \alpha + bToxCon_{t-1} + cX + zY + e$$

Where   t = 2008-2010 average

t-1 = 1998-2000 average

X = measure(s) of inequality

Y = control variables

α, b, c, z = regression coefficients

MODEL

U.S. METRO AREA ANALYSIS: RESULTS

Measures of inequality found to be significant

Measures of inequality included in analysis	
Environmental Inequality: Overall (4 measures)	**Share burden for most exposed 10% of population***
Environmental Inequality: by race (12 measures)	Concentration index* **Difference in means*** **Difference in means for the most exposed 10% of population (POC - white)***
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*Each measure calculated separately for (1) 1998-2000 average RSEI toxic concentration value; (2) 2005 NATA cancer risk; (3) 2005 NATA respiratory hazard; (4) 2005 NATA neurological risk.

Note: "POC" stands for people of color and includes all people who do not self-identify as non-Hispanic white. In **bold** are measures found to be significant at the .15 level; in **bold red** are measures found to be significant at the .10 level. Each measure entered separately into model controlling for initial levels of environmental quality, the share of employment in the manufacturing industry, logged median household income, and the homeownership rate.

U.S. METRO AREA ANALYSIS: RESULTS

Pattern of results suggest...

➢ Higher levels of initial inequality are associated with worsening environmental quality

➢ Strongest relationships found for measures of overall environmental inequality, racial environmental inequality, and political fragmentation

➢ Weaker relationships found for environmental inequality by poverty status and racial segregation

➢ Inconclusive results found for income inequality (overall or by race)

RESULTS

U.S. METRO AREA ANALYSIS: CONCLUSIONS

Concluding thoughts…

➢ Focusing on equity (especially by race) could lead to a better environment for all

➢ Environmental justice advocates and more traditional environmentalists may have more in common than they think

➢ Strong link to political fragmentation suggests that cross-jurisdictional decision-making (i.e. at the regional level) may be critical

CONTACT INFO:

Justin Scoggins scogginj@dornsife.usc.edu
Madeline Wander mwander@dornsife.usc.edu