

Environmental Justice

Impacts of waste and pollution on communities surrounding
Chemical Plants

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Based on the article
“Inequity in consumption of goods
and services adds to racial-ethnic
disparities in air pollution exposure”

In the Proceedings of the
National Academy of Sciences
of the United States of America

C. W. Tessum *et al.*, “Inequity in consumption of goods and services adds to racial-ethnic disparities in air pollution exposure,” *Proc. Natl. Acad. Sci.*, vol. 116, no. 13, p. 6001, Mar. 2019, doi: 10.1073/pnas.1818859116.

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The disparities: some definitions

“On average, Black and Hispanic minorities bear a disproportionate burden from the air pollution caused mainly by non-Hispanic whites”

- This study is on the exposure to fine particulate matter (PM_{2.5}) pollution, but can be generalized to other kinds of pollution
- Racial-ethnic groups roughly defined as
 - Black – persons self-identifying as black or African American (~12% of the population)
 - Hispanic – persons self-identifying as Hispanic or Latinx (~17% of the population)
 - White/other – including non-Hispanic white (~62% of the population) plus all other race/ethnicity groups (~8% of the population)

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The disparities: some definitions

“On average, Black and Hispanic minorities bear a disproportionate burden from the air pollution caused mainly by non-Hispanic whites”

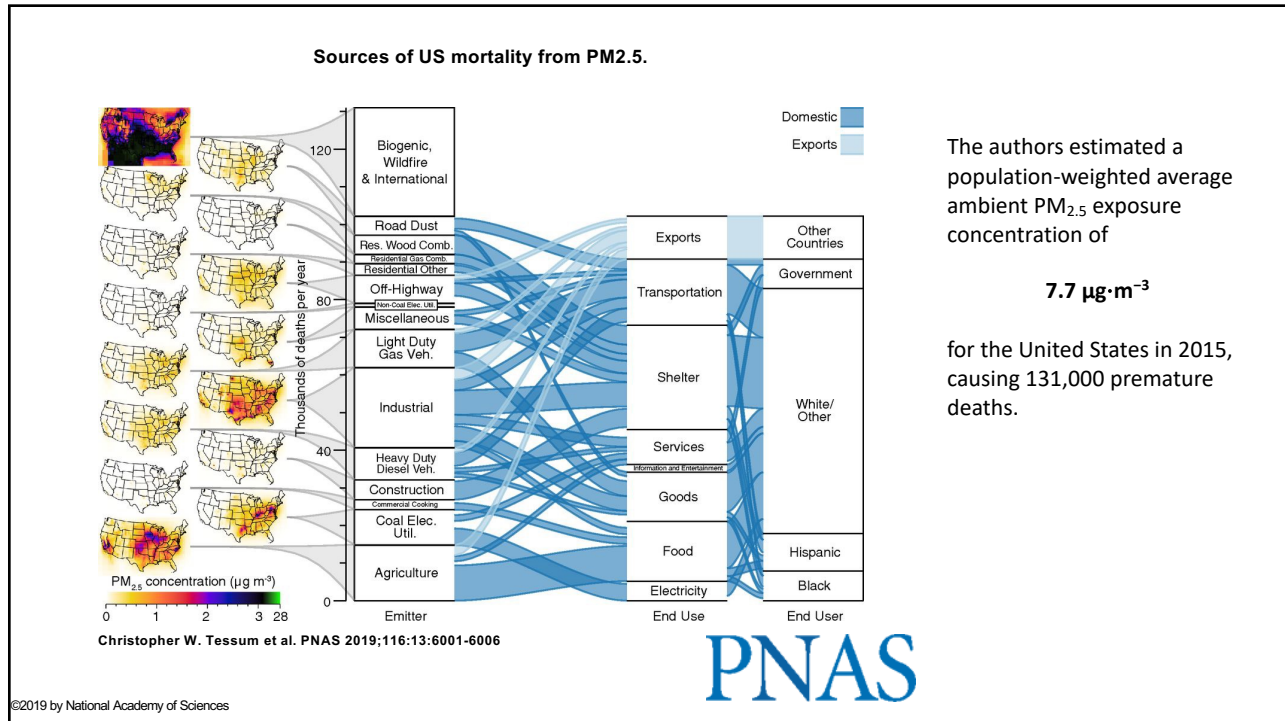
$$\text{Pollution inequity } (I_g) = \frac{E_g}{C_g} - 1$$

- E_g – Exposure to air pollution is defined as “the population-weighted average ambient concentration at places of residence” caused by all racial-ethnic groups
- I_g – Contribution to air pollution by that group, adjusted for population

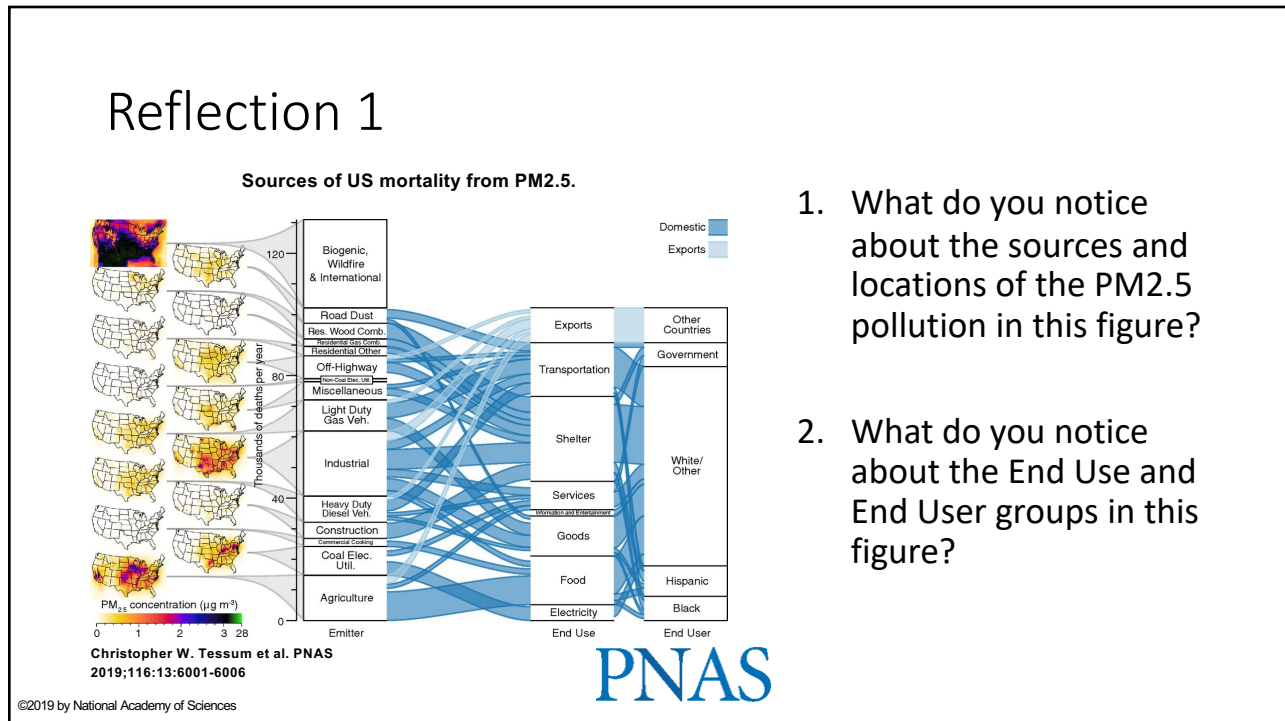
Positive values for I_g indicate that a group experiences more exposure than it causes (on average and after adjusting for population sizes).

Negative values indicate the opposite.

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Who is responsible for emitted PM_{2.5}?

- Responsibility for air pollution is typically assigned to its emitters – Clean Air Act
 - Factory, power plant, chemical plant, etc.
- But this study also connects the pollution released to the

end use (e.g., the purchase and use of manufactured goods)

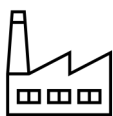
by

end users (e.g., individual consumers)



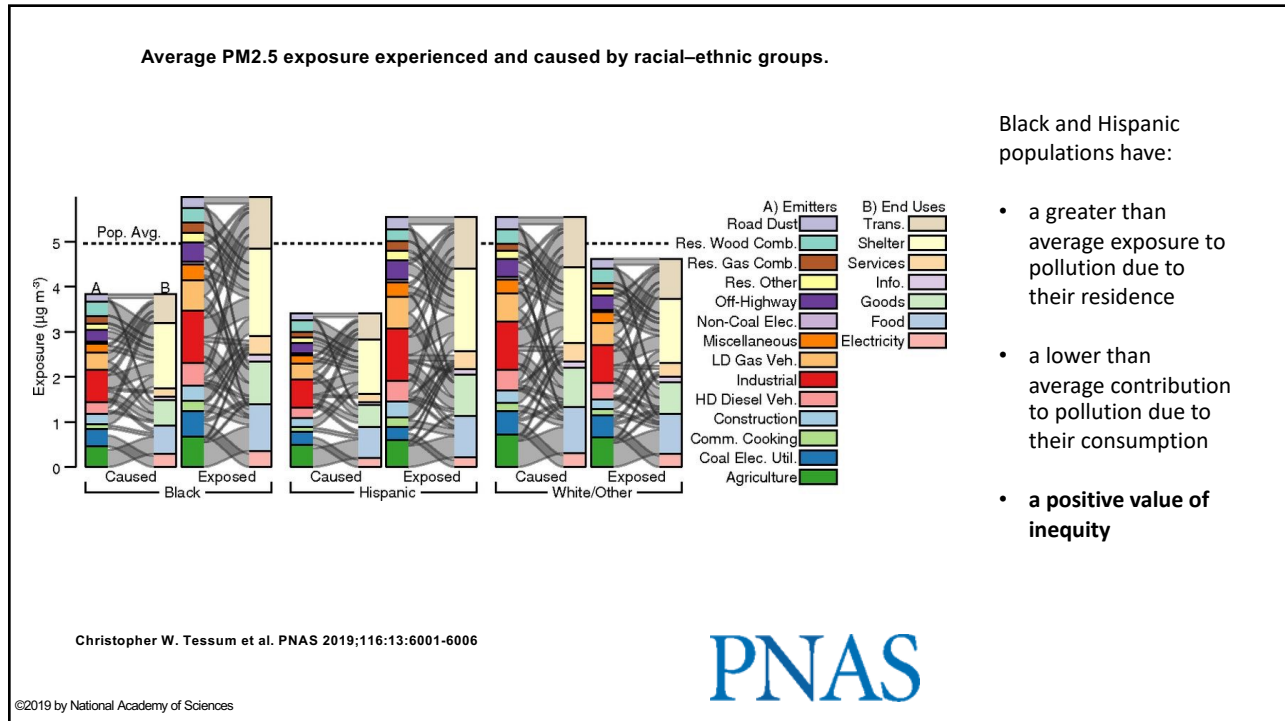
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Reflection 2

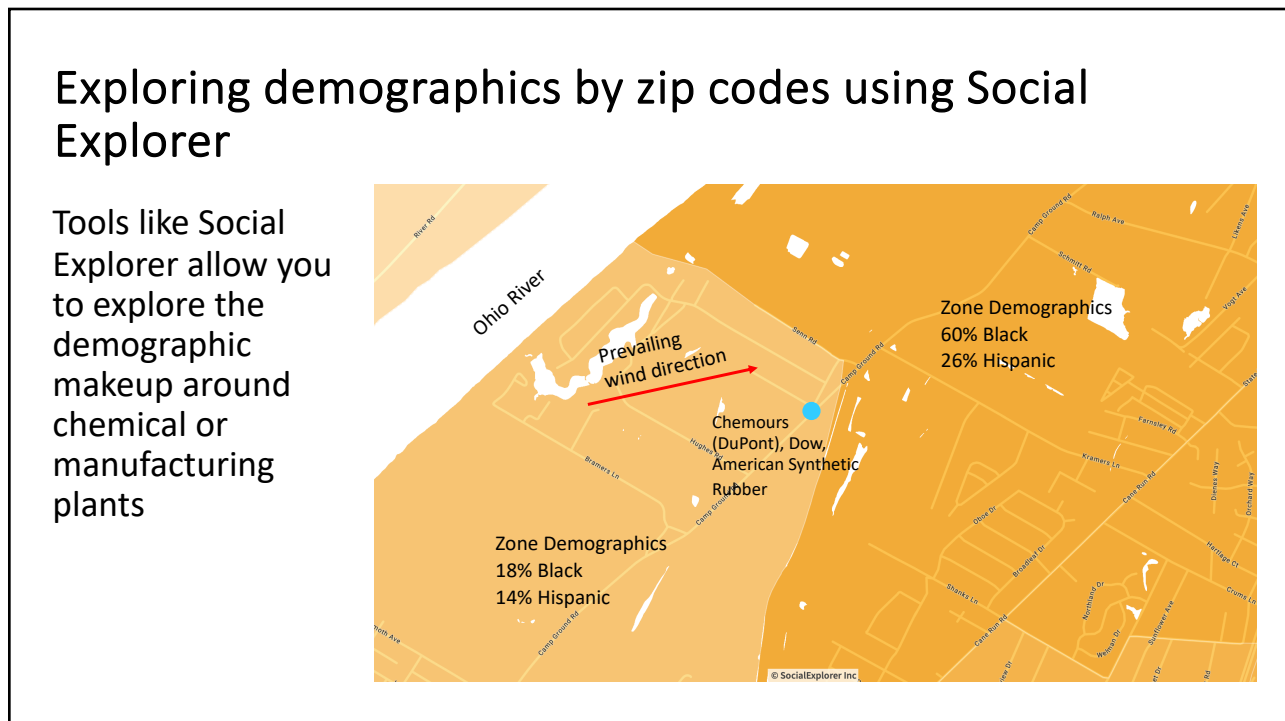


1. What are possible complications of assigning responsibility for pollution only to the emitters?
2. What are possible challenges of assigning responsibility for pollution to the end users?

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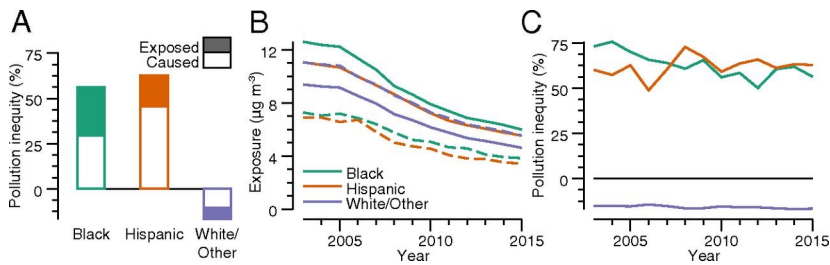
Trends and activism

- Laws on pollution have decreased some emissions
- Activists working toward reforms
 - Environmental Justice 4 All
<https://ej4all.org/about-us/overview>
 - Louisville Charter for Safer Chemicals
<https://smartpolicyreform.org/the-charter/the-louisville-charter>

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Pollution inequity contributions and trends.

Exposure averages have gone down, but inequities aren't really changing



Christopher W. Tessum et al. PNAS 2019;116:13:6001-6006

PNAS

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Reflection 3

What are other contributing factors to inequity?

- Zoning laws
- Historic segregation in cities
- Little connection between companies and the surrounding communities
- Little to no charitable giving or investment in the community by companies

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Reflection 4

What should you be thinking about in the design process?

- Who is benefitting from this product?
- What is the impact on pollution of this plant?
- Who bears the most impact of this plant's pollution?

- Assess and disclose the environmental and health impacts of your proposed design
- Use safer chemicals or processes
- Investigate potential safety or environmental hazards
- Less focus on econ, more focus on other socio-technical aspects in design process

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Reflection 5

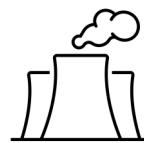
What are the barriers/obstacles to reducing injustice?

- economic
- regulatory
- technical
- organizational
- cultural
 - how to reach out to local communities
 - as well as the corporate culture

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Reflection 6

What opportunity do we have as engineers to make a difference?



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