

“Disparities in PM_{2.5} air pollution in the United States”

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joint work with Ian Hardman,
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Disadvantaged communities are disproportionately exposed to greater environmental risks

Much of our understanding is based on:

- Stationary sources of pollution, e.g. toxic waste plants
- Local case studies
- Snapshots in time

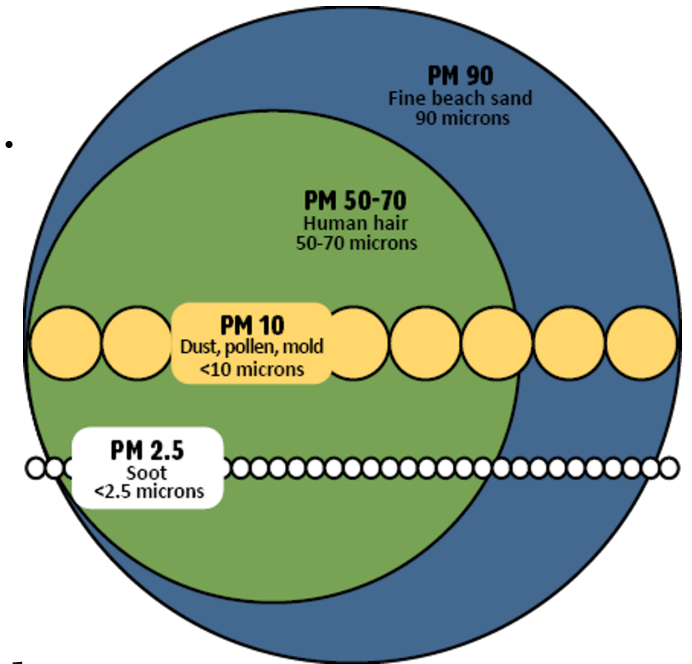
Our work focuses on building systematic evidence of environmental inequality across time and space

PM_{2.5} fine particulate matter

PM_{2.5} - particles 40 times smaller than a grain of sand.

Readily enter our lungs, bloodstream, and brain.

The health and economic consequences are pronounced.

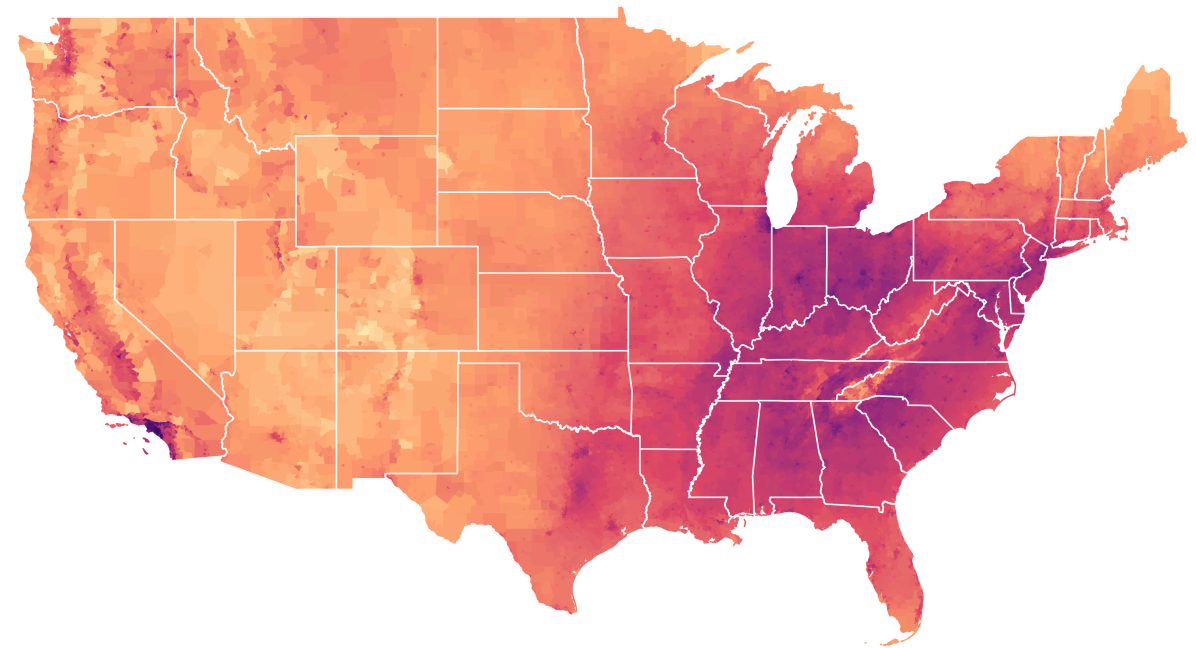
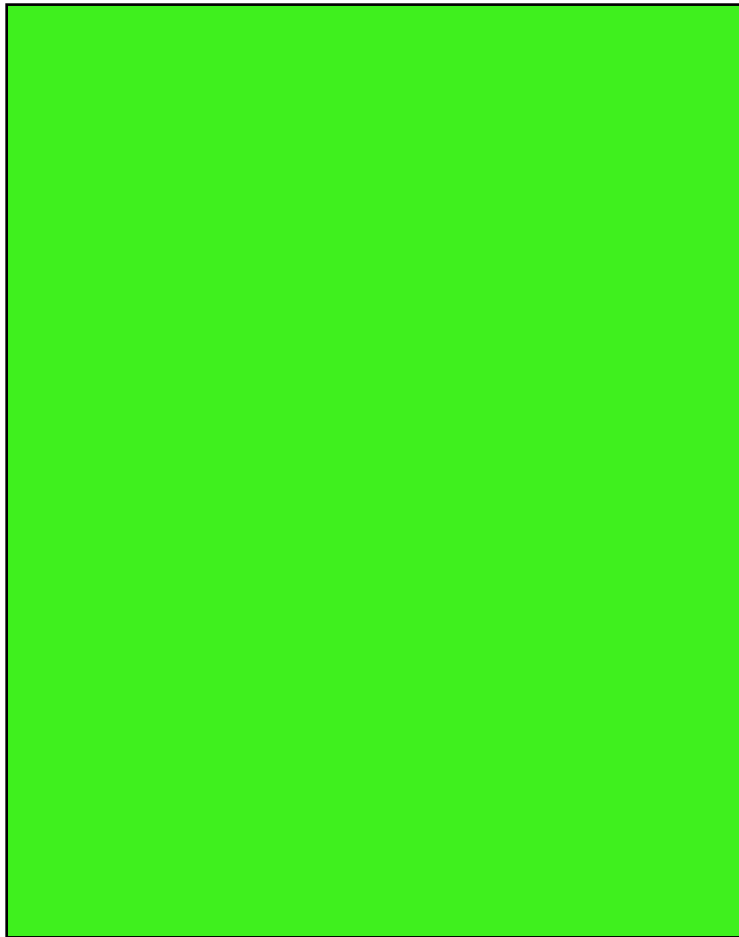


New Data

PM_{2.5} concentrations in the U.S.:

- > 8.6 million distinct locations
- Every year for nearly four decades (1981-2016).
- Derived from remote-sensing products, ground station data, and chemical transport models.

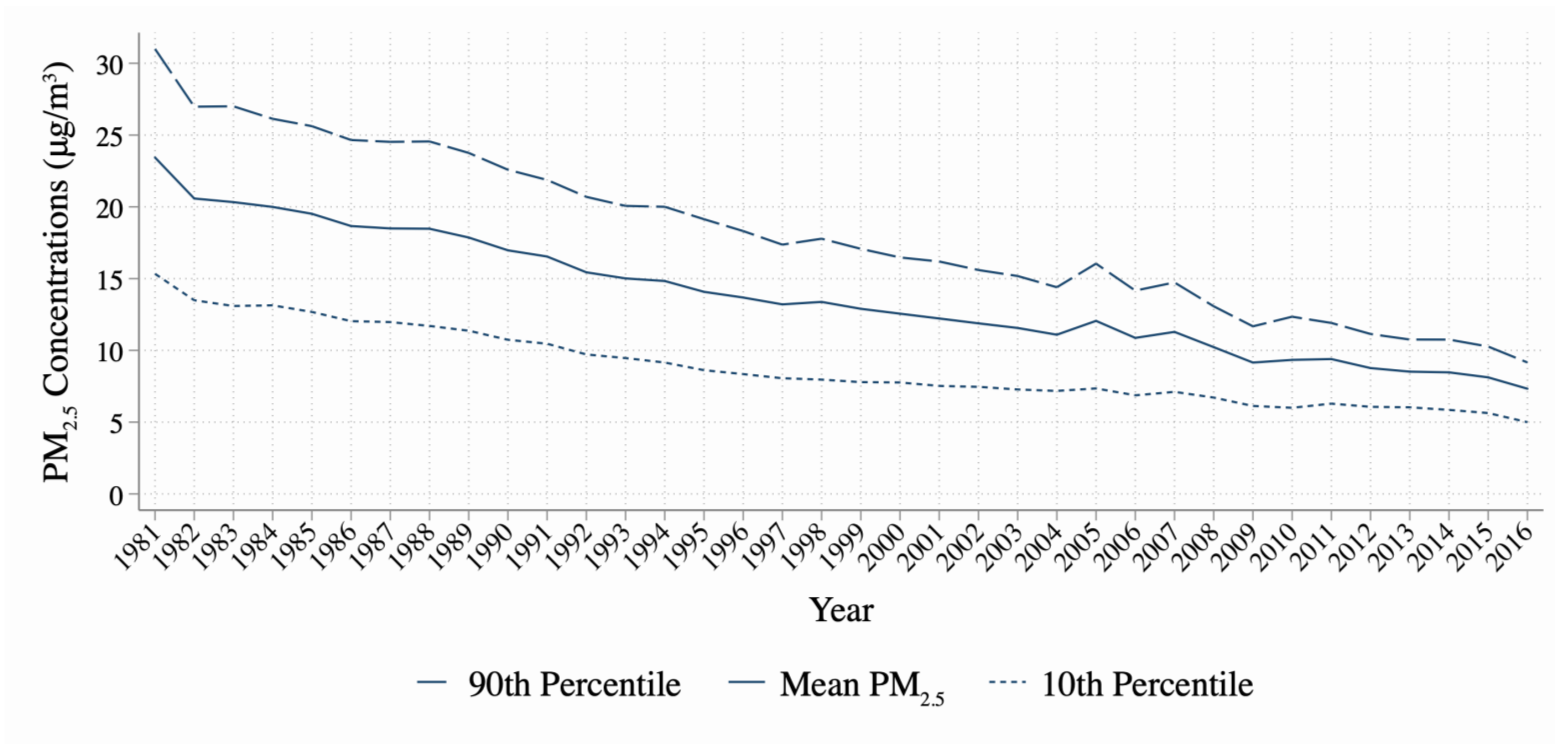
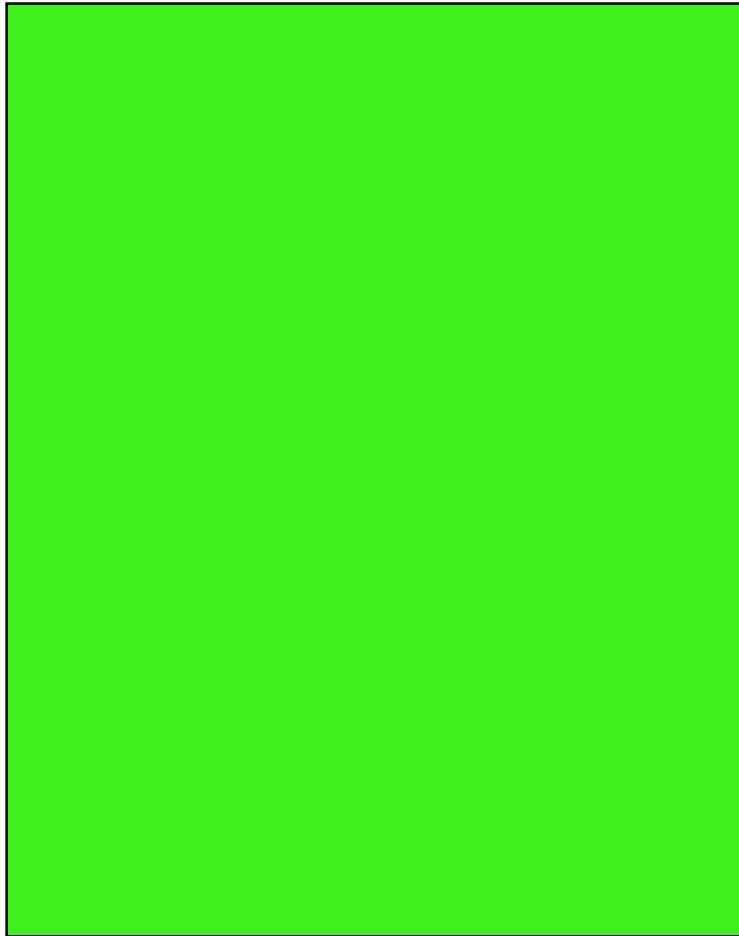
New Data



PM_{2.5} Concentration ($\mu\text{g}/\text{m}^3$) – 1981



Fine particulate matter air pollution has fallen 70% since 1981

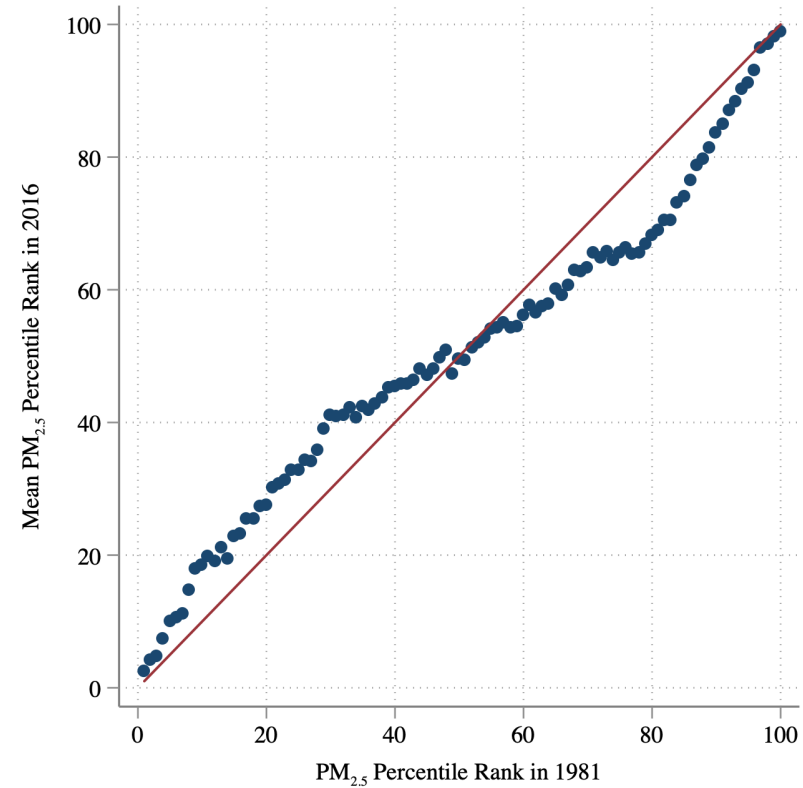
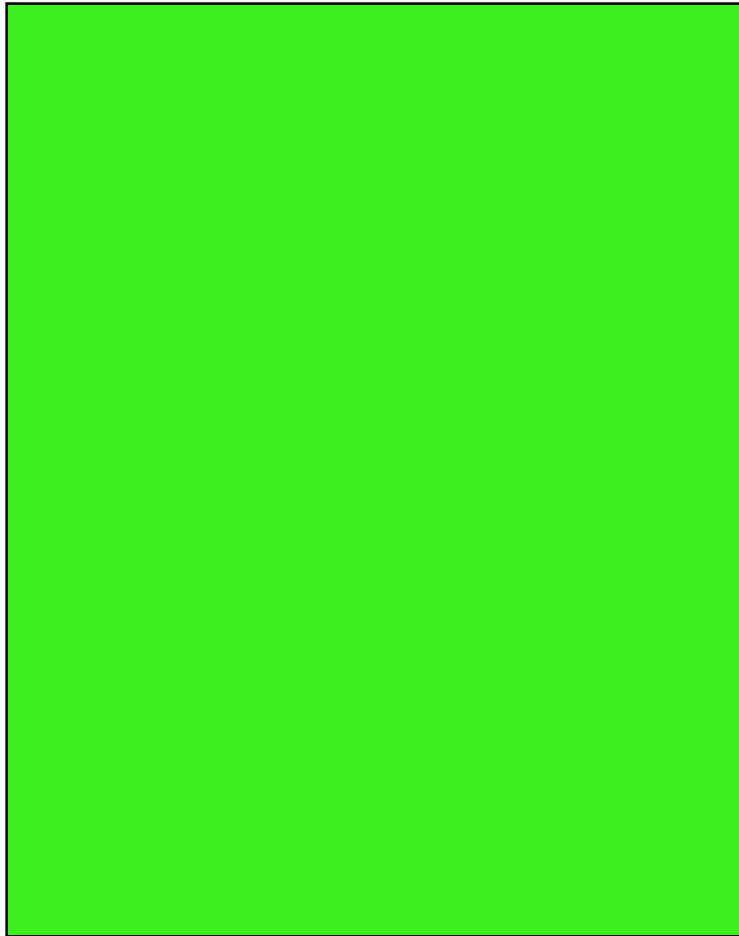


PM_{2.5} gaps

The PM_{2.5} gap between areas in the 90th and 10th percentile of the distribution has fallen since 1981.

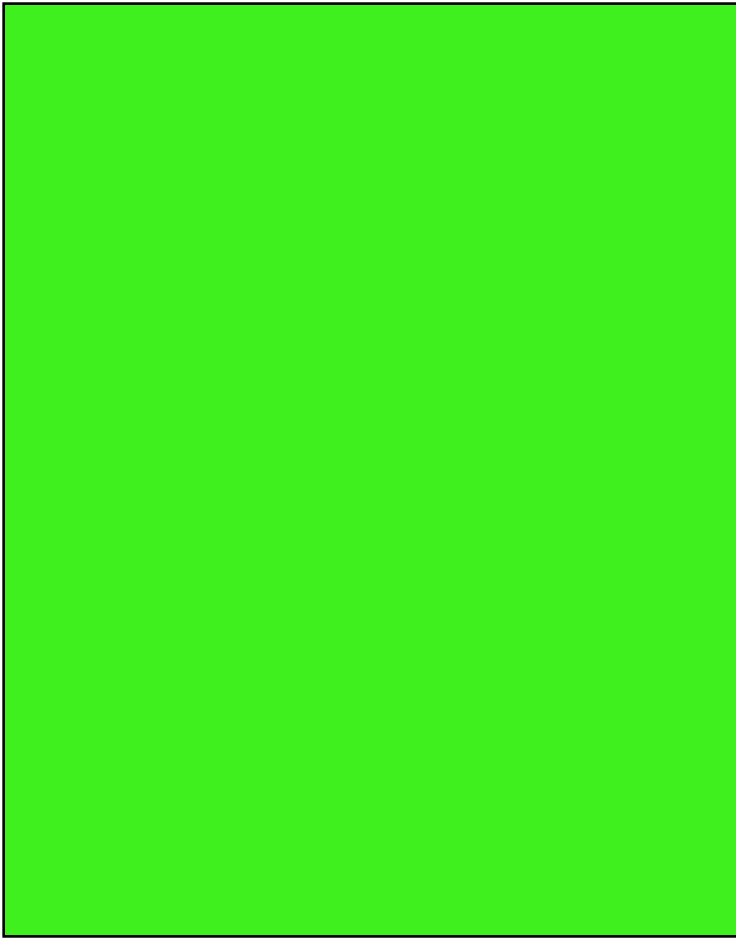
The gap was $15.66 \mu\text{g}/\text{m}^3$ in 1981
and $4.16 \mu\text{g}/\text{m}^3$ in 2016.

We measure the persistence of disparities using an area's rank (from least to most polluted)



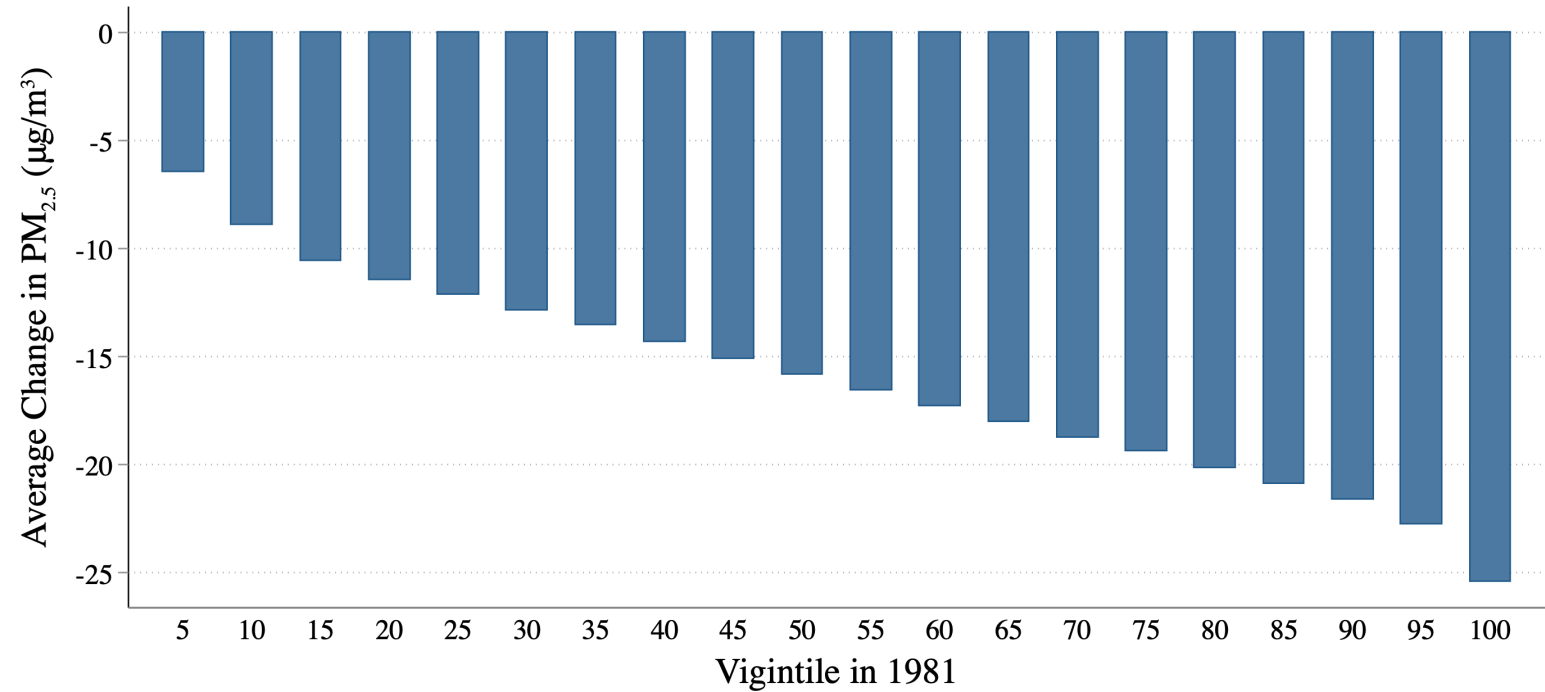
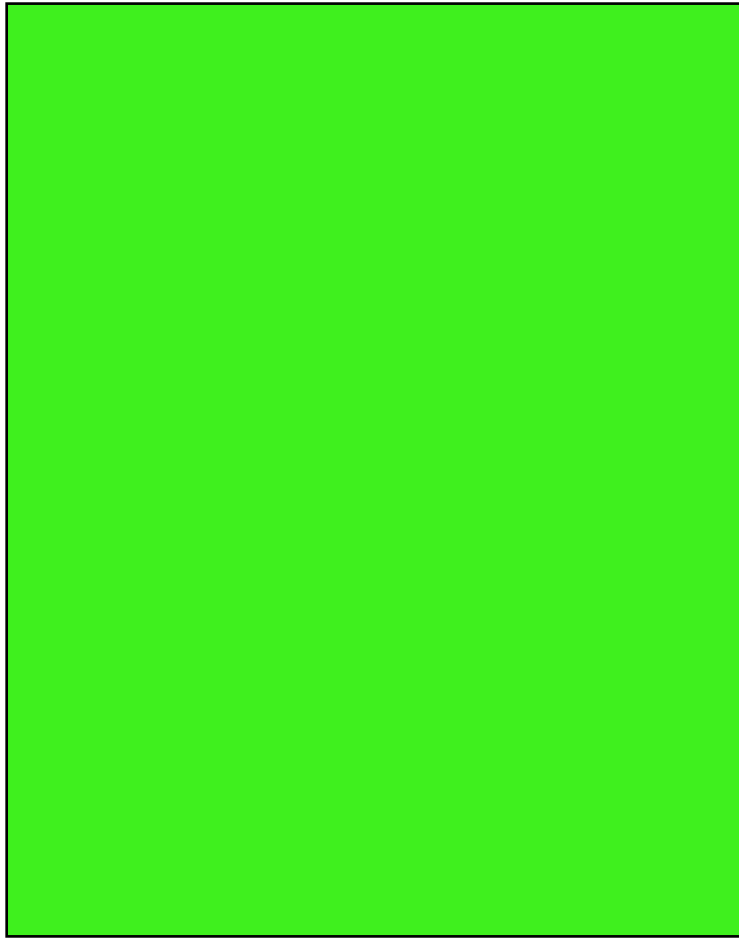
An area's rank in 1981 is a very strong predictor of its rank in 2016.

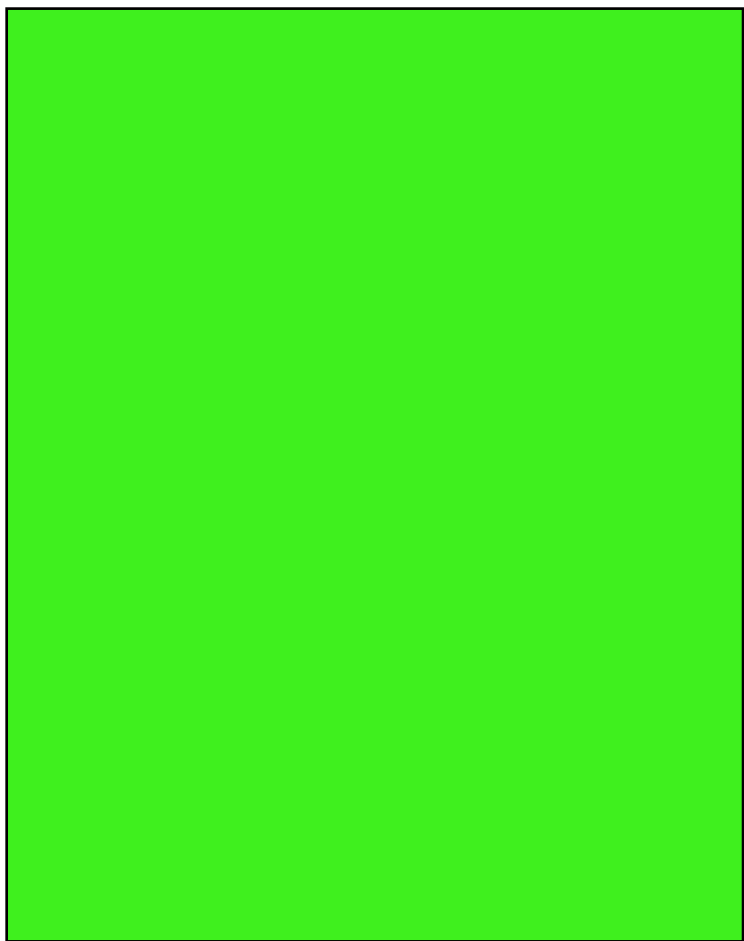
The most polluted areas in 1981 are still the most polluted today...



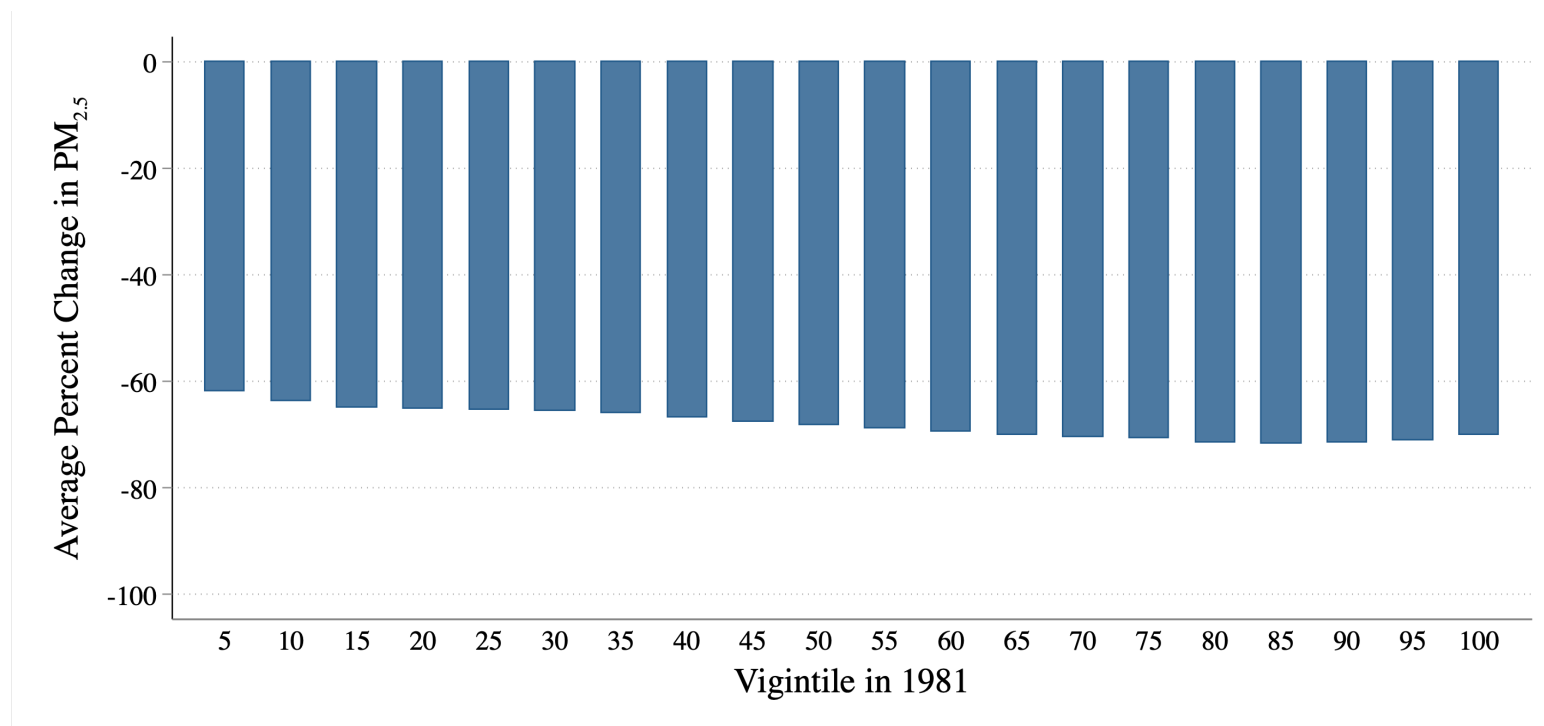
The least polluted areas in 1981 are still the least polluted today...

PM_{2.5} air pollution fell more in areas that were more polluted in 1981





But reductions were largely proportional

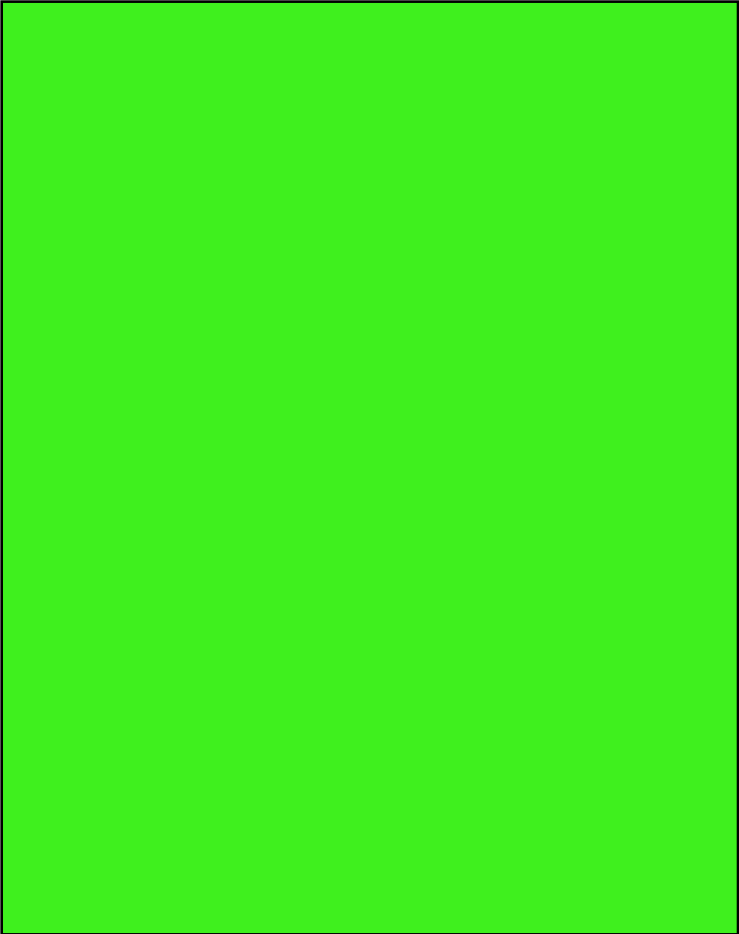


Larger reductions happened from a much higher baseline.

Who Bears the Burden?

Socioeconomically disadvantaged communities are far more likely to have higher levels of fine particulate air pollution at any time since 1981.





Pollution has fallen, shouldn't we just take the win?

Fairness, equity, and justice are inherently comparative.

We care about who is advantaged and who is disadvantaged.

Our findings suggest that who is disadvantaged and who is advantaged remains remarkably constant through time.

Environmental Inequality and Public Policy

Federal and state policy require that all people and places enjoy the same degree of environmental protection.

No group should bear a disproportionate burden from pollution.

While real progress has been made in reducing air pollution, policy has been less successful in reducing relative disparities.

Why?

What's Next?

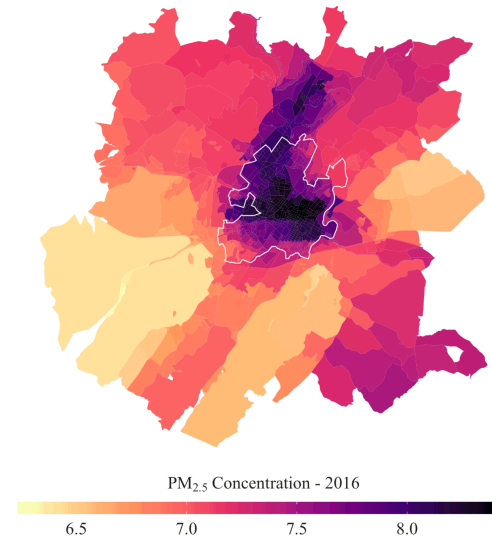
- We need to gain a better understanding of why environmental disparities exist and why they have persisted.
- We need to figure out how we can design and implement policy to address environmental disparities.



The Environmental Inequality Lab

The Environmental Inequality Atlas

An interactive website to easily visualize, download, and engage with neighborhood-level measures of environmental risk, alongside socio-economic data for the entire United States.



Our objective: to increase access to information, aid decision-making, and facilitate change.

Demand-Driven Research

- We want to do research that answers the questions that you need answered.
- We need to understand the constraints to addressing environmental inequality in the United States?
- You can get involved as:
 - Users of our research, data, and policy tools.
 - Contributors, providing data and research opportunities.
 - Development partners, shaping our research agenda.



The Environmental Inequality Lab