History and Future Outlook for the US Clean Air Act

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What's Ahead in this Session:

- **The US Clean Air Act** (me)
- **Methods in Air Pollution Accountability Research: The Case of Mobile Source and Electricity Generating Unit Policies** (Stefanie Ebelt)
- **From Congestion Charge to Ultra Low Emission Zone - Lessons learned from two decades of traffic management schemes in London** (Ben Barratt)
- **Impacts of Adopting Zero-Emission Truck Regulations on Tailpipe and Non-tailpipe Emissions and Air Quality in Southern California (**Jiachen Zhang)

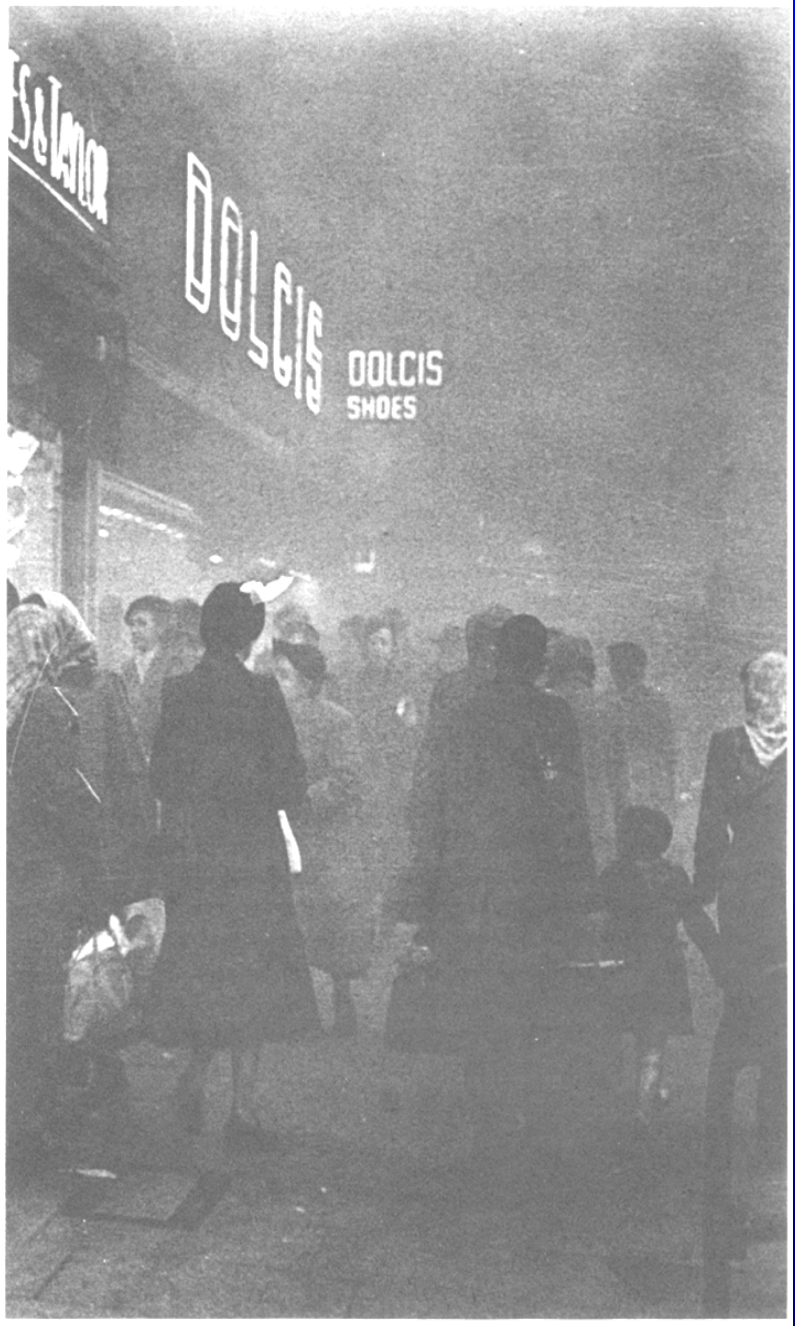
The Clean Air Act (CAA)

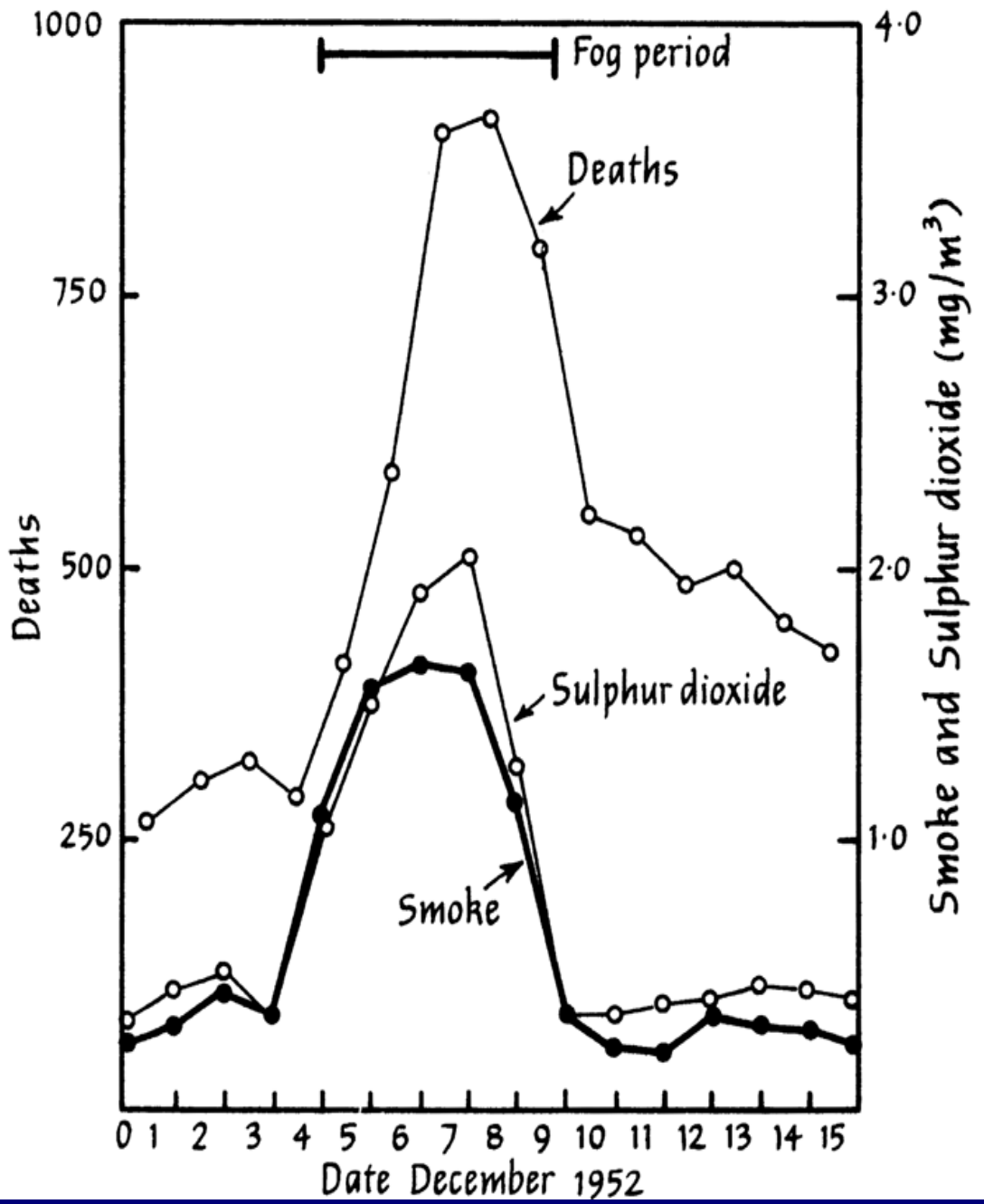
- CAA origins & evolution
- Key provisions
- Has it reduced air pollution?
- Has it improved health?
- What's happening lately?
- What are the opportunities?

Donora, PA, October,1948

The London Fog of 1952

From Brimblecombe, "The Big Smoke: a History of Air Pollution in London Since Medieval Times", 1987





Evolution of the CAA

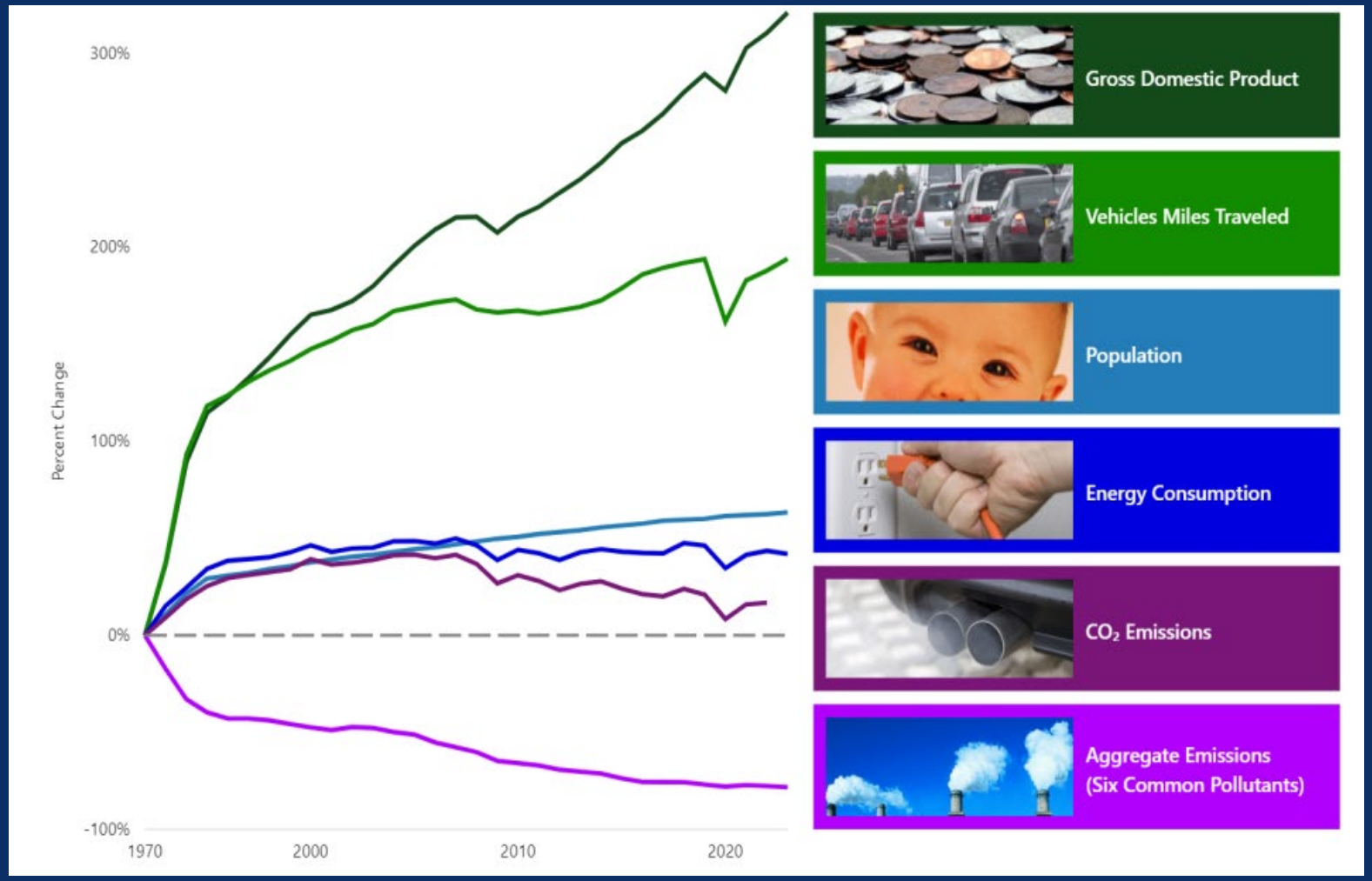
Year	Legislation	Notes
1955	Air Pollution Control Act	Funds for research
1963	Clean Air Act	First legislation for air pollution control
1967	Air Quality Act	Enforcement, expanded monitoring, stationary source inspections
1970	CAA Amendments of 1970	Limits on both industrial and mobile sources, reduced auto emissions 90% by 1975, expanded enforcement
1971	Creation of US EPA	To implement CAAA of 1970
1977	CAA Amendments of 1977	Prevent deterioration of air quality in areas not meeting NAAQS
1990	CAA Amendments of 1990	Increased authority and responsibility, acid rain, urban air pollution, toxic emissions, ozone depletion

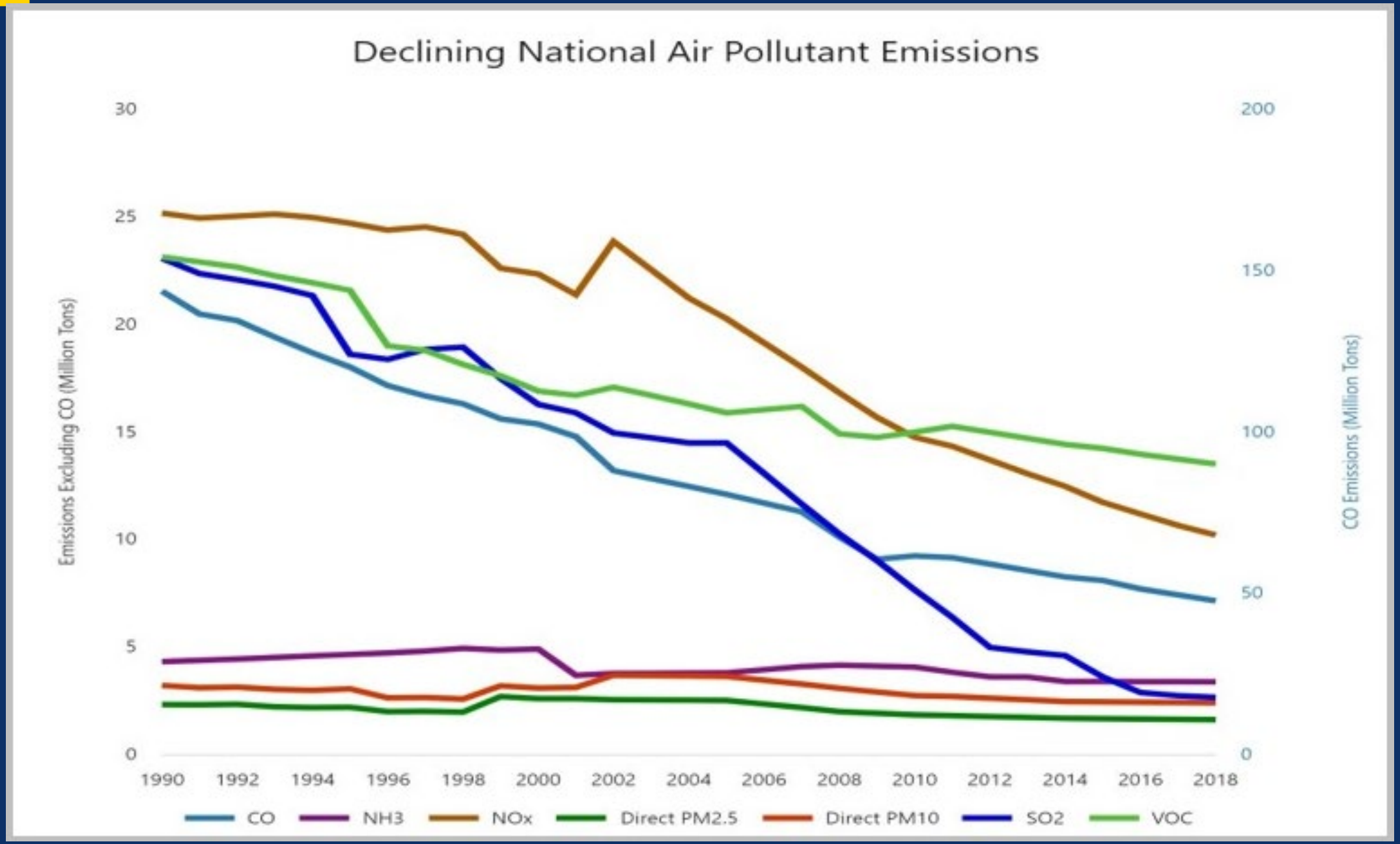
CAA: Key Provisions

- **NAAQS**
  - "…accurately reflect the latest scientific knowledge…"
  - "…allowing an adequate margin of safety, … requisite to protect the public health."
  - Cost not a consideration in establishing NAAQS
- **Review process**
  - CASAC. "…independent scientific review committee composed of seven members..."
  - Causality framework
- **Compliance**
  - Ambient Monitoring, SIPs, emission controls, penalties, courts
- **Accountability**
  - Measure outcomes

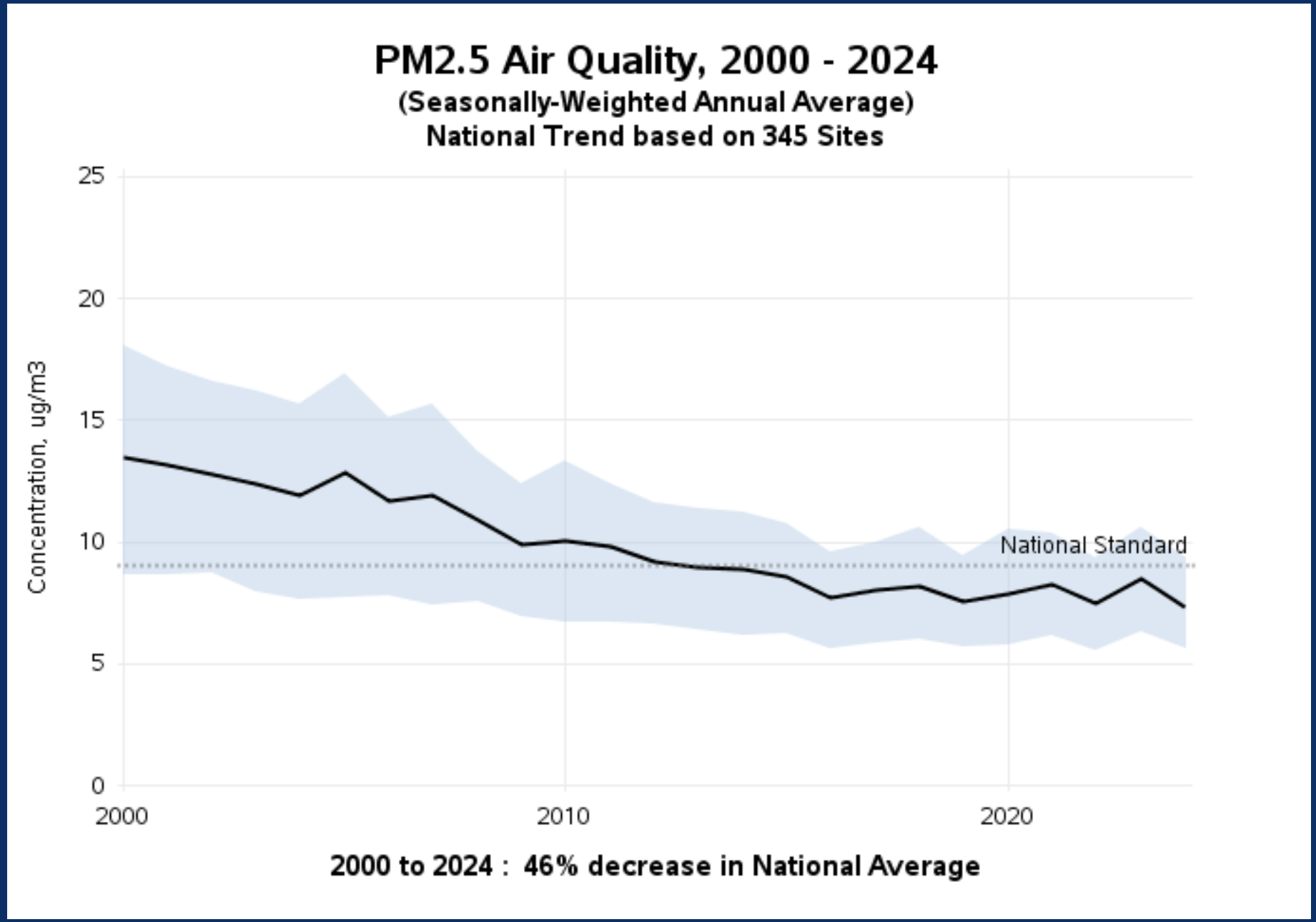
Has it reduced air pollution?

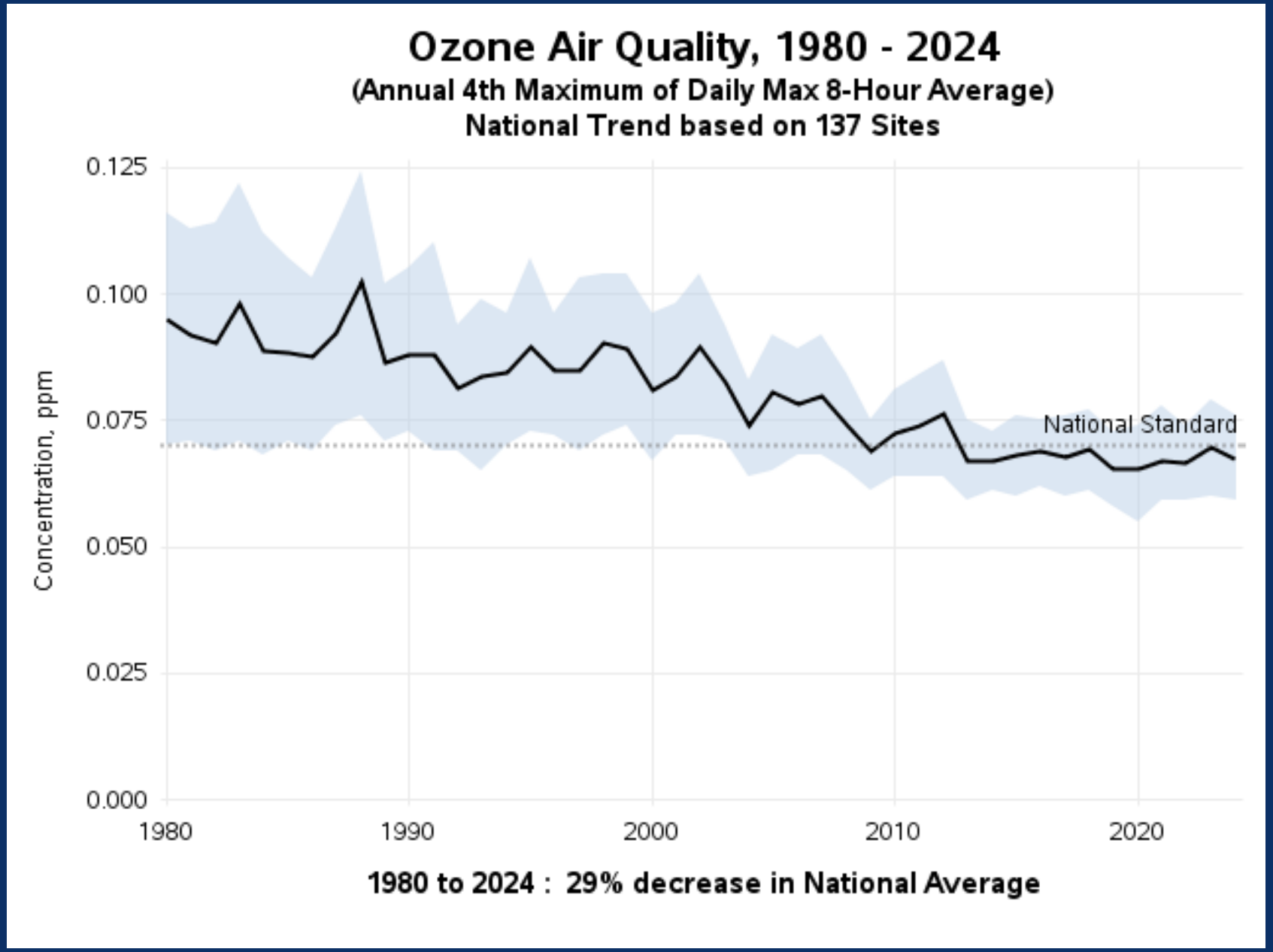
Emissions vs Economy & Growth, 1970-1923





https://www.epa.gov/sites/default/files/2019-09/2019_air_emissions_decline.png


PM2.5 Air Quality, 2000 - 2024
(Seasonally-Weighted Annual Average)
National Trend based on 345 Sites
Concentration, ug/m3
25
20
15
10
5
0
2000
2010
2020
National Standard
2000 to 2024 : 46% decrease in National Average


Ozone Air Quality, 1980 - 2024
(Annual 4th Maximum of Daily Max 8-Hour Average)
National Trend based on 137 Sites
0.125
0.100
0.075
0.050
0.025
0.000
Concentration, ppm
National Standard
1980
1990
2000
2010
2020
1980 to 2024 : 29% decrease in National Average

Has the CAA improved Health?

US EPA 2011: Benefits and Costs of the Clean Air Act 1990-2020

- benefits exceed costs by a factor of more than 30 to one

The 1990 Clean Air Act Amendments prevent:

Health Effects	Year 2010 (in cases)	Year 2020 (in cases)
Adult Mortality - particles	160,000	230,000
Infant Mortality - particles	230	280
Mortality - ozone	4300	7100
Chronic Bronchitis	54,000	75,000
Heart Disease - Acute Myocardial Infarction	130,000	200,000
Asthma Exacerbation	1,700,000	2,400,000
Emergency Room Visits	86,000	120,000
School Loss Days	3,200,000	5,400,000
Lost Work Days	13,000,000	17,000,000

HEI Accountability Studies on the CAA Amendments

Accountability Analysis of Title IV Phase 2 of the 1990 Clean Air Act Amendments

Richard D Morgenstern, Winston Harrington, Jhih-Shyang Shih, Michelle L Bell

Research Report 168,
2012

Causal Inference Methods for Estimating Long-Term Health Effects of Air Quality Regulations

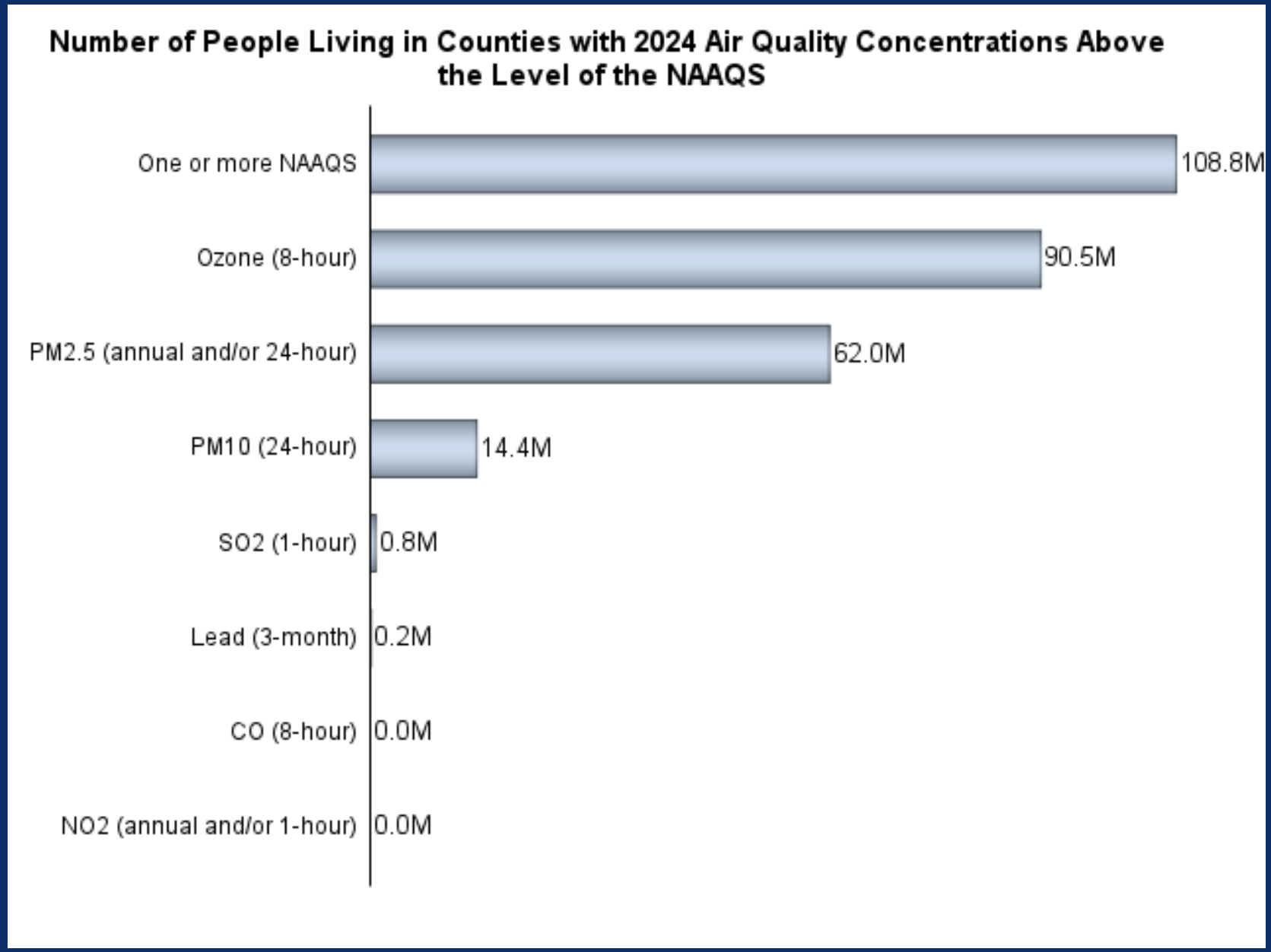
Corwin M. Zigler, Chanmin Kim, Christine Choirat, John Barrett Hansen, Yun Wang, Lauren Hund, Jonathan Samet, Gary King, Francesca Dominici

Research Report 187,
2016

The Clean Air Act has:

- Reduced emissions from point and mobile sources
- Reduced ambient concentrations of key pollutants
- Improved public health
- Reduced costs associated with adverse health and welfare effects

This despite robust economic growth and increased miles travelled


Number of People Living in Counties with 2024 Air Quality Concentrations Above the Level of the NAAQS
One or more NAAQS
108.8M
Ozone (8-hour)
90.5M
PM2.5 (annual and/or 24-hour)
62.0M
PM10 (24-hour)
14.4M
SO2 (1-hour)
0.8M
Lead (3-month)
0.2M
CO (8-hour)
0.0M
NO2 (annual and/or 1-hour)
0.0M

What's happening lately?

- CASAC reconstituted (again)
- Efforts to vacate the new PM2.5 NAAQS
- Efforts to terminate "Good Neighbor Plan"
- Limits on power plant emissions rescinded
- Vehicle emission standards rolled back
- Office of Research and Development (ORD) eliminated
- Research funding grants cancelled
- No longer monetizing benefits from PM2.5 and ozone

And so much more…

What's happening lately?

The NEW ENGLAND JOURNAL of MEDICINE

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PERSPECTIVE

The Dismantling of Environmental Protections — A Grave Threat to America's Health

Authors: Adam W. Gaffney, M.D., M.P.H., David Himmelstein, M.D., Steffie Woolhandler, M.D., Sancia Sehdev, B.S., and Philip J. Landrigan, M.D. Author Info & Affiliations

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What are the Opportunities?

PNAS

RESEARCH ARTICLE | ENVIRONMENTAL SCIENCES
SUSTAINABILITY SCIENCE

OPEN ACCESS

Location-specific strategies for eliminating US national racial-ethnic $PM_{2.5}$ exposure inequality

Yuzhou Wang[a], Joshua S. Apte[b,c], Jason D. Hill[d], Cesunica E. Ivey[b], Regan F. Patterson[e], Allen L. Robinson[f], Christopher W. Tessum[g], and Julian D. Marshall[a,1]

Edited by Douglas Massey, Princeton University, Princeton, NJ; received March 31, 2022; accepted August 30, 2022

Most efficient way to reduce/eliminate exposure inequality:

Location-specific strategies

(NAAQS-based is least efficient)