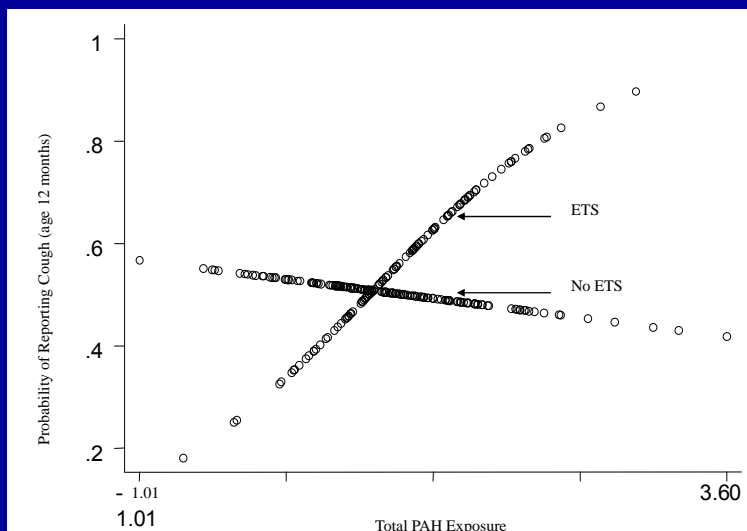


Long-term average concentrations of fine particle air pollution were associated with mortality rates across six U.S. cities.

Results from Harvard Six Cities Study. Dockery et al., NEJM, 1993.

Symptoms of Cough Were Greater as a Function of Exposure to Toxic Organic Compound Concentrations in New York City Children



Miller, R.L., R. Garfinkel, M. Horton, D. Camann, F. P. Perera, R. Whyatt, P.L. Kinney. Polycyclic aromatic hydrocarbons, environmental tobacco smoke, and respiratory symptoms in an inner-city birth cohort, *Chest* 126(4): 1071-1078 (2004)

Lung Function is Lower on Days with Higher Ozone Concentrations at Summer Camps

(Kinney et al, Environ Health Perspec 1996)

Table 4. Slopes of afternoon FEV₁ and PEFR on ozone for all camp studies combined^a

Measurement	Slope	SE (slope)	p-value
FEV ₁	-0.50 ml/ppb	0.07	0.0001
PEFR	+0.17 ml/sec/ppb	0.33	0.62

Abbreviations: FEV₁, forced expiratory volume in 1 sec; PEFR, peak expiratory flow rate.

Climate Change Effects on Ozone in NYC Metro Area

Mean 1-hr max O₃ (ppb)

O₃-related deaths (%)

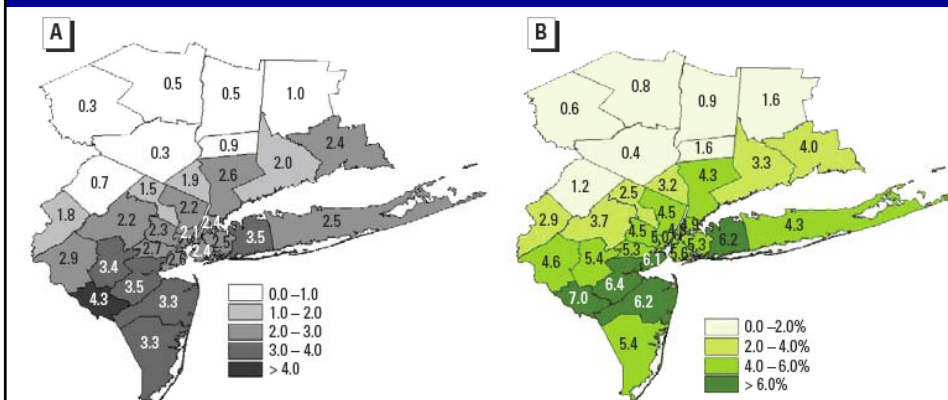
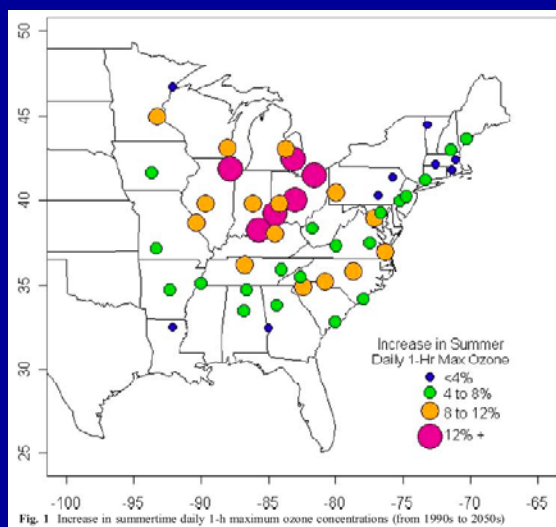


Figure 2. Estimated changes in O₃ and associated summertime mortality in the 2050s compared with those in the 1990s for M1, where climate change alone drives changes in air quality. (A) Changes in mean 1-hr daily maximum O₃ concentrations (ppb). (B) Percent changes in O₃-related mortality.

Knowlton, K., J. Rosenthal, C. Hogrefe, B. Lynn, S. Gaffin, R. Goldberg, C. Rosenzweig, K. Civerolo, J.-Y. Ku, P.L. Kinney. Assessing ozone-related health impacts under a changing climate. *Environ. Health Perspect.*, 112:1557-1563 (2004)

Projected Percent Increases in Summer daily 1-hr max Ozone in 50 Large Cities by 2050



Bell, M.L., Goldberg R., Hogrefe, C., Kinney, P.L., Knowlton K., Lynn B., Rosenthal J., Rosenzweig C., and Patz J. Climate change, ambient ozone, and health in 50 U.S. cities. *Climatic Change* 82:61-76, 2007

Actions to reduce emissions from fuel combustion will...

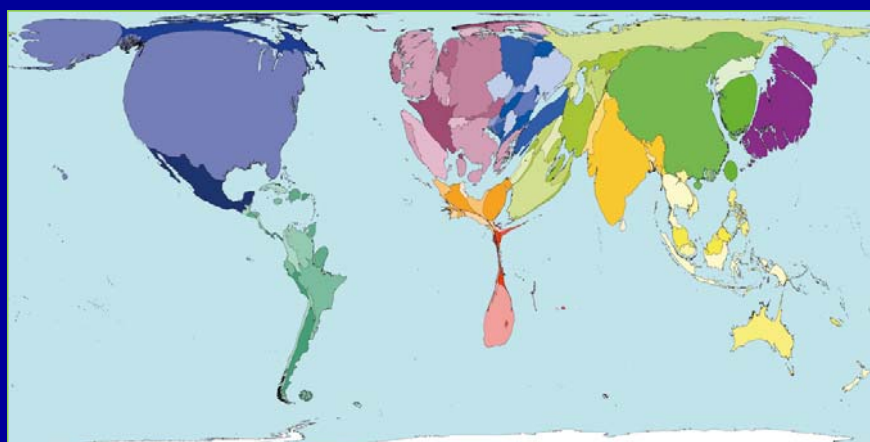
- Improve public health via reductions in local and regional concentrations of PM, ozone, and other toxic air pollutants, and
- Reduce human influence on global climate by reducing CO₂ emissions.
- To the extent possible, these two environmental health goals should be addressed in a coordinated, systematic way.

Summary Points

- Transport emissions include a range of health-relevant pollutants (PM, toxics, Nox, Ozone), as well as the major greenhouse gas, CO₂
- Health impacts are well-documented by high quality science (e.g., premature deaths, asthma)
- Climate change worsens air quality via increases in regional ozone concentrations
- We can and should address both climate change and air pollution problems in a coordinated way
- Policies directed at motor vehicle emissions are likely to have greatest health benefits, among the major greenhouse gas sectors

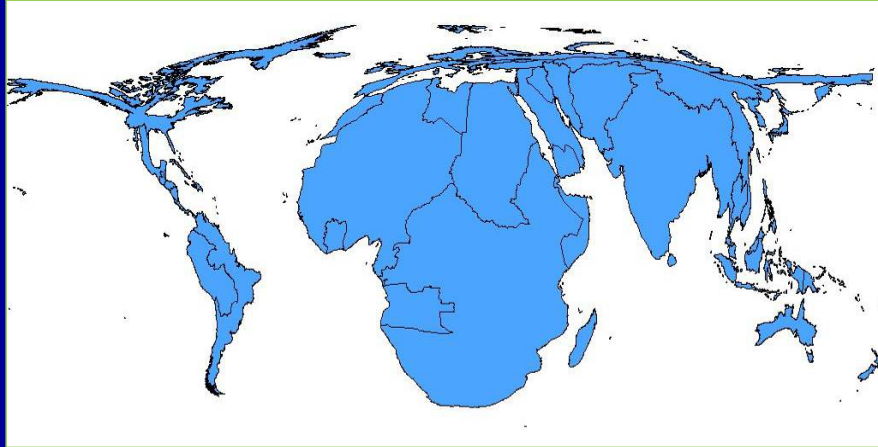
Greenhouse Emissions by Country

(Density-Equalizing Cartogram)



Mark Newman, University of Michigan | www.worldmapper.org

Climate-Related Mortality



Jonathan Patz, University of Wisconsin