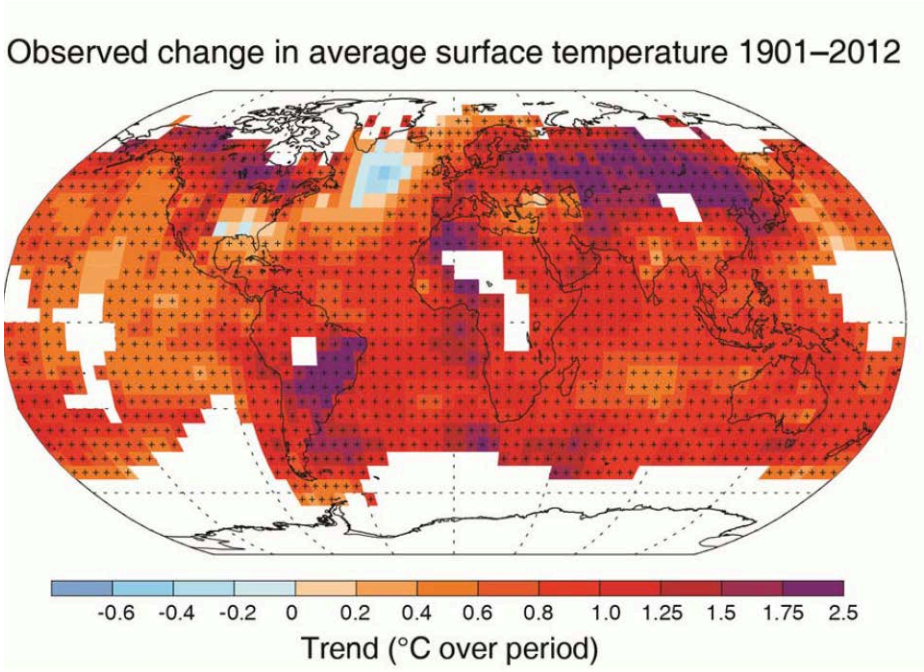
Climate Change: Risks & Opportunities for Health

IUCN World Parks Congress
Parks, People, Planet
Sydney, Nov. 18, 2014

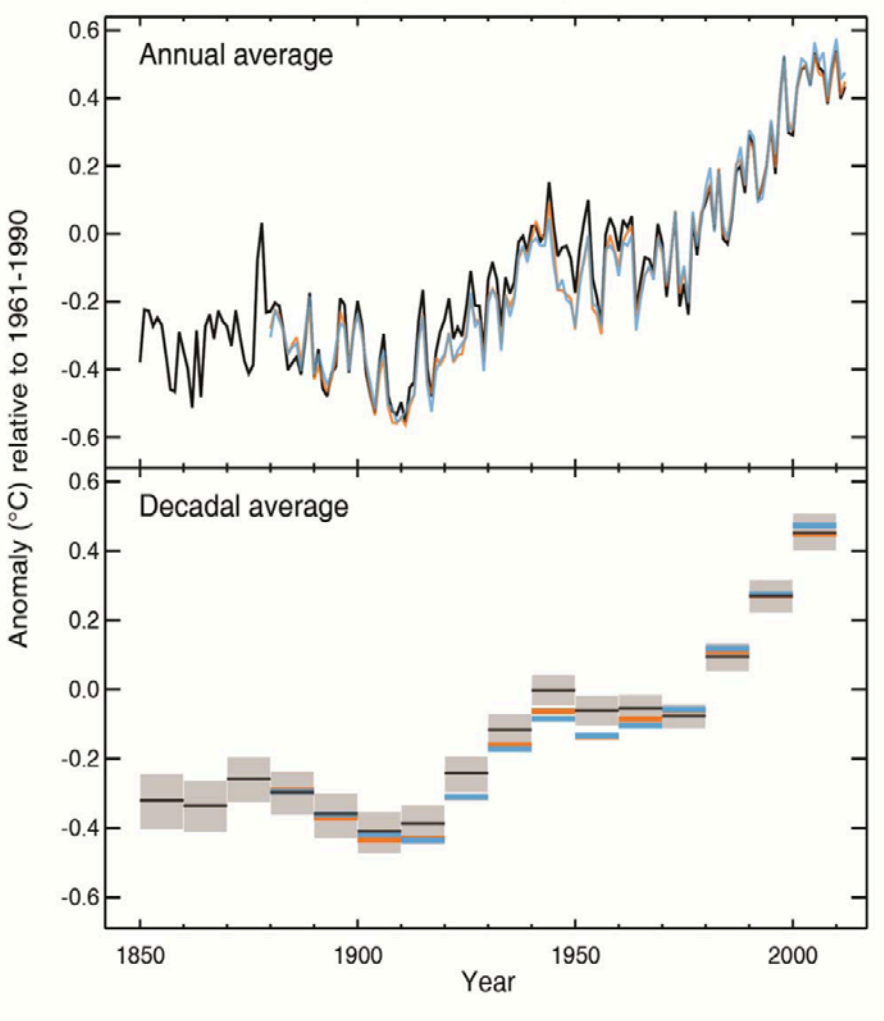
Jonathan Patz, Professor & Director
Global Health Institute
UNIVERSITY OF WISCONSIN-MADISON

Temperature data

"The globally averaged combined land and ocean surface temperature data .. show a warming of 0.85 [0.65 to 1.06]° C, over the period 1880–2012" IPCC AR5 WG1 2013



Global Temperature Anomaly 1850-2012



IPCC AR5 WG1 Figure SPM.1

HEALTH EFFECTS OF CLIMATE CHANGE

CLIMATE CHANGE

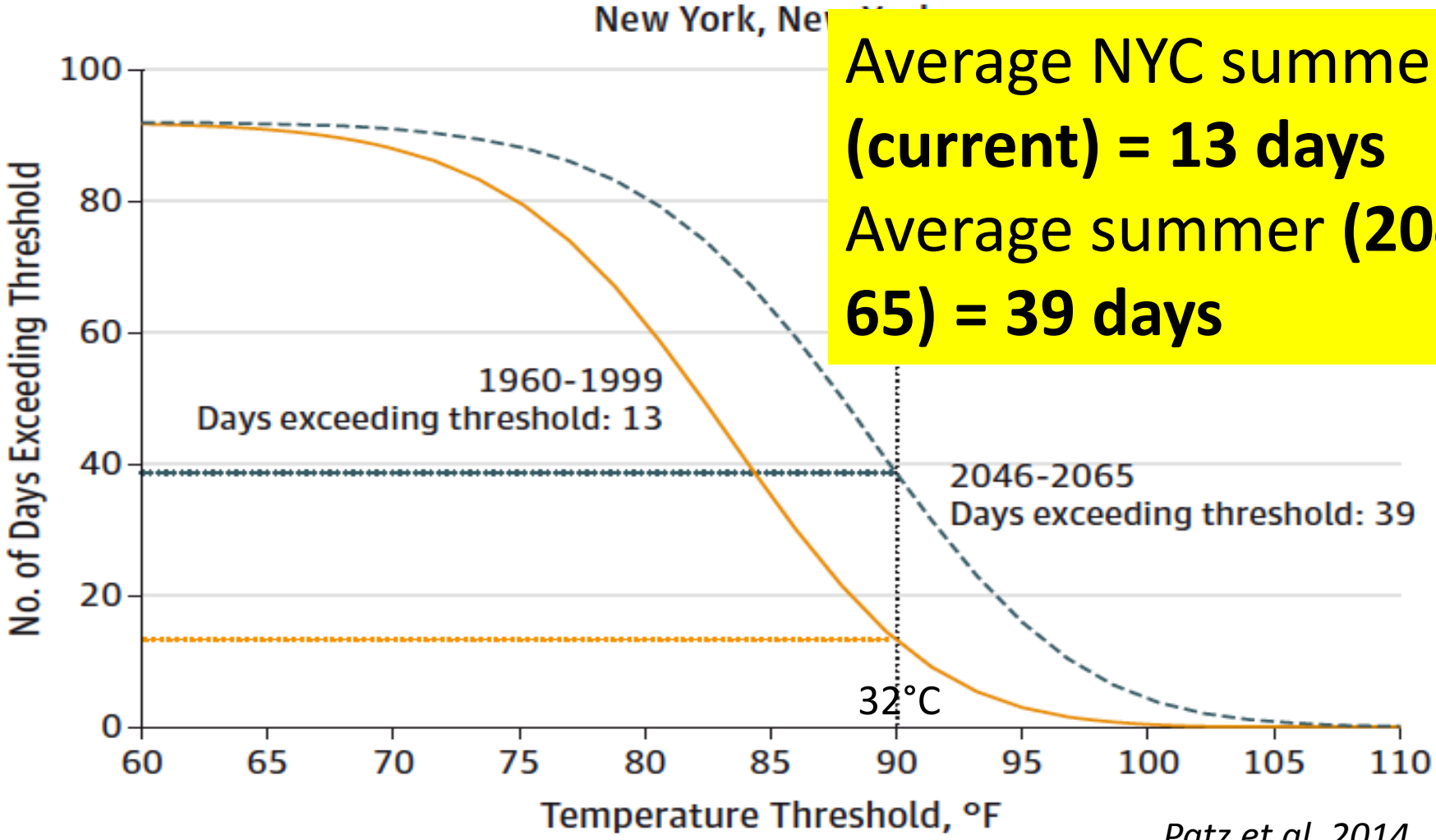
Temperature Rise [1]
Sea level Rise [2]
Hydrologic Extremes

[1] **3° C** by yr. 2100
[2] **40 cm** " "
IPCC estimates

Urban Heat Island Effect	→ Heat Stress Cardiorespiratory failure
Air Pollution & Aeroallergens	→ Respiratory diseases, e.g., COPD & Asthma
Vector-borne Diseases	Malaria Dengue Encephalitis Hantavirus Rift Valley Fever
Water-borne Diseases	Cholera Cyclospora Cryptosporidiosis Campylobacter Leptospirosis
Water resources & food supply	→ Malnutrition Diarrhea Toxic Red Tides
Mental Health & **Environmental Refugees**	→ Forced Migration Overcrowding Infectious diseases Human Conflicts

Patz, 1998

Projected # of days over 32°C



Average NYC summer **(current) = 13 days**

Average summer **(2046-65) = 39 days**

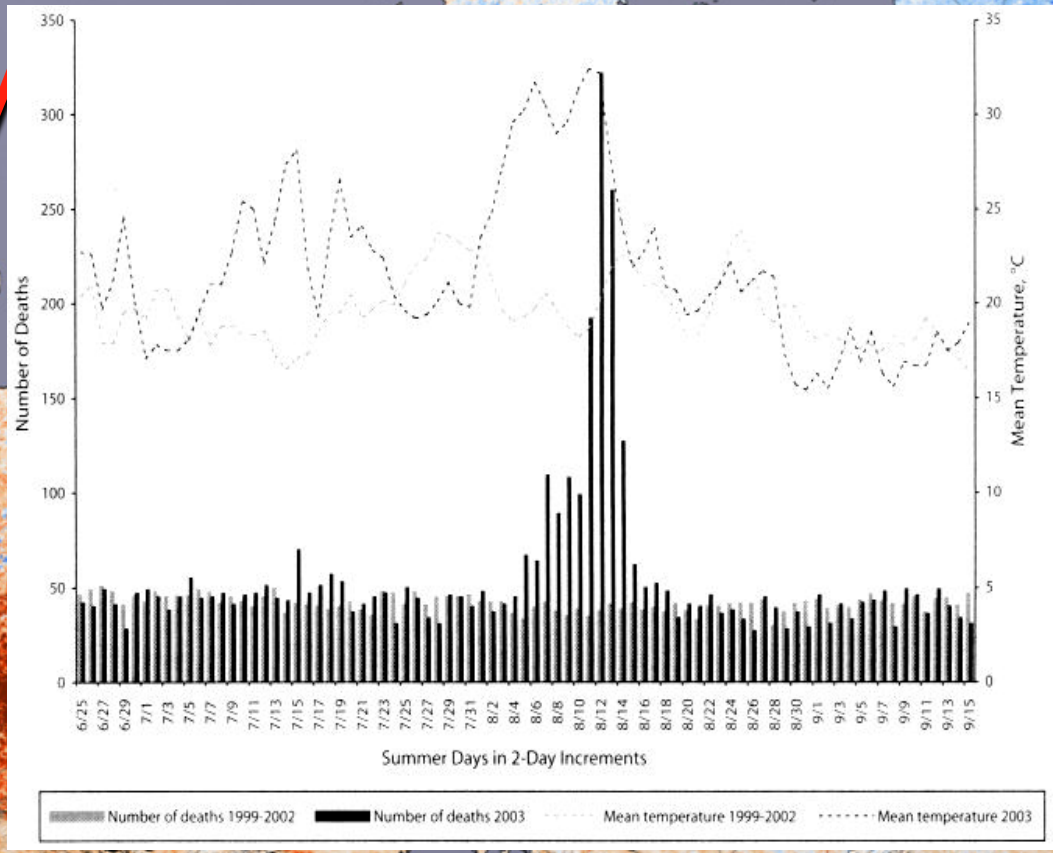
Patz et al. 2014

New York, Sept. 21, 2014

John Minchillo, AP Images

HEAT WAV

TIME LINE (FRANCE)



- **70,000 deaths**
  in 11 days

Vandentorren et al. Mortality in 13 French cities during the August 2003 heat wave. *Am J Public Health 2004; 94(9):1518-20.*

Probability of 'mega-heatwaves' will increase by a factor of 5 to 10 within the next 40 years.

Future summers warmer than warmest on record

Today's 900 million at risk for hunger could double by mid-century.

Battisi and Naylor, *Science* 2009

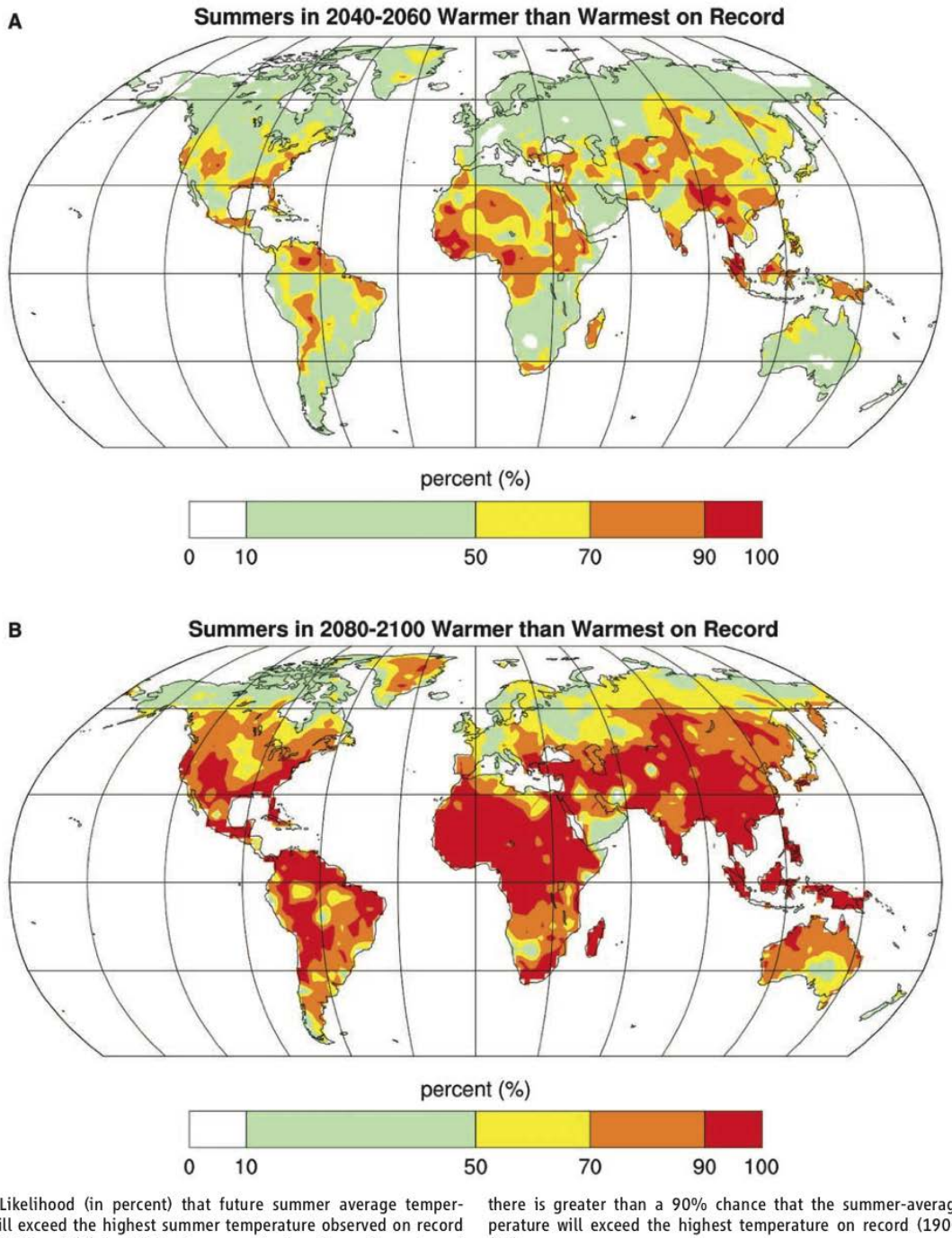
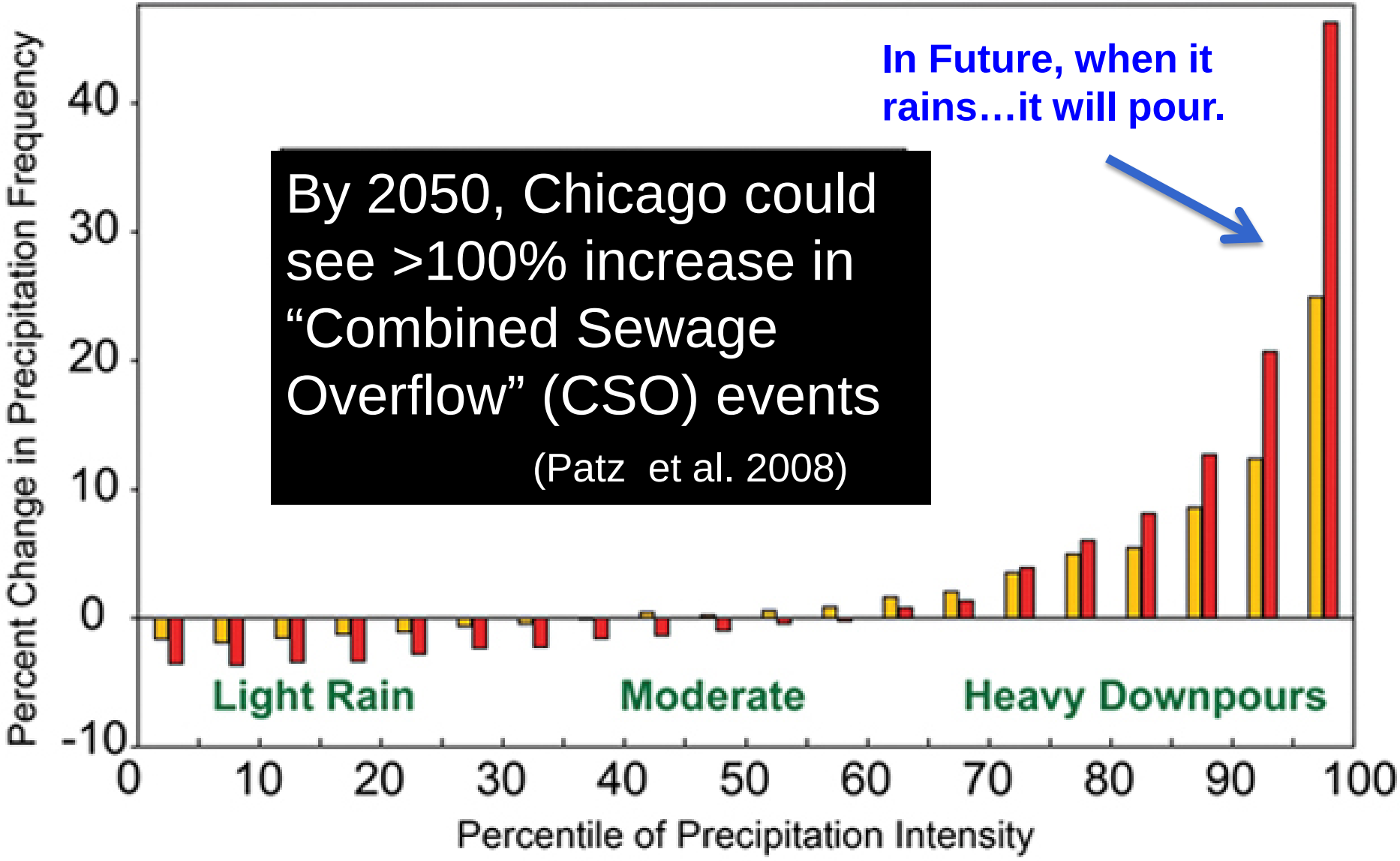


Fig. 3. Likelihood (in percent) that future summer average temperatures will exceed the highest summer temperature observed on record (**A**) for 2050 and (**B**) for 2090. For example, for places shown in red there is greater than a 90% chance that the summer-averaged t perature will exceed the highest temperature on record (1900–2 (*22*).



Globally Averaged

U.S. CCSP, 2008

So climate change

is not just about warming.

…and of course it's not **just** about **human health**

Could Combating Climate Change be cost-free?

…or even a net gain?

The opportunity for improving health determinants

We can reduce:

The **3 million annual deaths** from urban air pollution

The loss of **3.2 million deaths**, **from physical inactivity**

Global Burden of Disease Report, 2013

Examples from Transport Sector

Study of the Day: Biking to Work Could Save 1,100 Midwesterners

Grabow et al. 2011

NOV 2 2011, 8:00 AM ET

+1 0 Recommend

New research from U. Wisconsin projects the benefits of active transport in terms of improvements in air quality and physical fitness

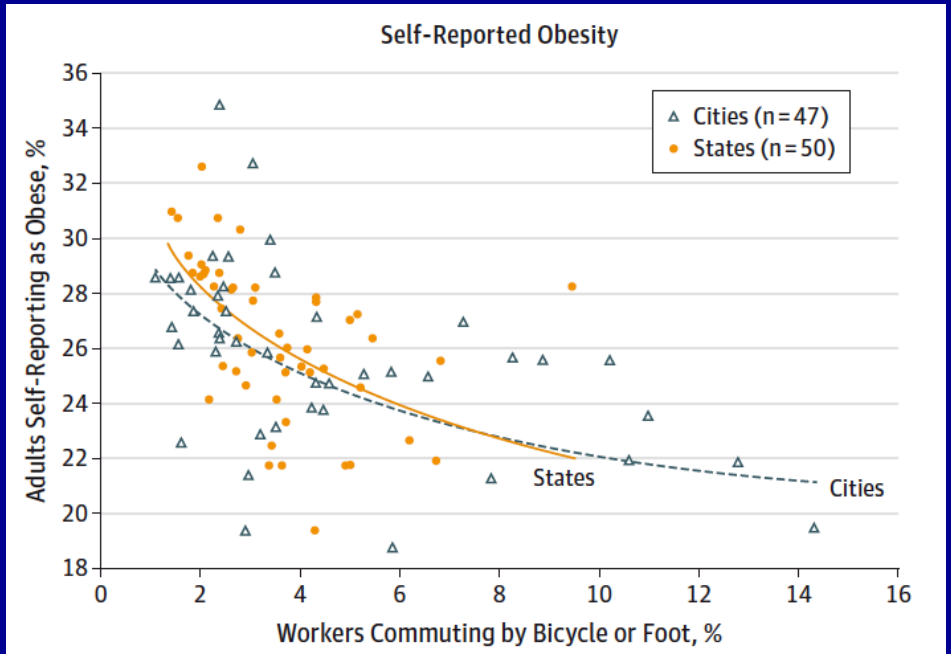
Shanghai : 44-48% reduction in colon cancer

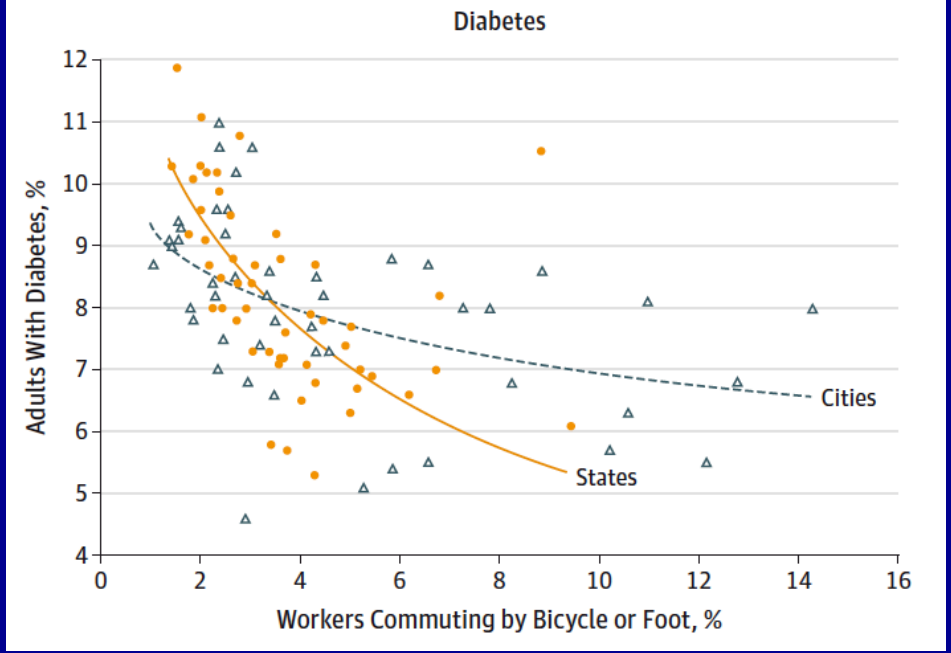
Hou et al. 2004

London, 12-13% reduction in breast cancer and 10-19% less heart disease

Woodcock et al. 2007

Commuting to work by bike or on foot, yields health benefits in the US





Data from Pucher et al. 2010

Greenspace and Mental

Bever et al. 2014

Table 3. Difference in Symptoms of Depression, Anxiety and Stress Associated with 25% More Neighborhood Green Space [§§].

Green Space Measure	Depression	Anxiety	Stress
25% More Tree Canopy	−1.005 (0.293) **	−0.273 (0.139)	−0.548 (0.261) *
25% Higher NDVI	−1.369 (0.464) **	−0.512 (0.227) *	−0.701 (0.432)
25% More Greenspace (NDVI &Tree Canopy Average)	−1.379 (0.397) **	−0.427 (0.185) *	−0.735 (0.349) *

Co-benefits: Food and Agriculture

People's Climate March, Sept. 21, 2014, NYC
Photo: J Patz

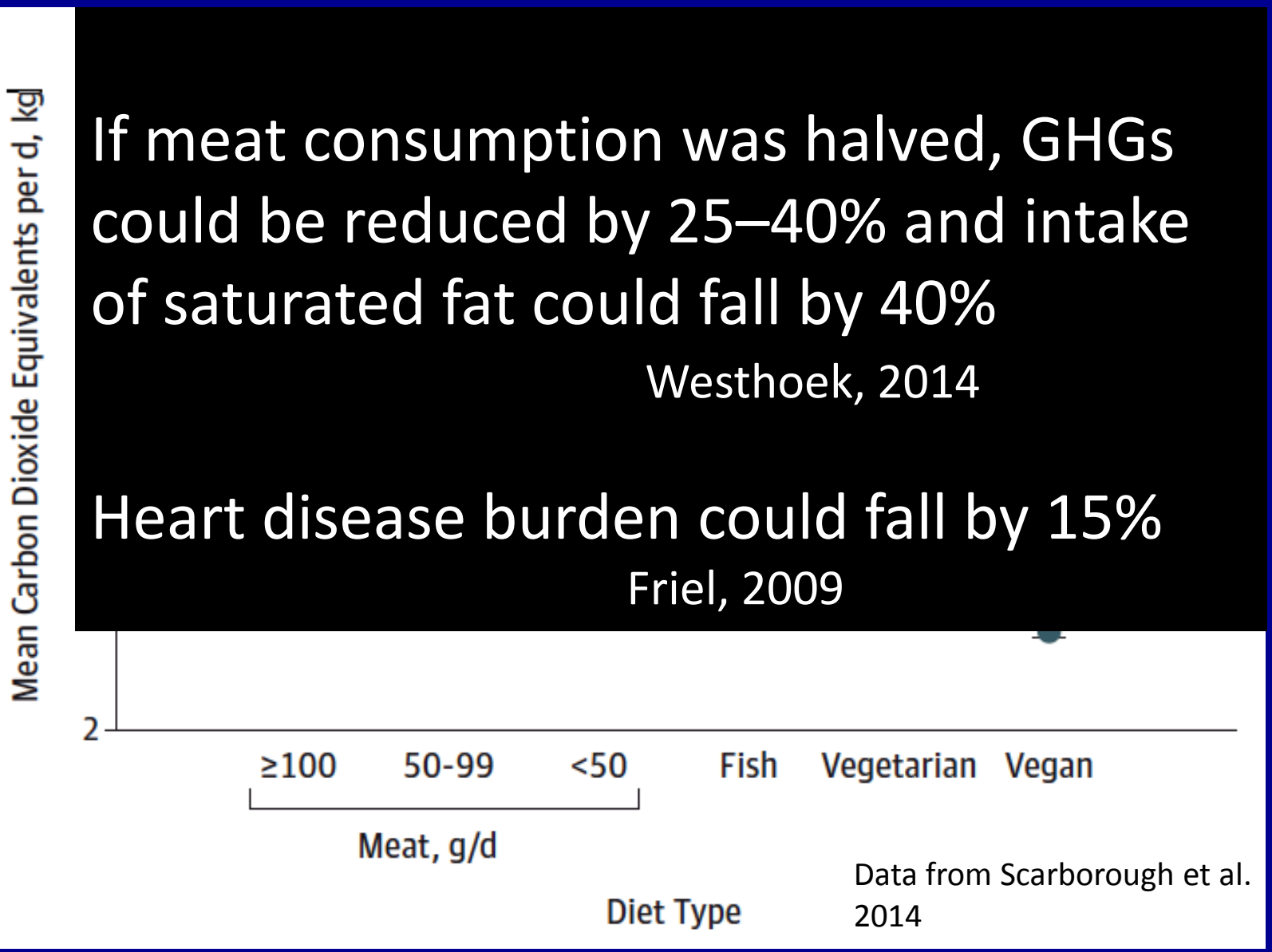
Diet and GHG Emissions

If meat consumption was halved, GHGs could be reduced by 25–40% and intake of saturated fat could fall by 40%

Westhoek, 2014

Heart disease burden could fall by 15%

Friel, 2009



Data from Scarborough et al. 2014

nature climate change

ARTICLES

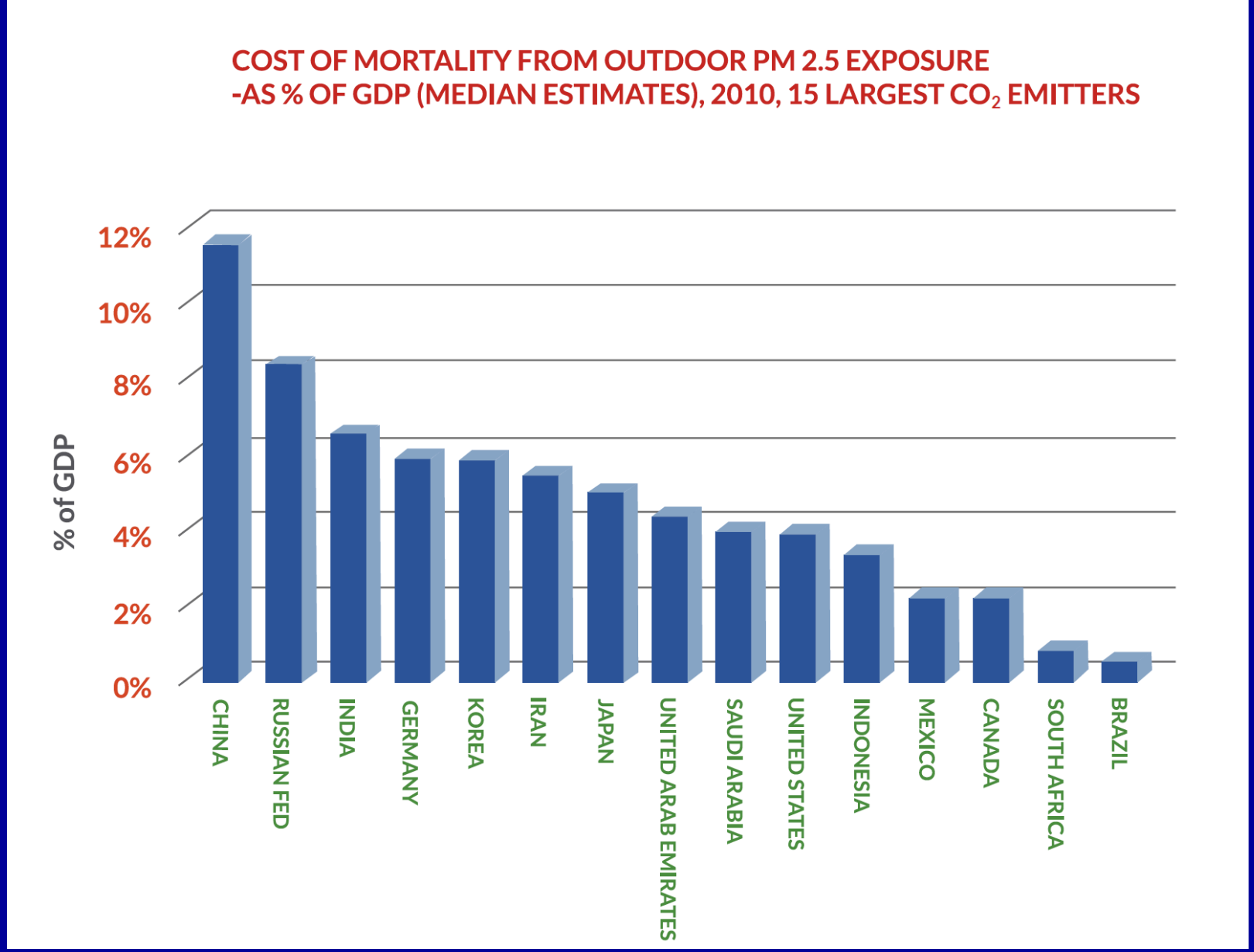
PUBLISHED ONLINE: 24 AUGUST 2014 | DOI: 10.1038/NCLIMATE2342

A systems approach to evaluating the air quality co-benefits of US carbon policies

Tammy M. Thompson[1*†], Sebastian Rausch[1†], Rebecca K. Saari[2] and Noelle E. Selin[2,3]

Because human activities emit greenhouse gases (GHGs) and conventional air pollutants from common sources, policy designed to reduce GHGs can have co-benefits for air quality that may offset some or all of the near-term costs of GHG mitigation. We present a systems approach to quantify air quality co-benefits of US policies to reduce GHG (carbon) emissions. We assess health-related benefits from reduced ozone and particulate matter ($PM_{2.5}$) by linking three advanced models, representing the full pathway from policy to pollutant damages. We also examine the sensitivity of co-benefits to key policy-relevant sources of uncertainty and variability. We find that monetized human health benefits associated with air quality improvements can offset 26–1,050% of the cost of US carbon policies. More flexible policies that minimize costs, such as

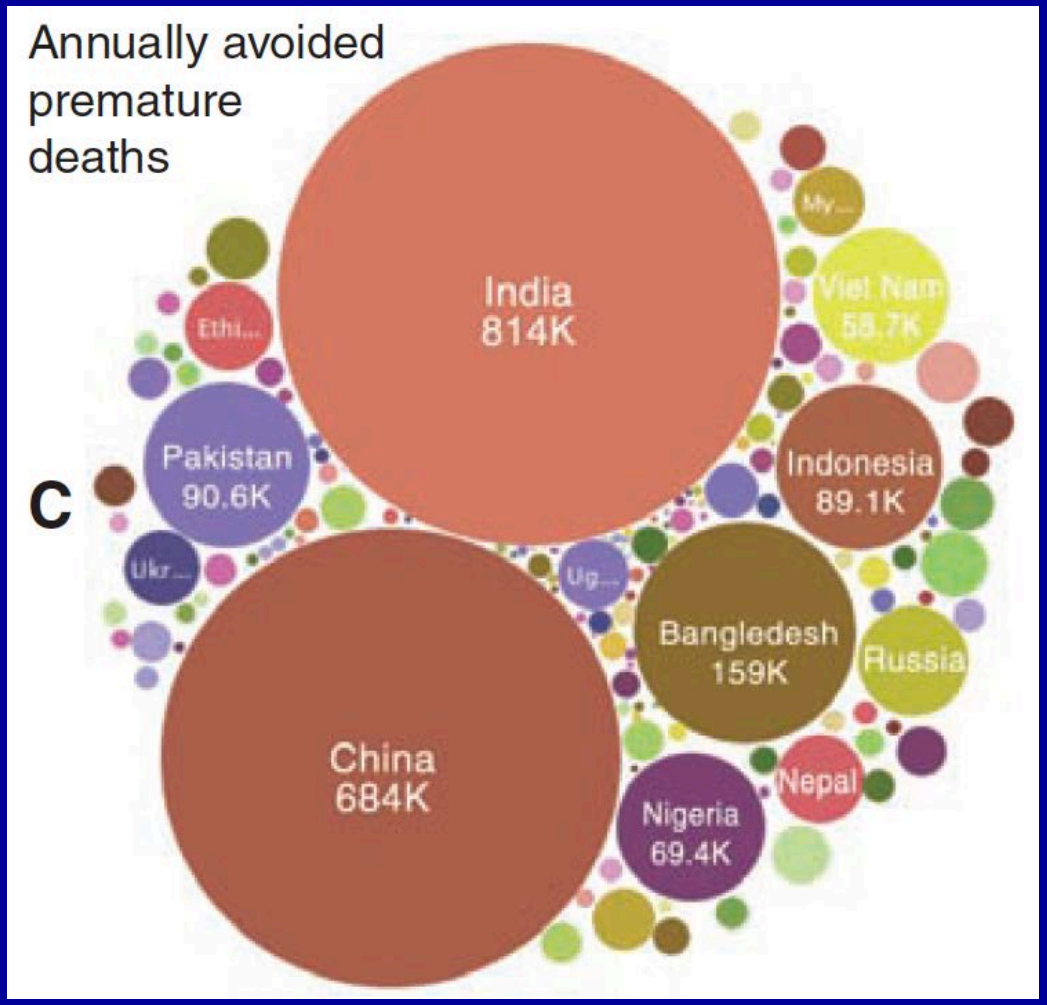
"…health benefits…can offset 26-1050% of the cost of US carbon polices"



From Hamilton, 2014. In: "The New Climate Economy Report," 2014.

Co-benefit of 0.7 to 4.7 million deaths/yr. Reductions in PM pollution in 2030

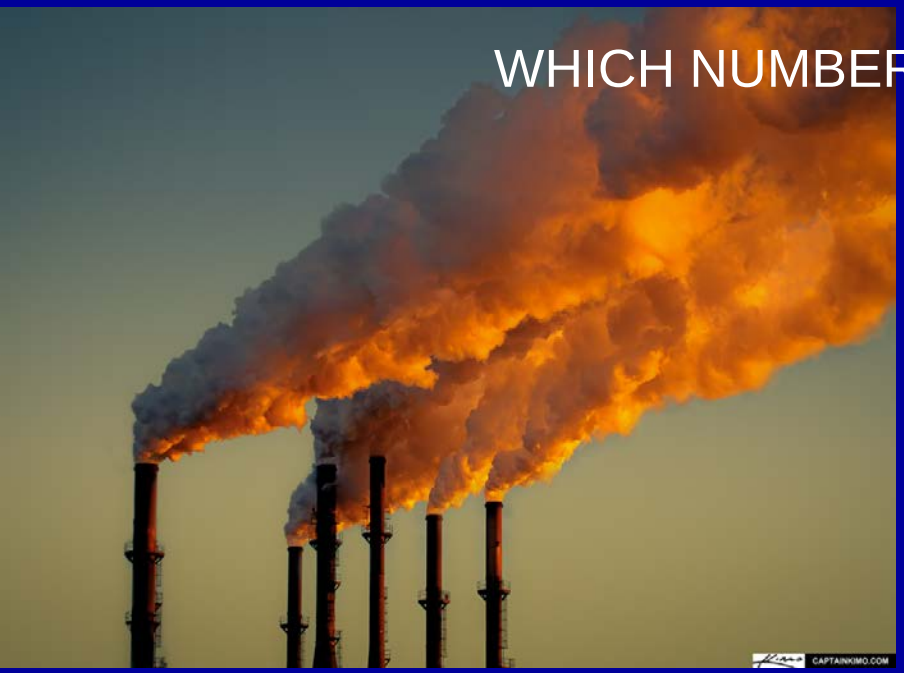
Shindell….J Schwartz… et.al. *Science*, 2012



- ***Cost of cleaner energy:***

  < $30/ tCO_2

- ***Benefits of cleaner energy:$200*/ tCO_2***



WHICH NUMBER IS BIGGER???

(* Range: $50 to $380)

For E. Asia, co-benefits are **10 to 70 times** greater

West et. al. 2013

Conclusions

Health Promotion =

- Energy Policy
- Urban Planning & Transportation
- Agriculture & Food System Policy

- Therefore, the health sector must reach out & engage

Thank You

(and G’day)!

patz@wisc.edu

Global Health Institute

UNIVERSITY OF WISCONSIN–MADISON