

Climate Change and Children's Health- From Personal Health to Planetary Health

Ming-Nan Lin, M.D., MPH

Chair, HPH & Environment Task Force
HPH international Network

Vice Superintendent
Dalín Tzu Chi Hospital, Taiwan



佛教大林慈濟醫院

Buddhist Dalin Tzu Chi Hospital

Outline




- Climate change and health
 - ✓ Climate drivers, exposure pathways and health outcomes
- Climate change and children's health
 - ✓ Vulnerability, exposure, health outcomes
- ✓ Awareness and actions for the healthcare sector
 - ✓ Ecological model perspectives



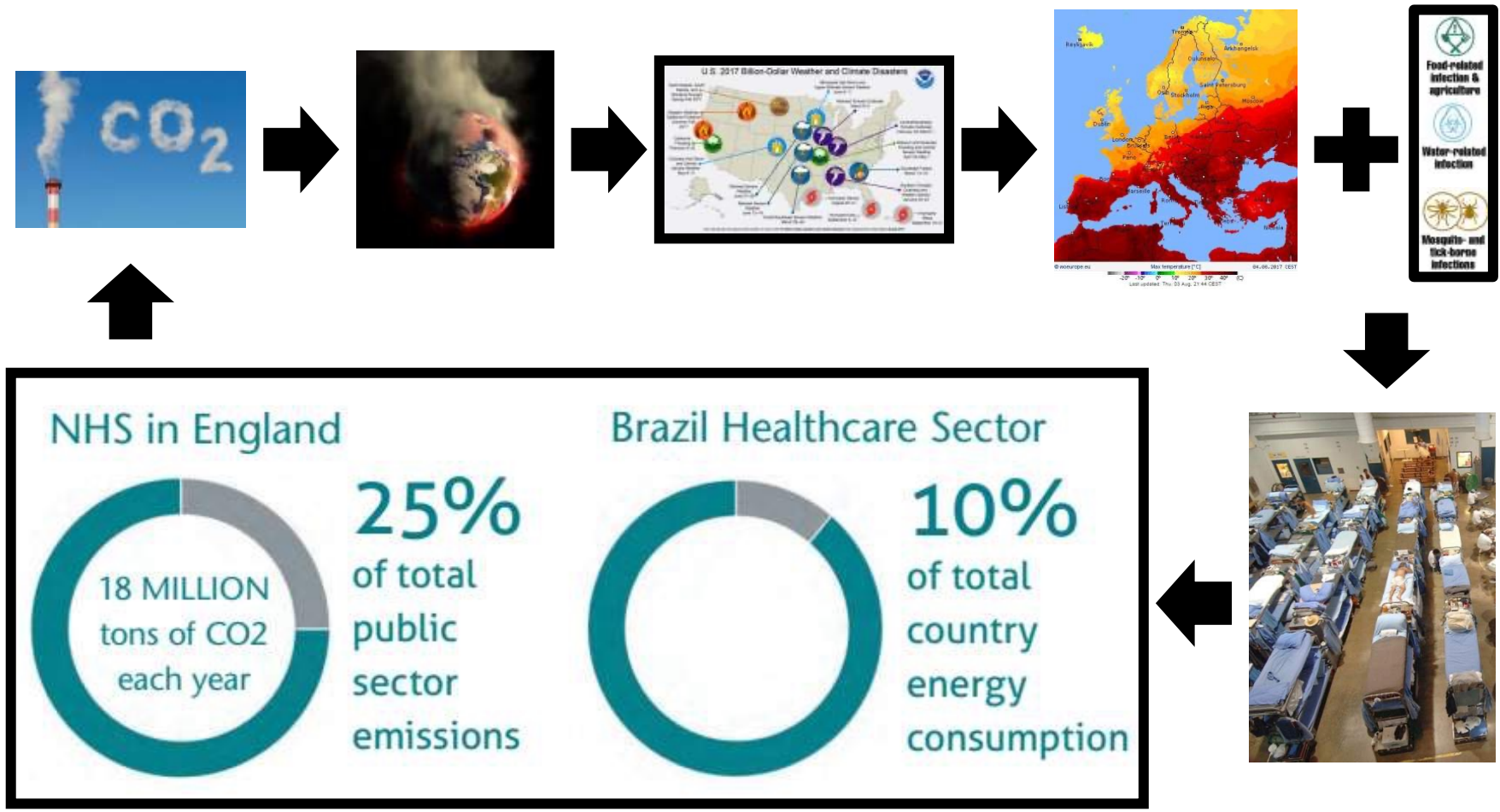
Climate Change and Natural Disasters



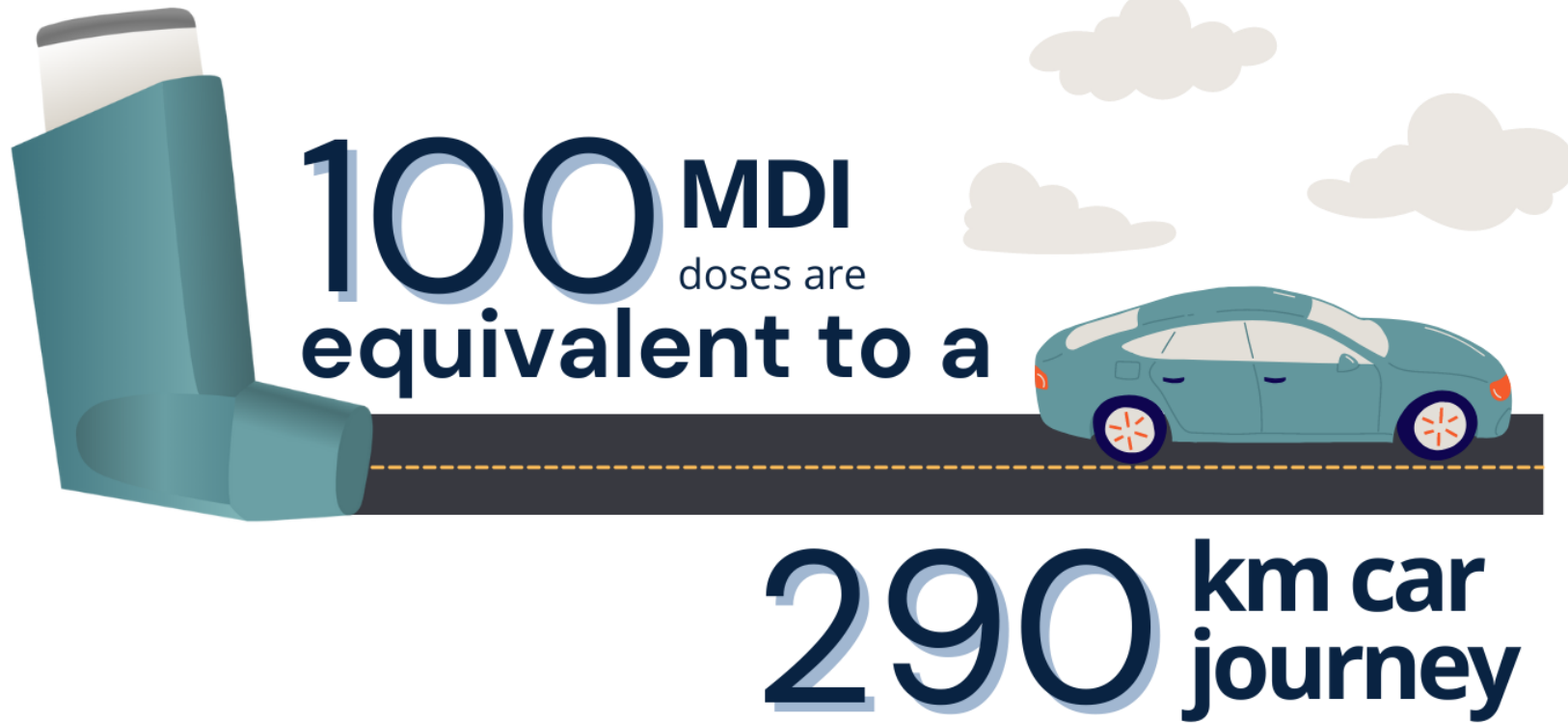


		
Food-related infection & agriculture	Water-related infection	Mosquito- and tick-borne infections





You may not know

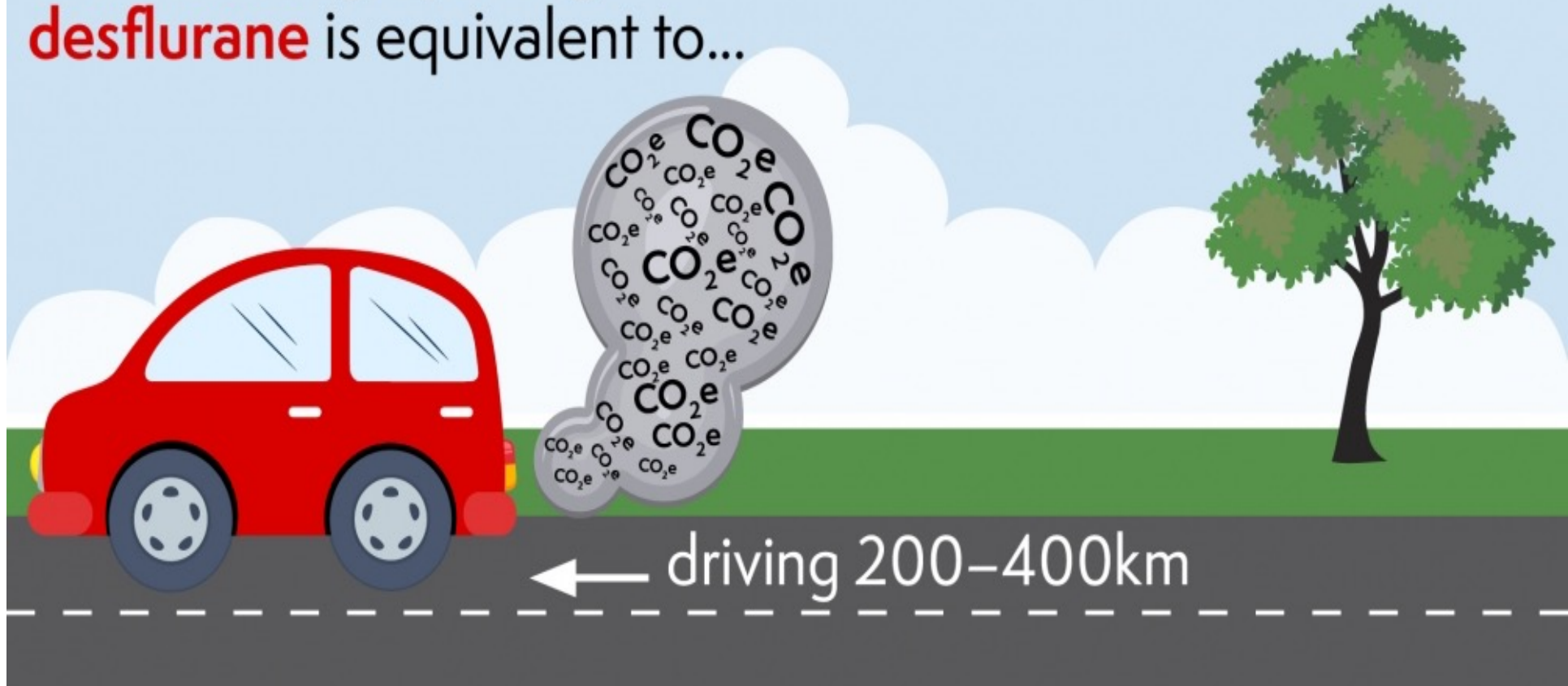


Available at:

<https://cascadescanada.ca/courses/climate-conscious-inhaler-prescribing-collaborative/>

You may not know

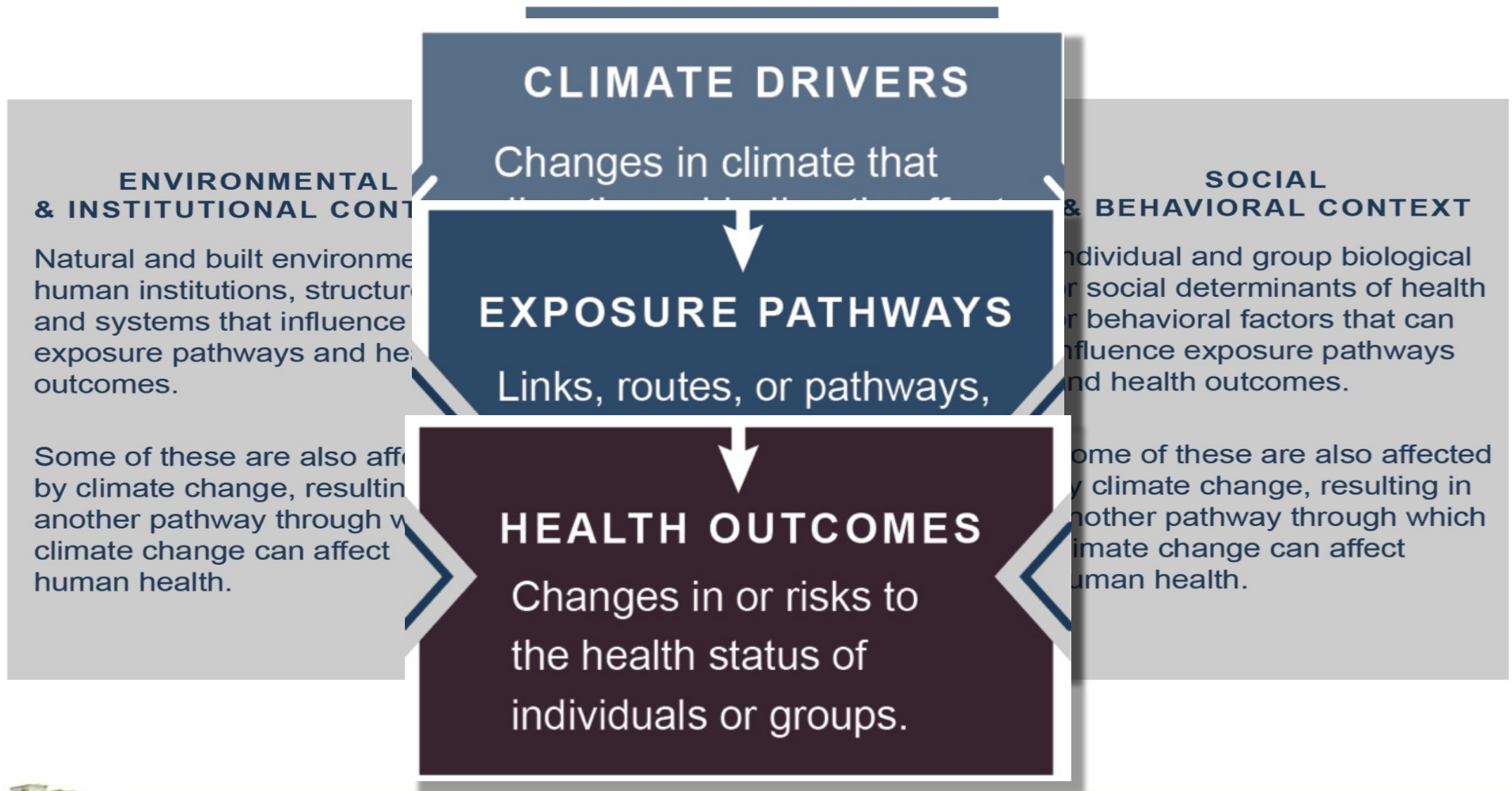
1 hour of surgery using
desflurane is equivalent to...



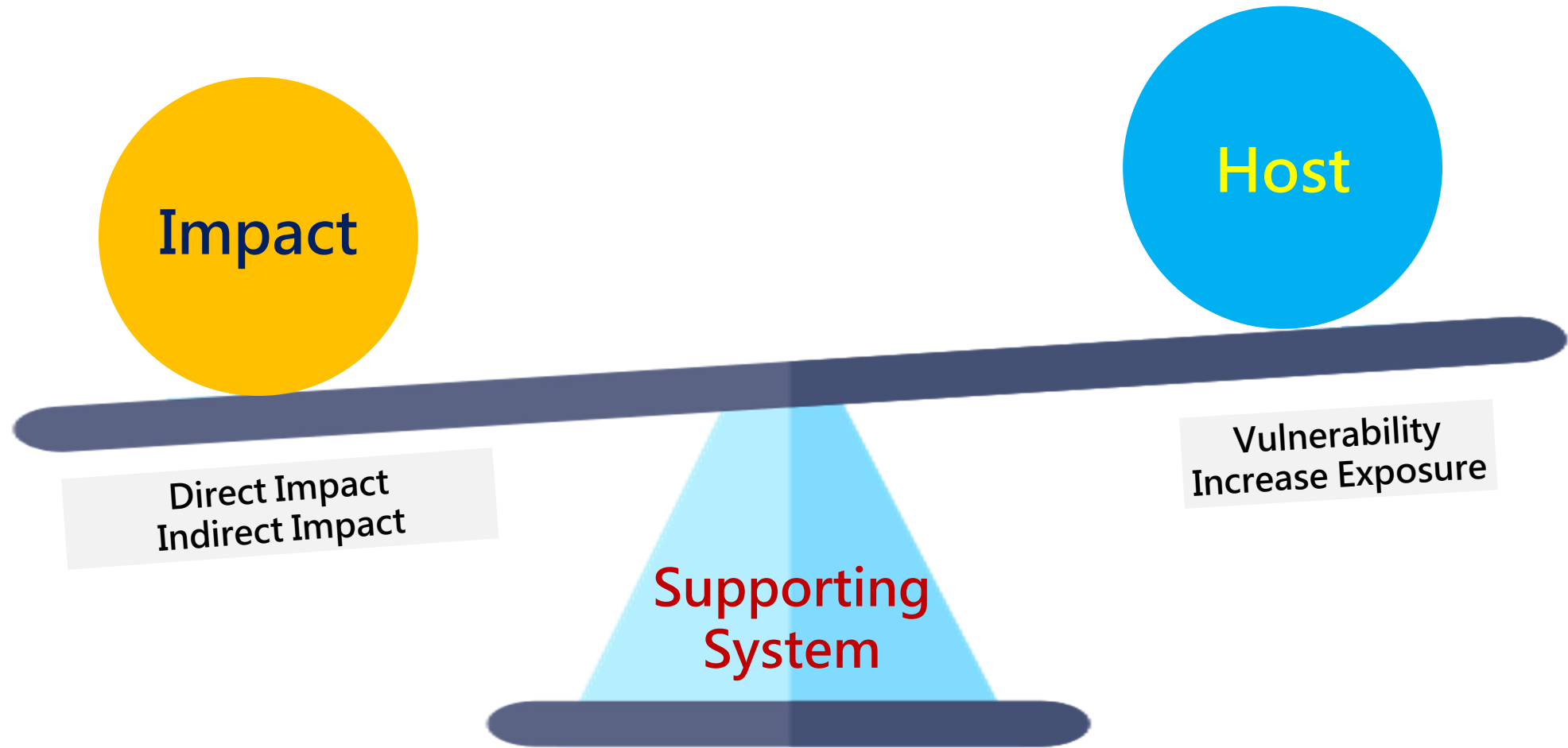
Available at:

<https://rcoa.ac.uk/patient-information/about-anaesthesia-perioperative-care/your-anaesthetic-environment>

Climate Change and Health



Host-Impact-Supporting System



Vulnerability

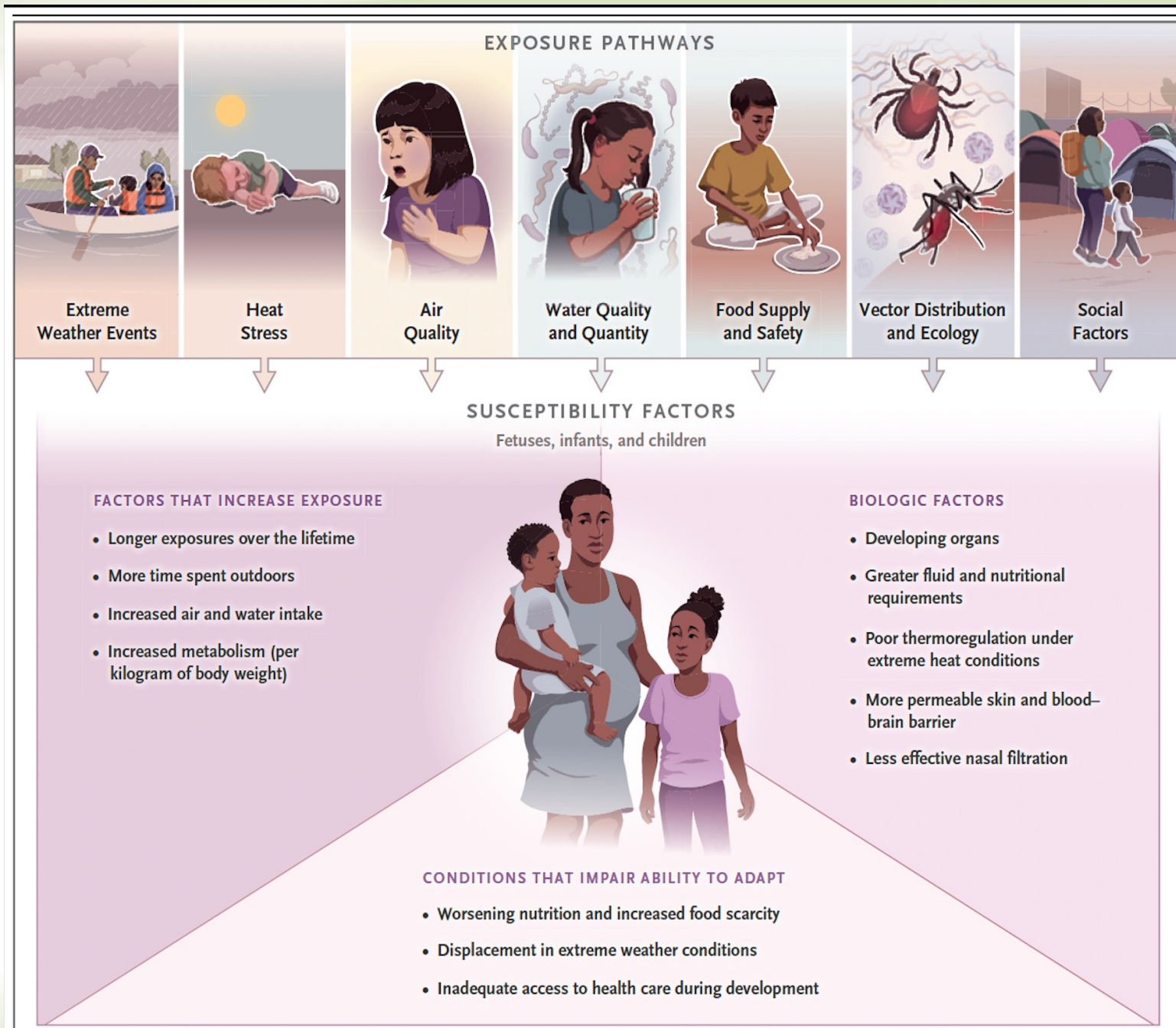
- Physical body still under development
- Emotion under development
- Depend on adult

Increase Exposure

- Breathing faster
- Drinking more water /kg body weight
- Spend more time outdoor

From Frederica P, Kari N, *Climate Change, Fossil-Fuel Pollution, and Children's Health* N Engl J Med 2022;386:2303-14.

Figure 2. Susceptibilities in Fetuses, Infants, and Children Associated with Climate Change and Exposures.



Effects of Climate Change

Direct Effects

- Extreme heat or cold
- Air Pollutions
- Natural Disasters

Indirect Effects

- Expand vectors distribution
- Increase water contamination
- Exposure to traumatic events
- Reduce Food and water security

Health Outcomes of Climate Change

- Direct mortality and morbidity from extreme weather events and natural disasters:
 - Heat illness, mental health impacts
- Increase infectious diseases:
 - Vector-born, water-born, food-born infectious diseases
- Increase illness due to air pollutions
- Increase malnutrition due to food security

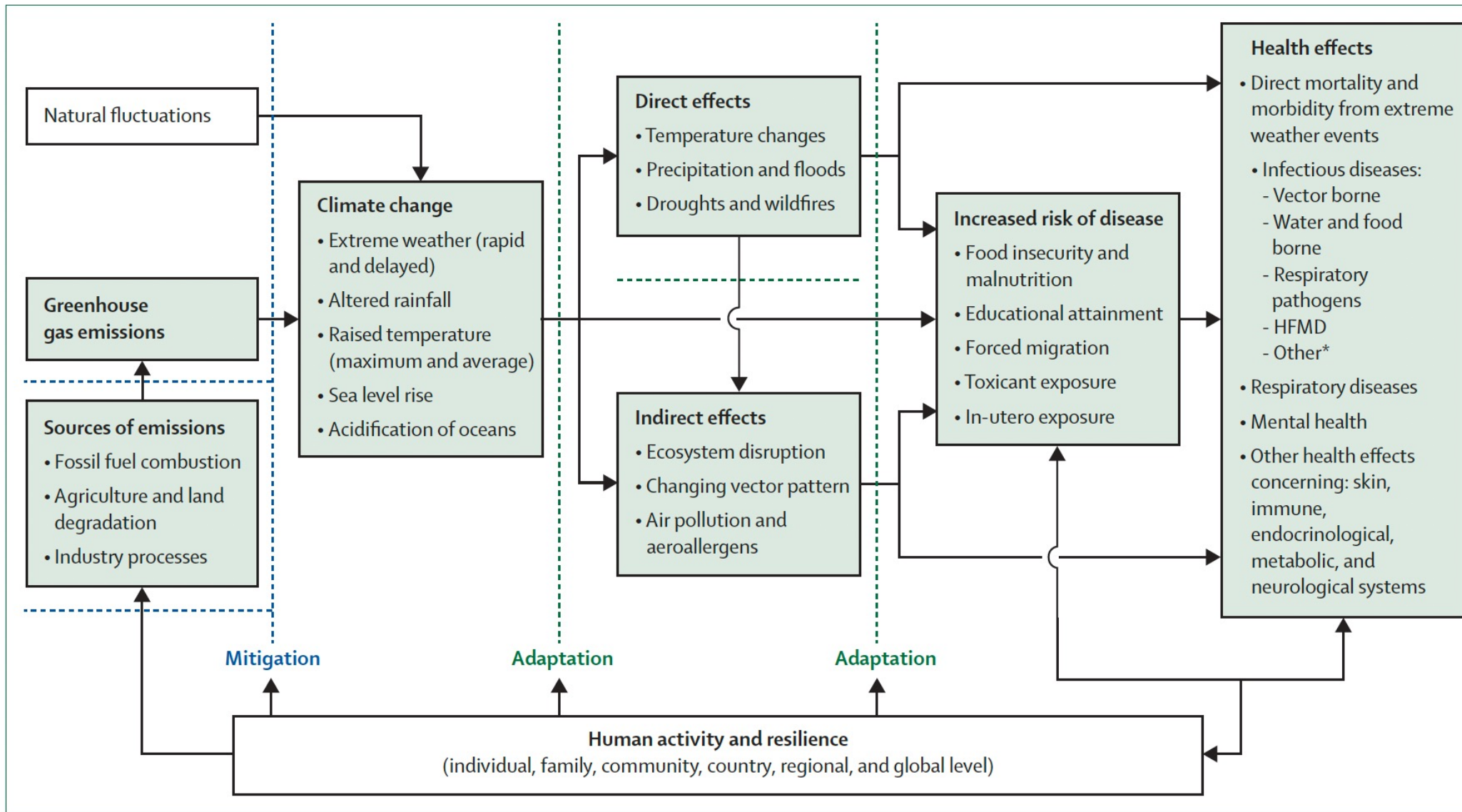


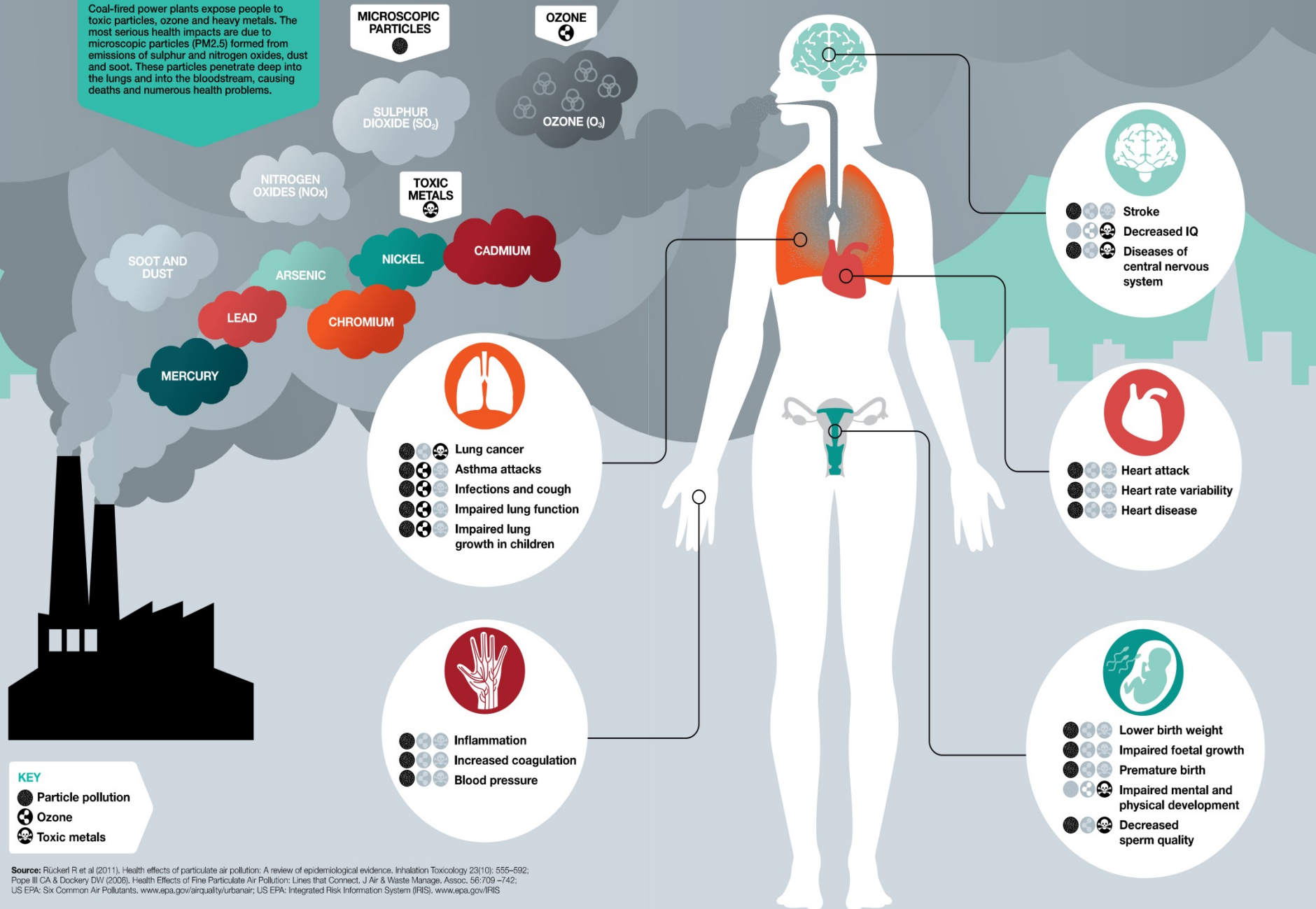
Figure 3: Climate change and child health: an expanded framework

The dashed lines show where mitigation and adaptation can hinder the effects of climate change on child health and wellbeing. HFMD=Hand, foot, and mouth disease. *Other infectious diseases, from mumps to bacterial meningitis, varicella viruses, and parasitic diseases.

Daniel H, Camilla A. et al Climate change and child health: a scoping review and an expanded conceptual framework Lancet Planet Health 2021; 5: e164–75

How coal-fired power plants can make you sick

Coal-fired power plants expose people to toxic particles, ozone and heavy metals. The most serious health impacts are due to microscopic particles (PM2.5) formed from emissions of sulphur and nitrogen oxides, dust and soot. These particles penetrate deep into the lungs and into the bloodstream, causing deaths and numerous health problems.



KEY

- Particle pollution
- ⊕ Ozone
- ☠ Toxic metals

Source: Rückerl R et al (2011). Health effects of particulate air pollution: A review of epidemiological evidence. *Inhalation Toxicology* 23(10): 555-592;
 Pope III CA & Dockery DW (2006). Health Effects of Fine Particulate Air Pollution: Lines that Connect. *J Air & Waste Manage. Assoc.* 56:709-742;
 US EPA: Six Common Air Pollutants. www.epa.gov/airquality/urbanair; US EPA: Integrated Risk Information System (IRIS). www.epa.gov/IRIS

WHO: Air Pollution Deaths > Combined Mortality of HIV/AIDS, Malaria and TB

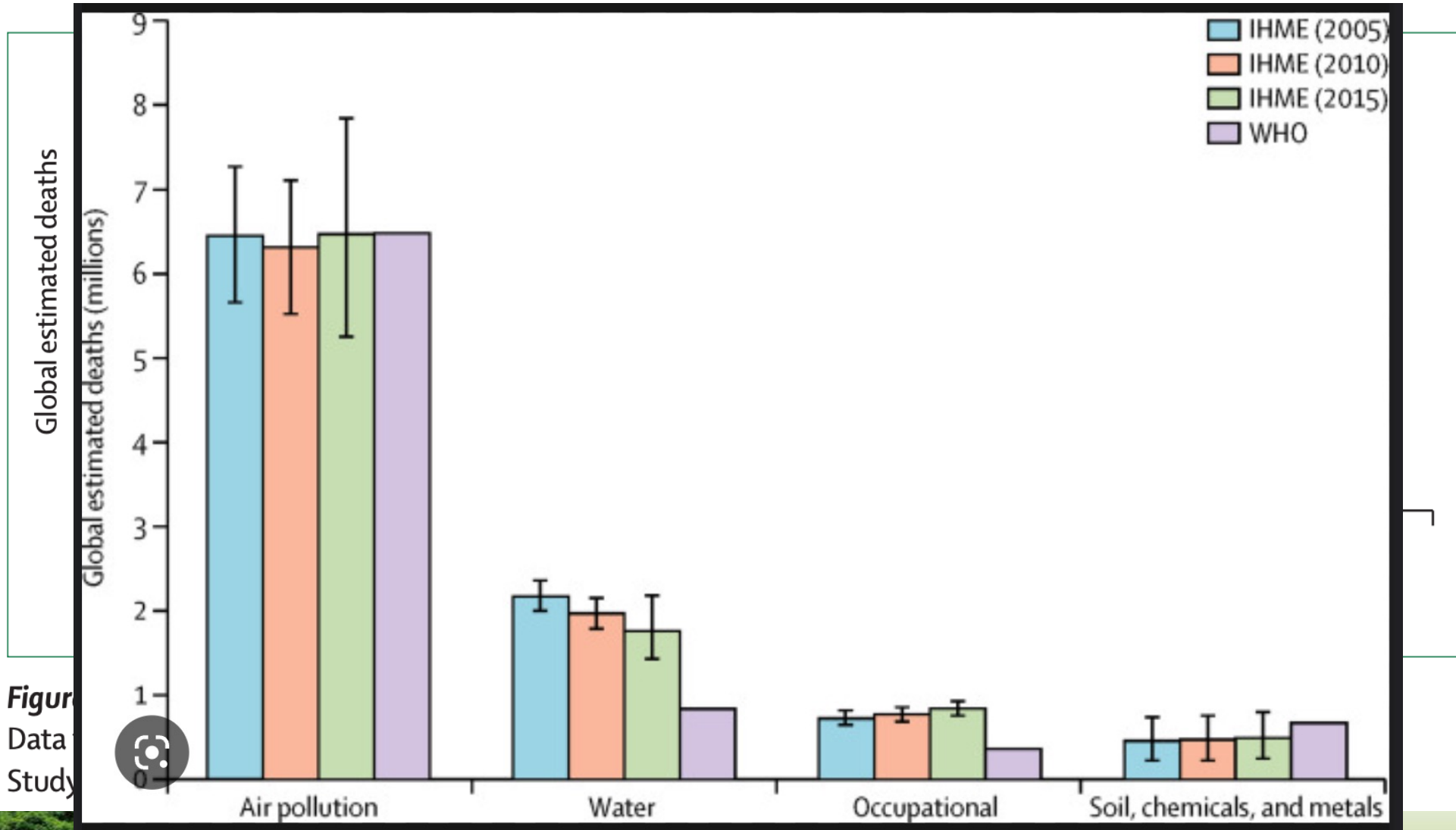
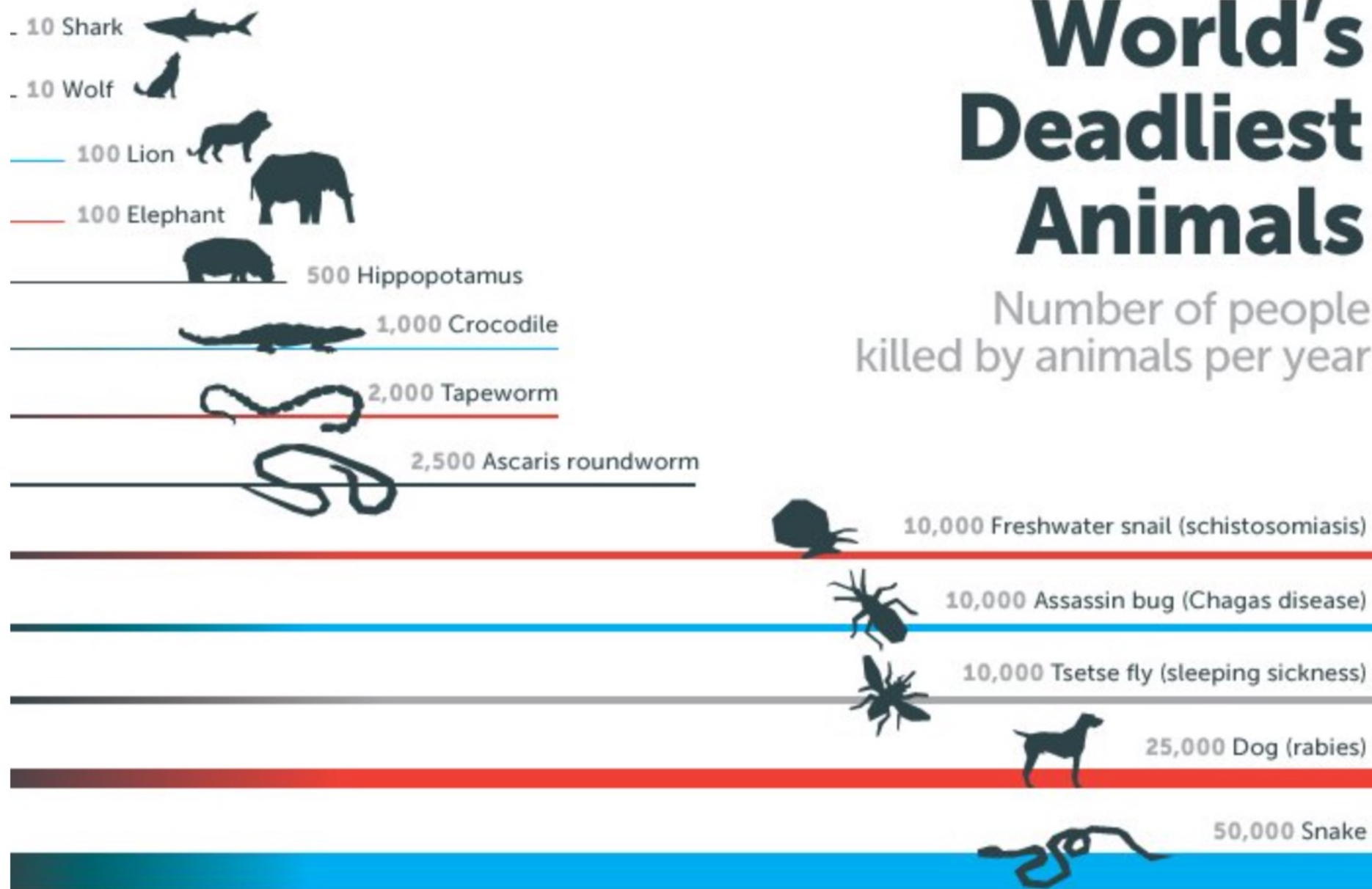


Figure Data Study

World's Deadliest Animals

Number of people killed by animals per year





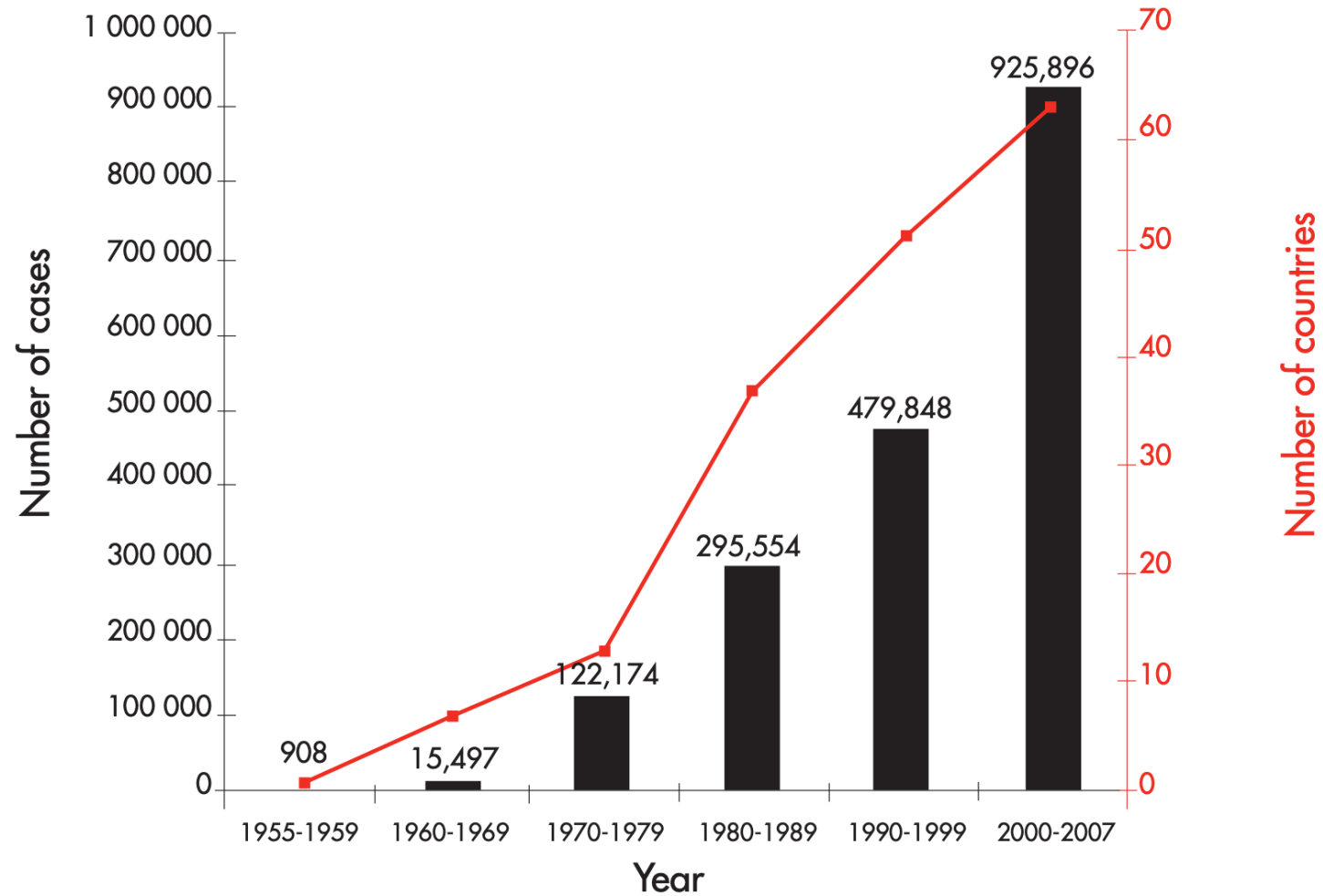
475,000
Human



725,000
Mosquito

SOURCES: WHO; crocodile-attack.info; Kasturiratne et al. (doi.org/10.1371/journal.pmed.0050218); FAO (webcitation.org/6OgpS8SVO); Linnell et al. (webcitation.org/6ORL7DBUO); Packer et al. (doi.org/10.1038%2F436927a); Alessandro De Maddalena. All calculations have wide error margins.

Figure 1.2 Average annual number of dengue fever (DF) and dengue haemorrhagic fever (DHF) cases reported to WHO, and of countries reporting dengue, 1955–2007

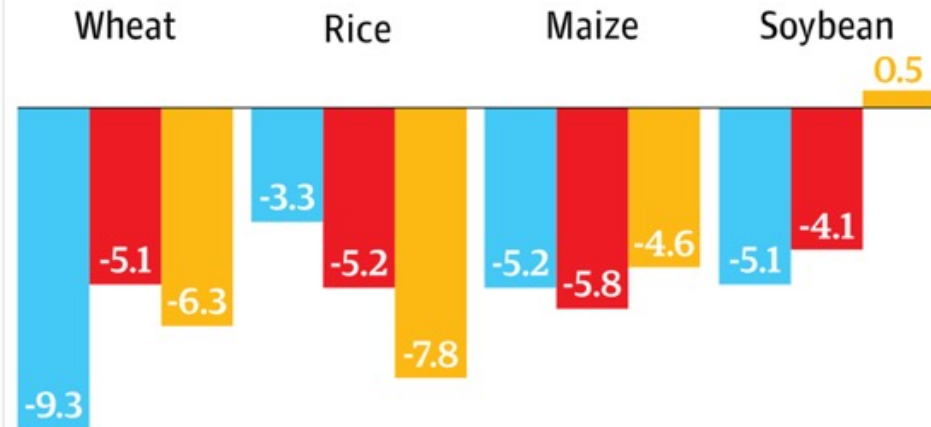


Climate change and food security

High CO2 cuts crop nutrients

Percentage under CO2 levels expected in 2050,

■ Zinc ■ Iron ■ Protein

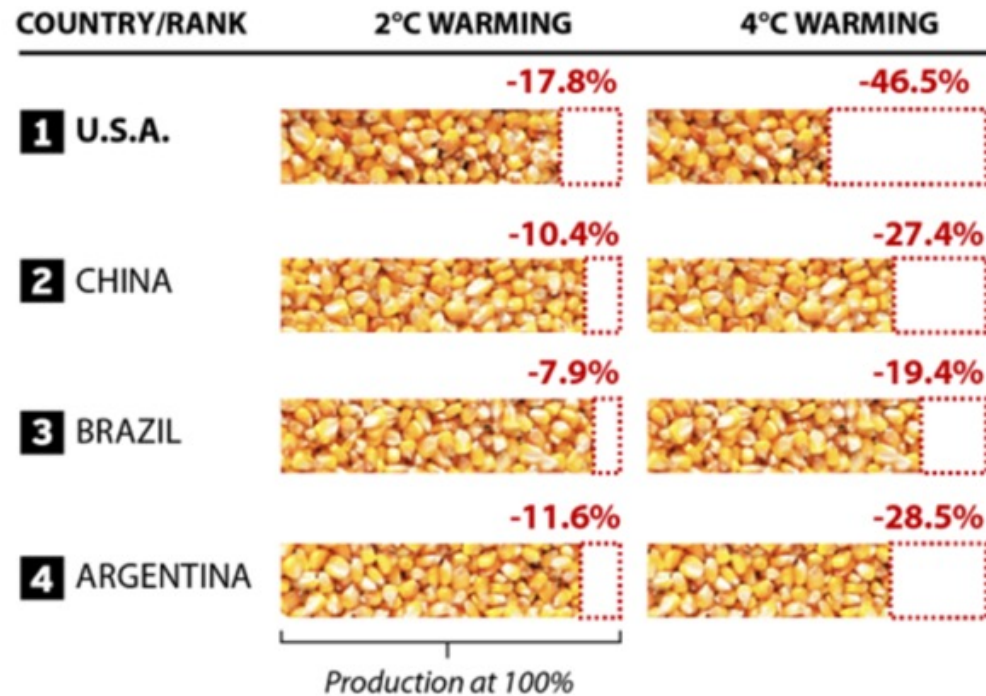


SOURCE: NATURE

Myers, S. S., Zanobetti, A., et al (2014). Increasing CO2 threatens human nutrition. Nature, 510(7503), 139–142. doi:10.1038/nature13179

MAIZE PRODUCTION PROJECTIONS

Projections under different warming scenarios, top producers, mean figures



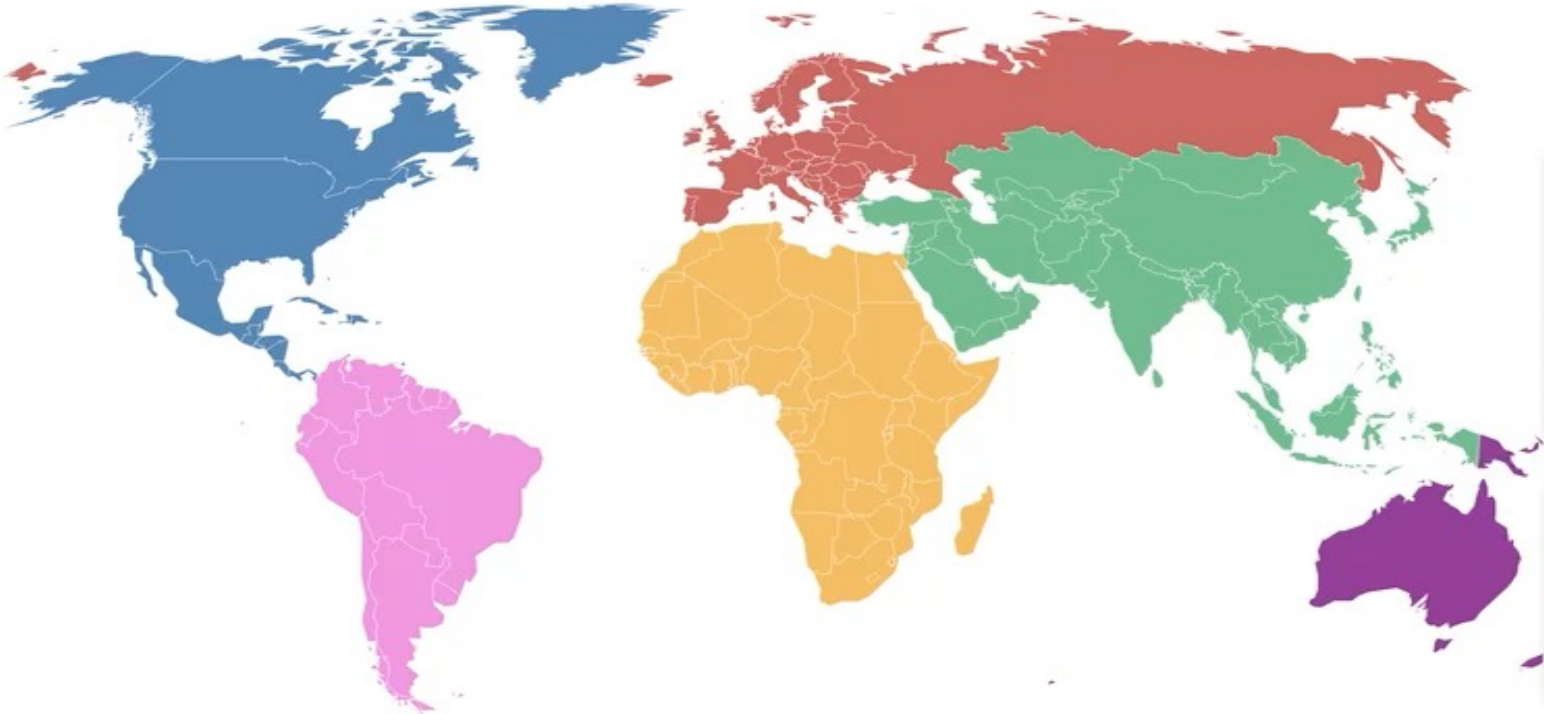
SOURCE: Tigchelaar et al., 2018

PAUL HORN / InsideClimate News

Michelle T, David S. et al, (2018) Future warming increases probability of globally synchronized maize production shocks, <https://doi.org/10.1073/pnas.17180311>

World Maps from Different Perspectives

BACKGROUND Area Population Wealth **RESPONSIBILITY** Extraction Emissions Consumption Historical Reserves **VULNERABILITY** People at risk Sea level Poverty



Shade by

Continents

- Europe
- Africa
- Asia
- North America
- South America
- Oceania

i This map
This is the world as seen in one of the most common maps: the Robinson projection.

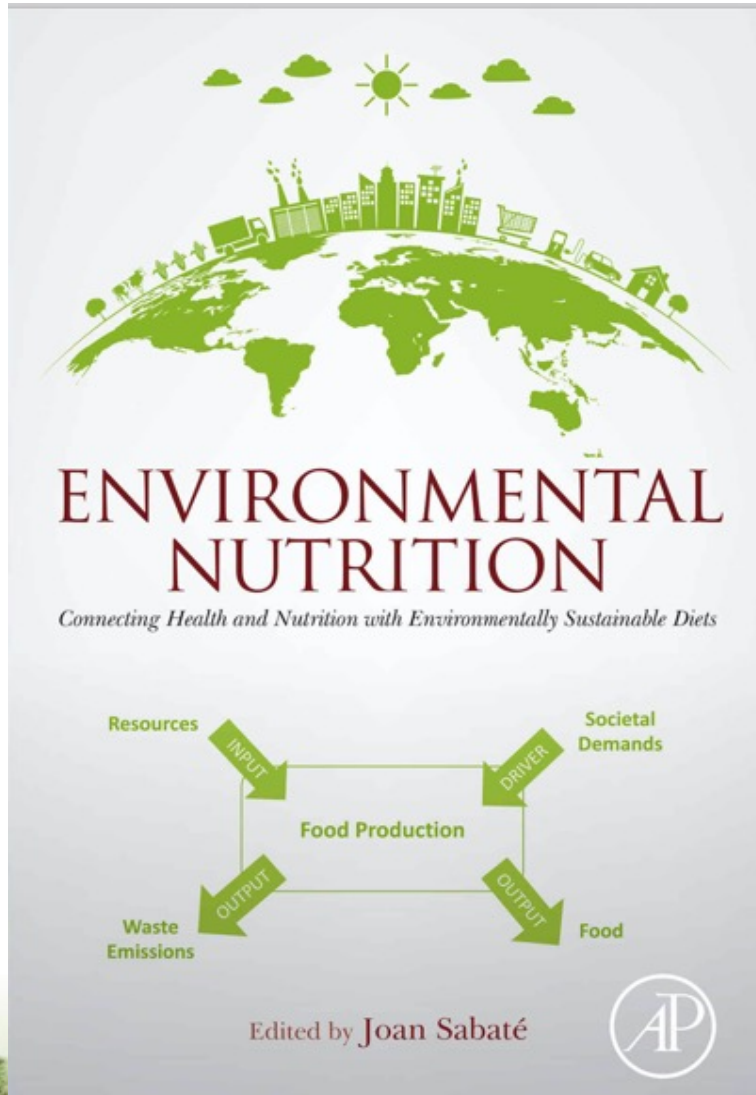
[ABOUT THIS TOOL](#) [DATA SOURCES](#)

Access from the guardian. https://www.theguardian.com/news/datablog/interactive/2012/mar/29/carbon-map-infographic-world?fbclid=IwAR1gDM3hidzI8r6pj8-XOuKxz5RjFOV8TW9t16ubScJyM1-0R_3y5eoQFiI



Environmental Nutrition-

Connection health and nutrition with environmentally sustainable diets



Joan Sabaté, MD, DrPH



Natural world



Human societies

Resources

- Land
- Solar radiation
- Water
- Fossil fuel
- Chemicals

Food life cycle

- Agriculture
- Livestock
- Fisheries
- Transportation
- Processing
- Packaging
- Retail
- Cooking
- Disposal



Demands

- Consumer preferences
- Policy
- Technology
- Marketing
- Social dynamic

Pollution

- Solid & fluid waste
- Biological contaminants
- Gas emissions (GHG)

Food

Consumption patterns of diverse populations

Climate change

Low regional food yields

Food insecurity

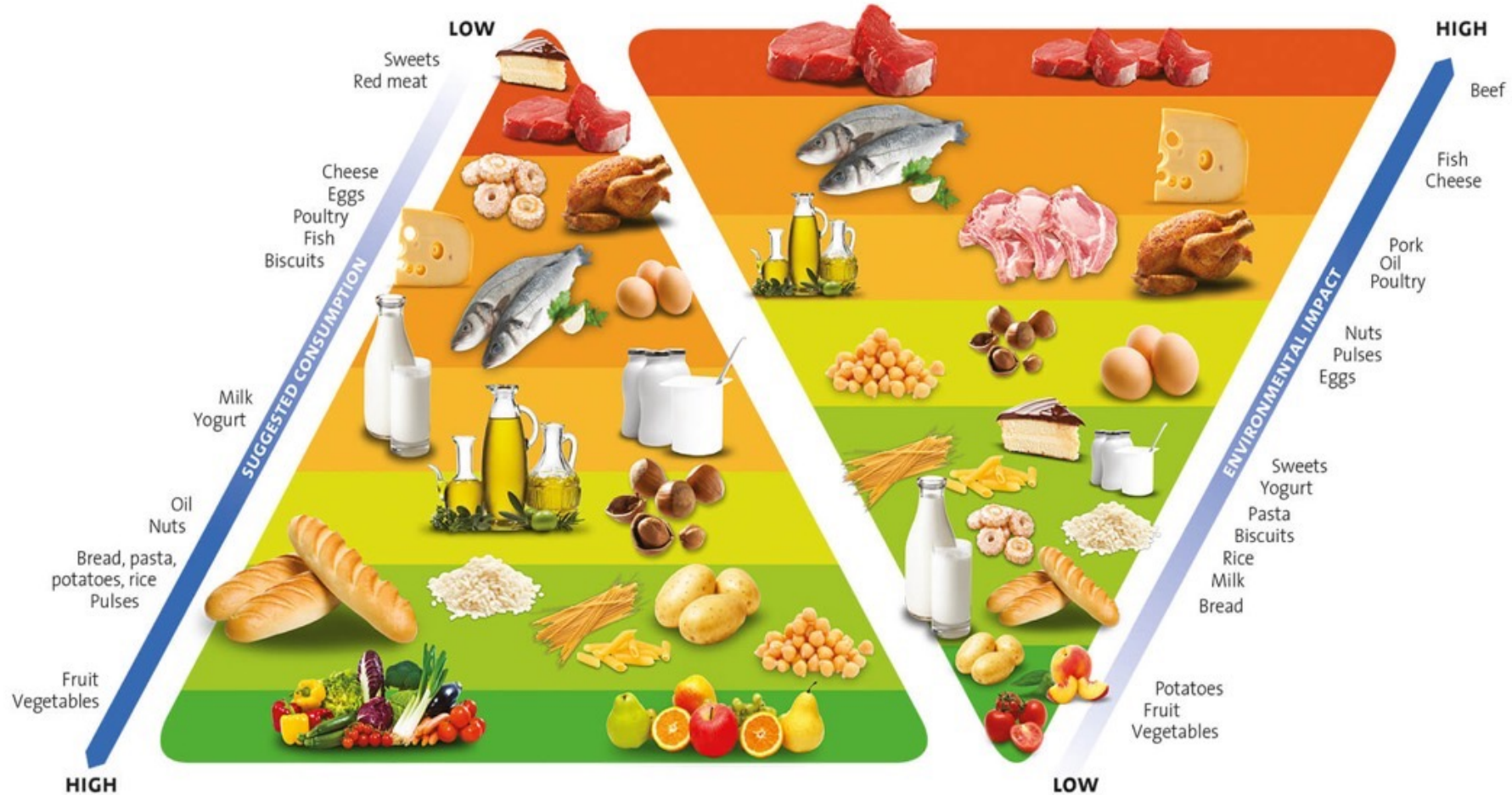
Undernourished

- Malnutrition
- Deficiency diseases

Overfed

- Obesity
- Chronic diseases

ENVIRONMENTAL PYRAMID



FOOD PYRAMID

Source : BCFN. Recommendations for a sustainable diet . 2016

		Health effects		
		Negative	Medium	Positive
Environmental impact	High	Processed meat	Red meat	Seafood
	Medium	Ultraprocessed foods	White meat, dairy	Nuts, vegetable oils
	Low	Added sugar, refined grains	Roots and tubers	Fruits and vegetables, legumes, whole grains

For the Healthcare Sector

Awareness

- **International and national level**
 - ✓ WHO, HPH, IHF..
- **Institutional level**
 - ✓ Hospitals, Clinics, Specialties..
- **individual level**
 - ✓ Personal, Professional...

Actions

- **International and national level**
 - ✓ Policies, Standards, Accreditations..
- **Institutional level**
 - ✓ Policy, Committee, Education...
- **individual level**
 - ✓ Diet, Transportation, Prescription...

**If you want to walk fast, walk alone.
If you want to walk far, walk together.**

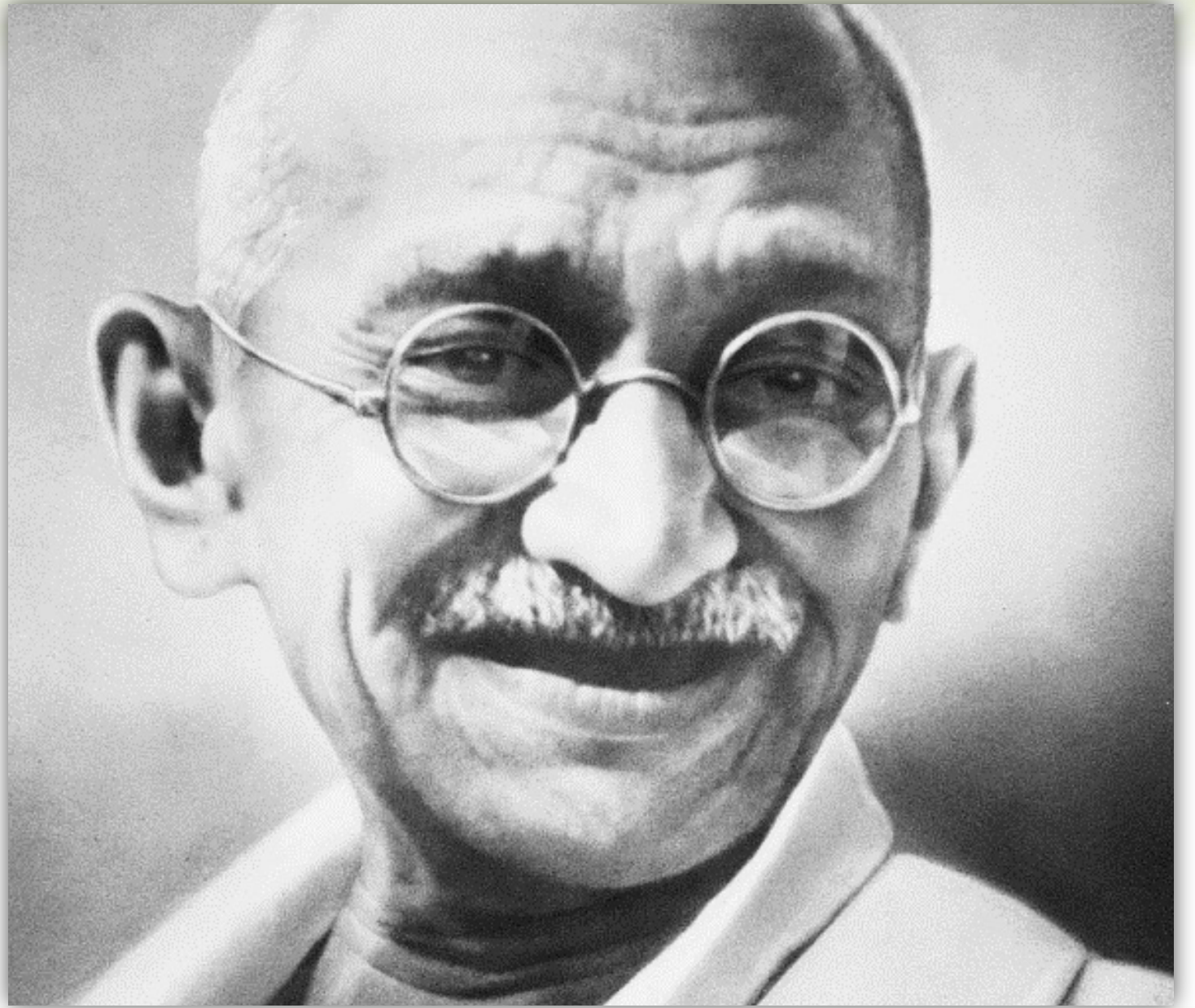
- African proverb -



Be the Change

**You Want to
See in the World**

- Mahatma Gandhi





Task Force on HPH and the Environment



Aims

The aim of the Task Force on HPH and the Environment is assist the medical community in mitigating the effects of climate change and cultivate the resilience of health care systems to climate change. We provide evidence-based findings and work to visualize environment-related health promotion issues in existing HPH models and tools. Our group represents a broad range of research, practice, and policy expertise in public health, health promotion, climate change, environmental sustainability, and protection.