Climate-Associated Changes in Health Outcomes

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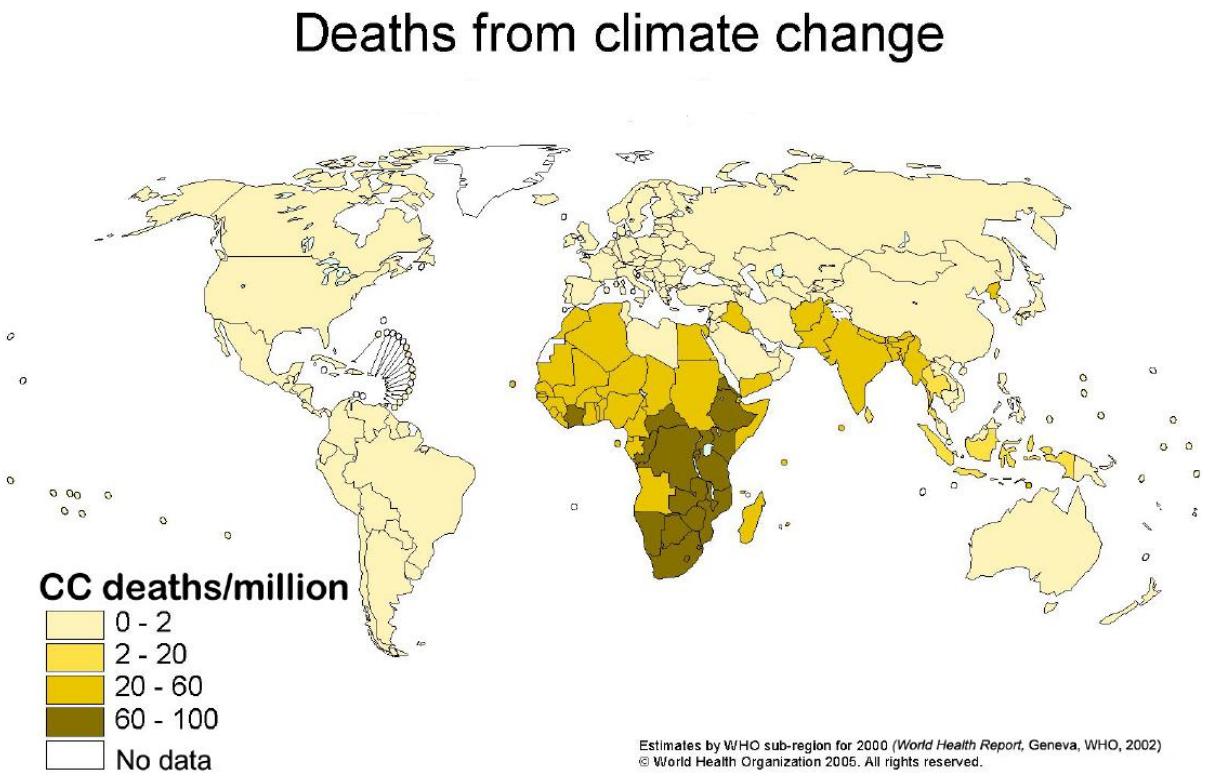
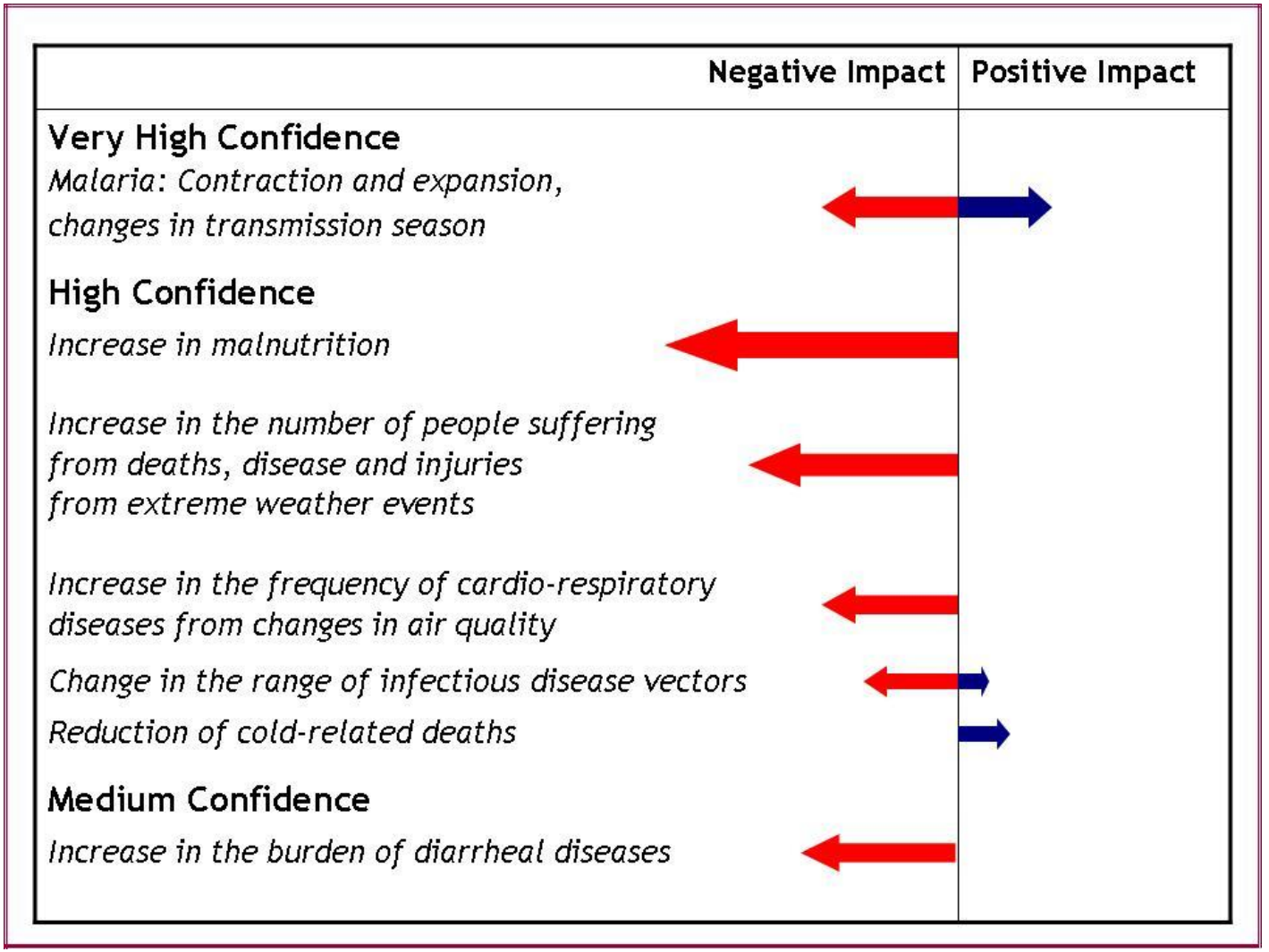
IPCC AR4 Health Impacts of Climate Change

- Emerging evidence of climate change impacts:
  - Altered distribution of some vectors
  - Altered seasonal distribution of some pollen species
  - Increased risk of heatwave deaths

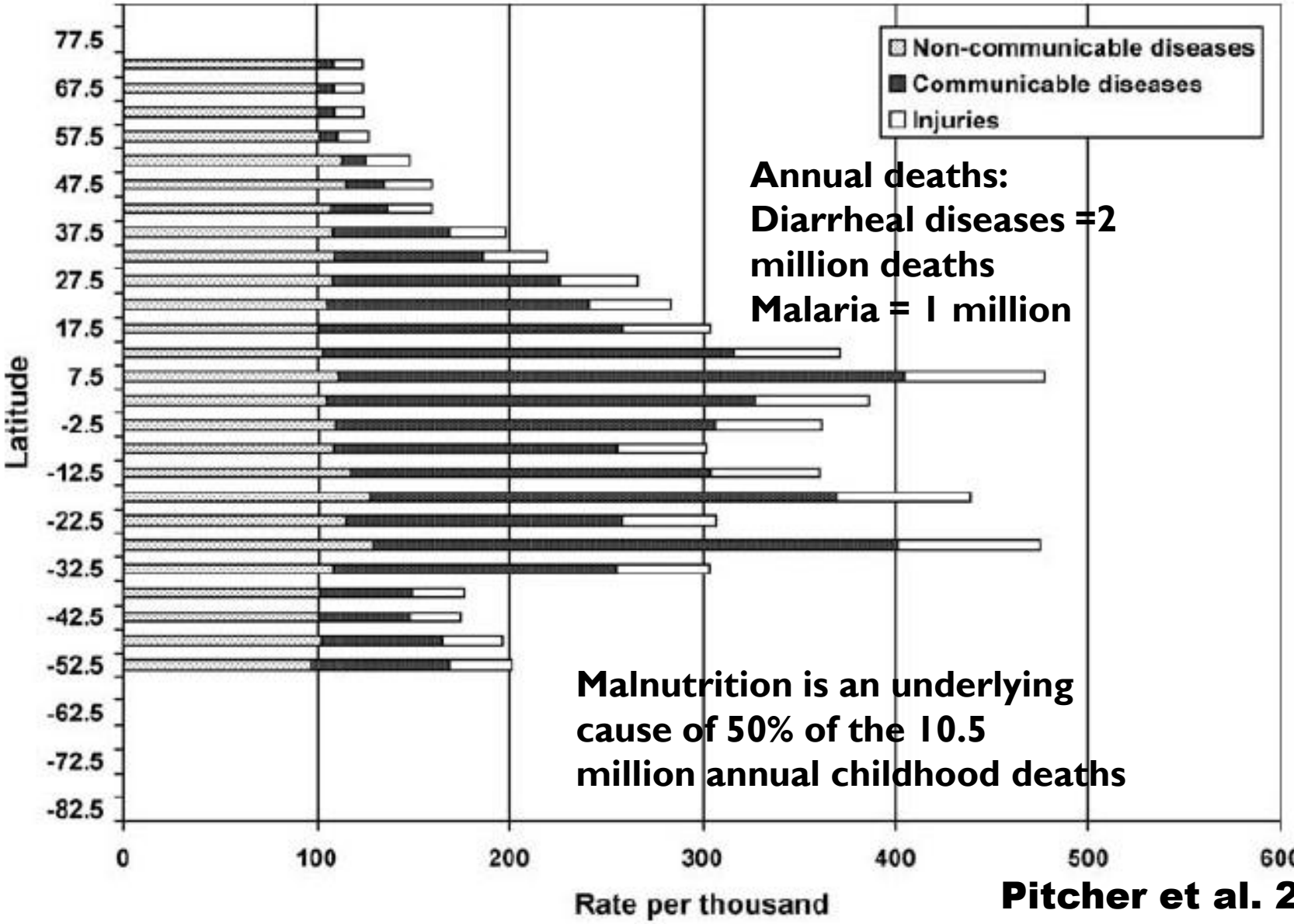


Direction and Magnitude of Climate Change Health Impacts



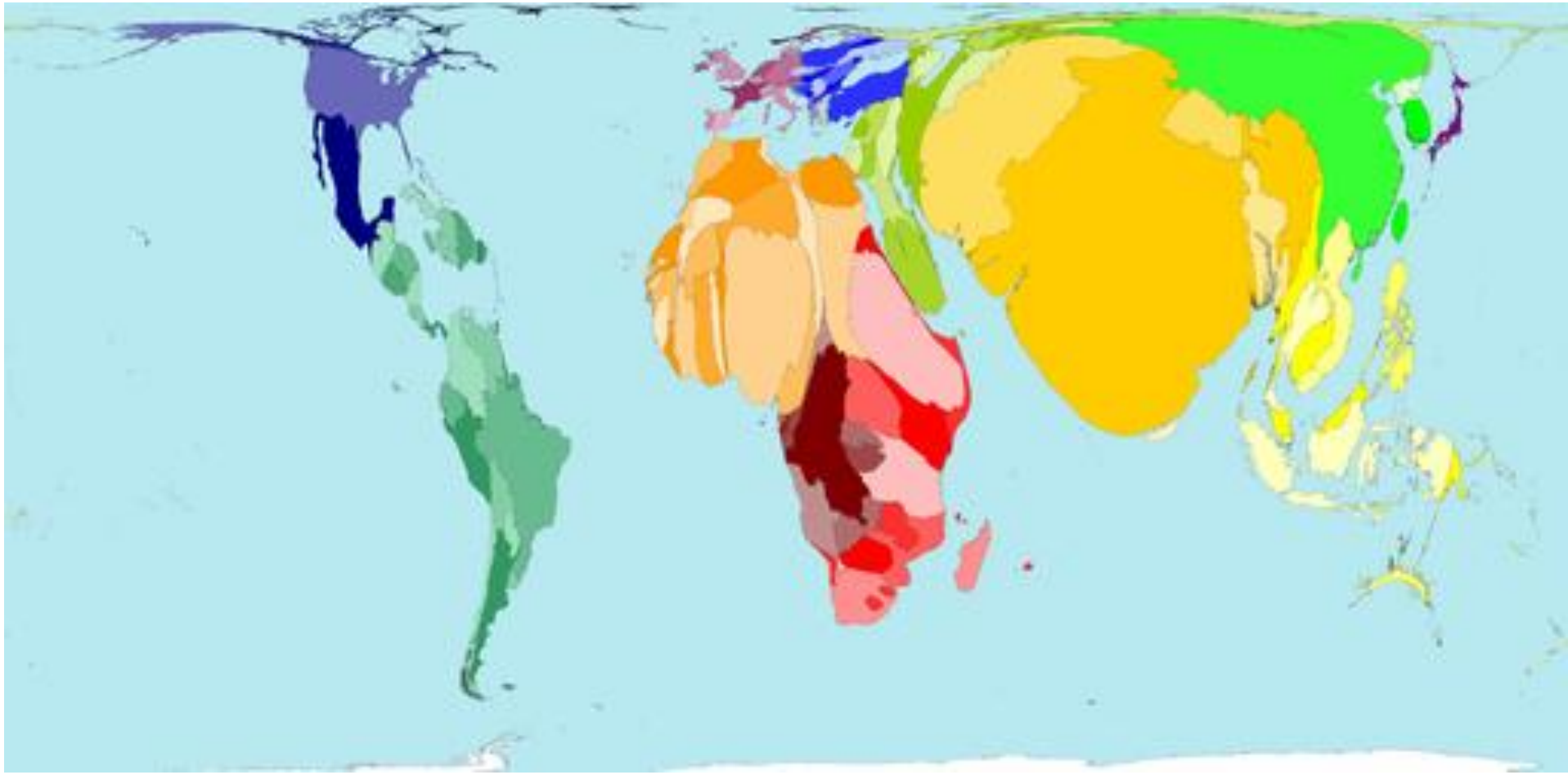
IPCC 2007

Sum of Years of Life Lost and Years of Life Lived with Disability



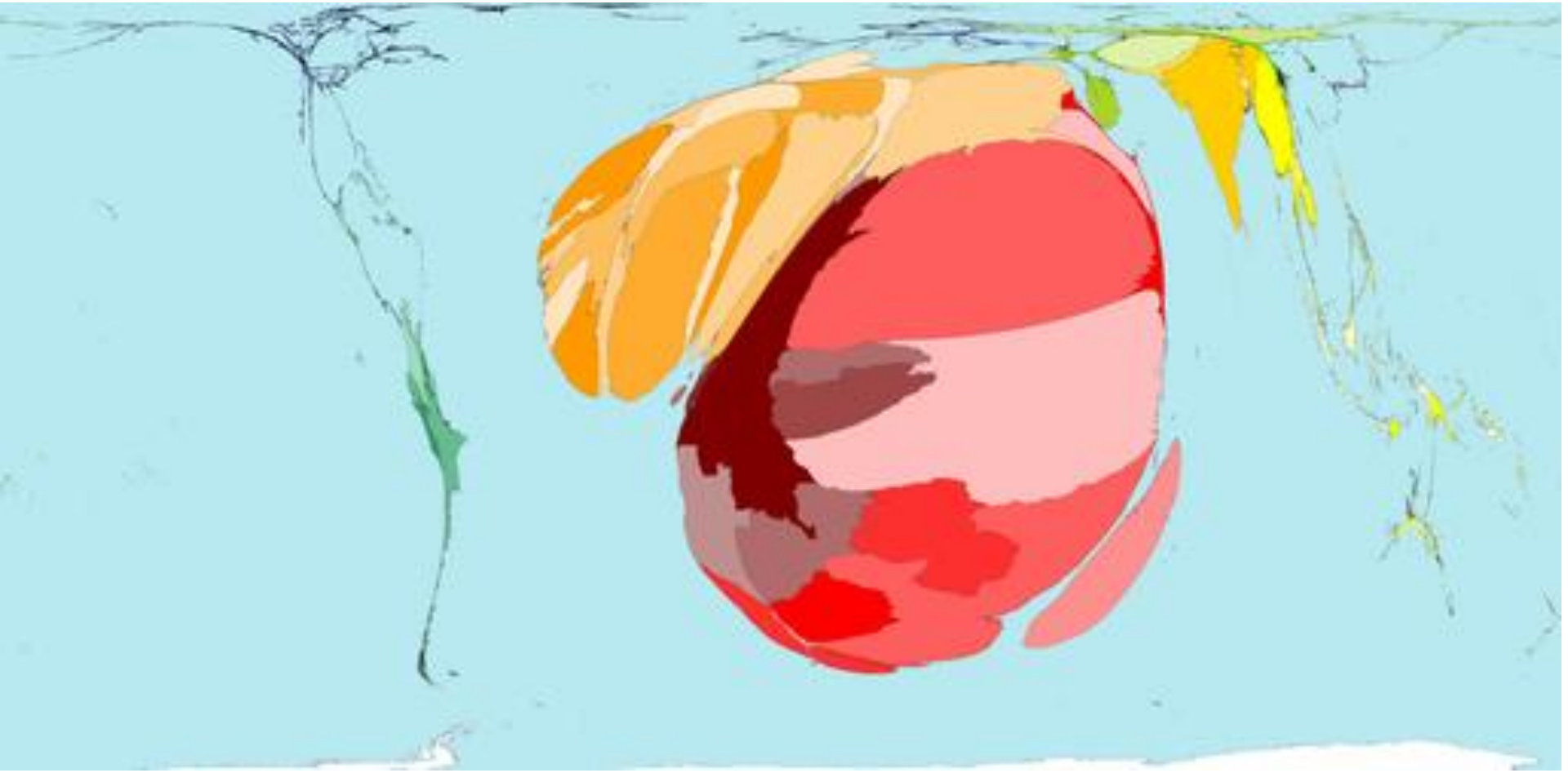
Pitcher et al. 2008

Prevalence Childhood Diarrhea



www. Worldmapper.org

Malaria Cases



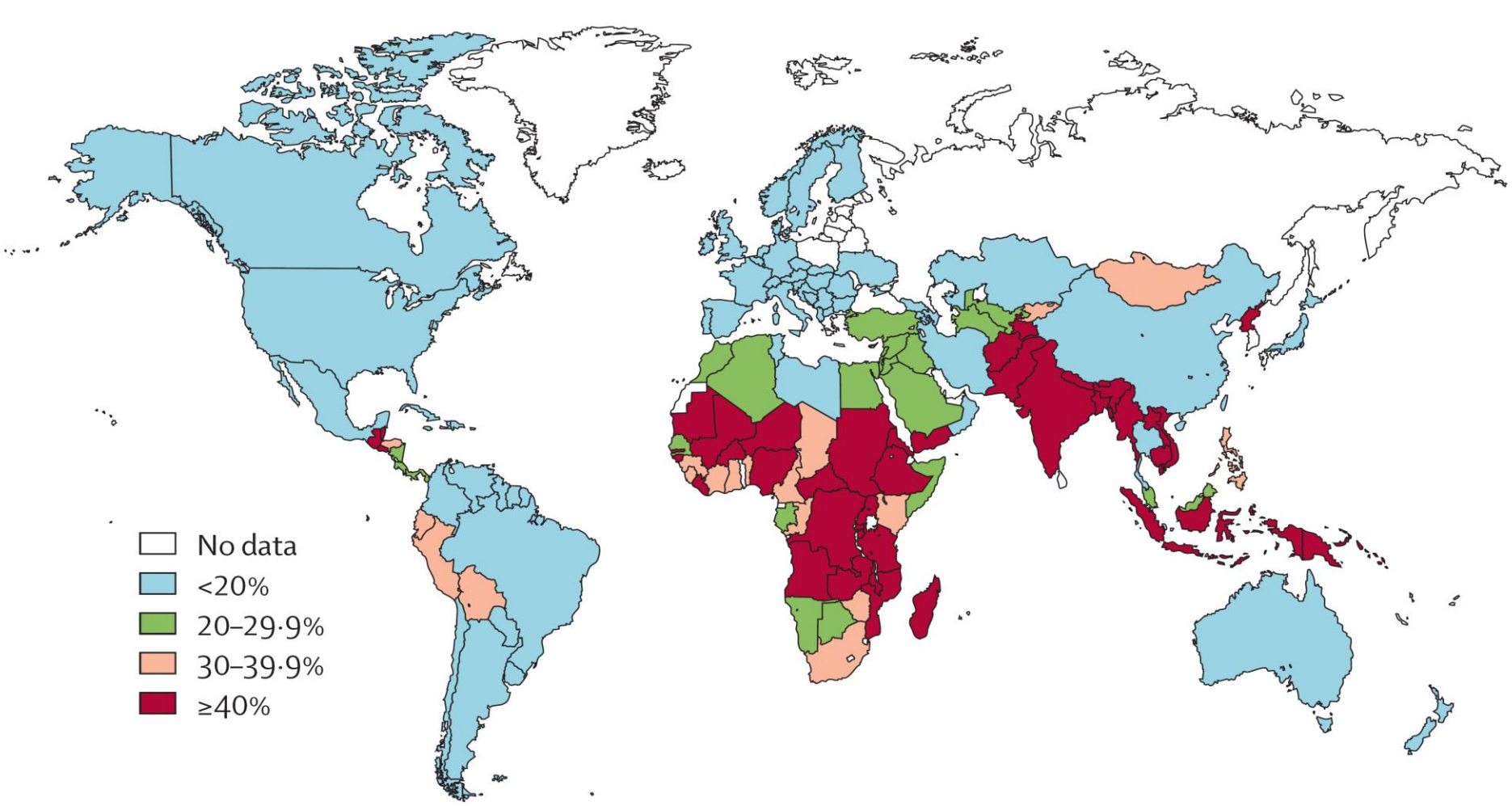
www. Worldmapper.org

Global Burden of Disease Undernutrition

- 21% disability-adjusted life-years (DALYs) for children younger than 5 years
- 35% child deaths – 11% of total global Burden of Disease
- When all the effects of malnutrition are considered (including loss of cognitive function, poor school performance, and loss of future earning potential), the total estimated costs of environmental risk factors could be as high as 8-9% of a typical developing country's GDP in South Asia or Sub-Saharan Africa

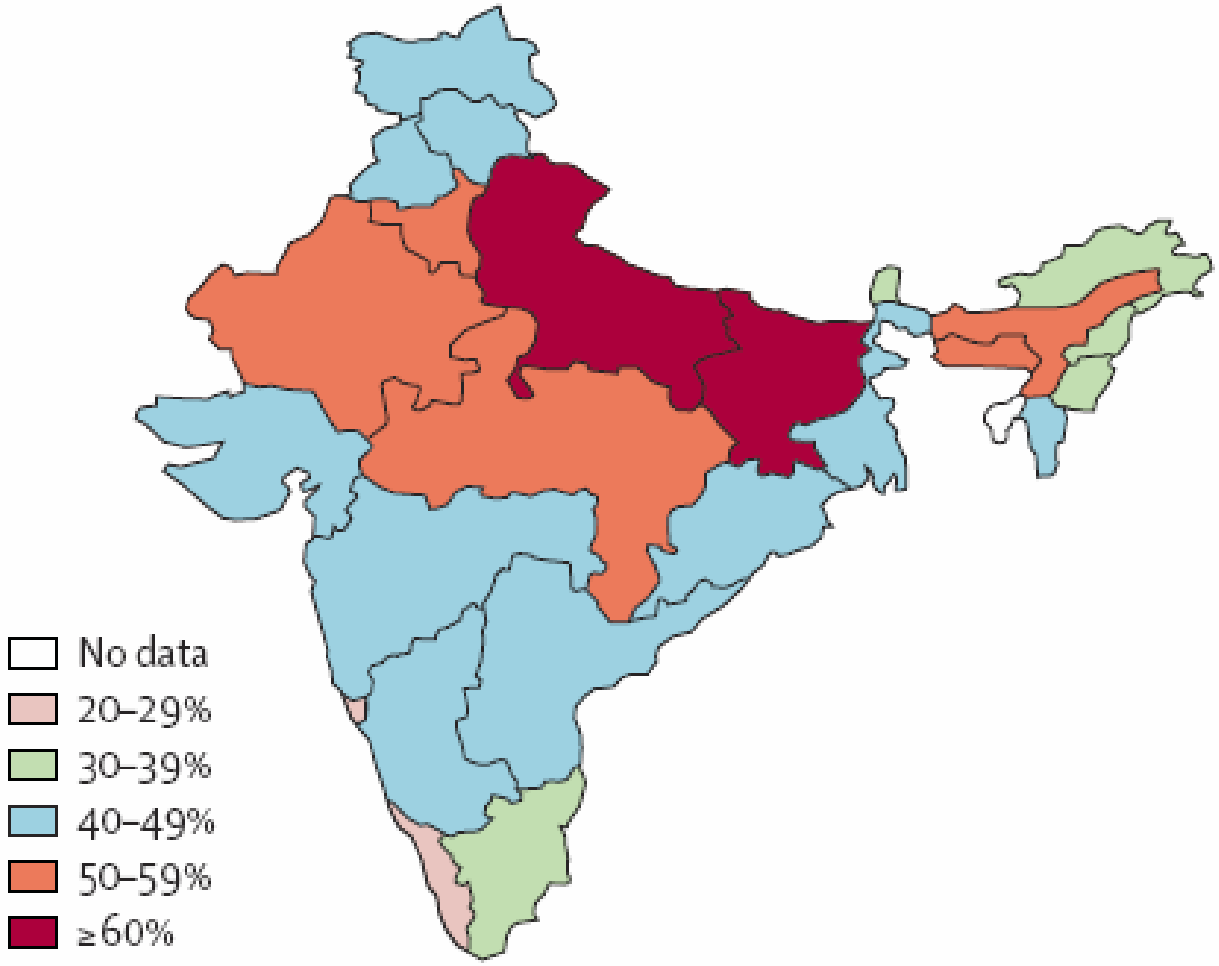
Black et al. 2008

Prevalence of Stunting in Children Under 5 years (2005)



Black et al. 2008

Prevalence of Stunting in Children Under 5 years in India (2005)



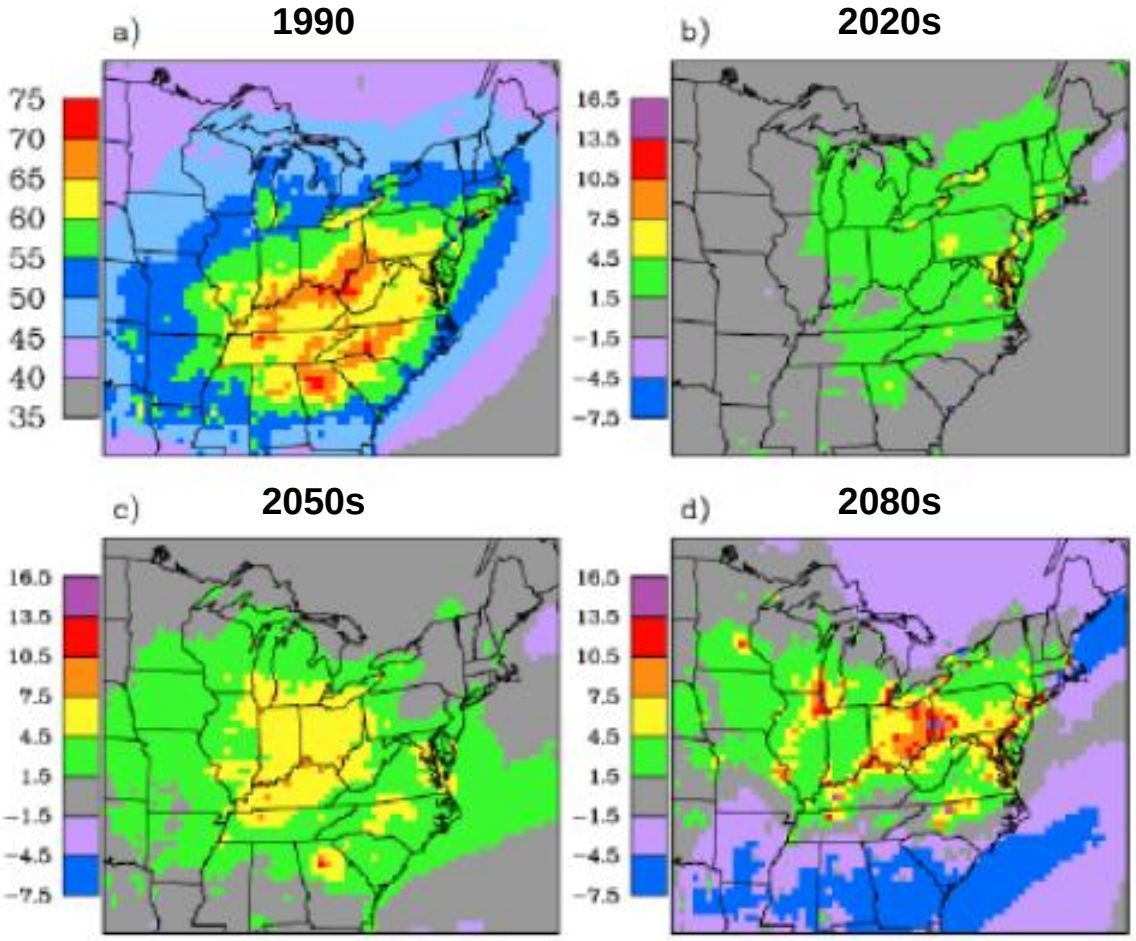
India has more than 61 million stunted children, 51% of the national population and 34% of the global total. However, stunting prevalence varies substantially by state.

Black et al. 2008

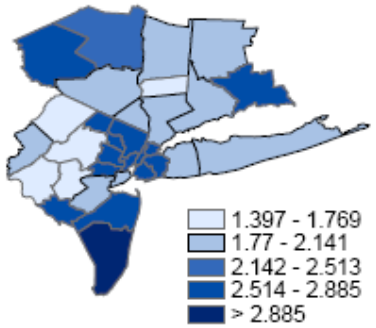
Interactions of Infectious Diseases and Undernutrition

- Poor nutritional status, especially in infants and young children, makes infections more severe and prolonged, and often more frequent
  - In low-income countries, 27% of children under the age of 5 are chronically undernourished or stunted, and 23% are underweight
- Almost all infections influence a child's nutritional status through loss of appetite, changes in intestinal absorption, metabolism, and excretion of specific nutrients
  - The effects of infections appear to be directly proportional to the severity of the infection

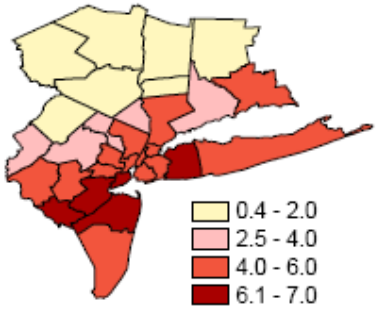
Projected Changes in Ozone and Related Deaths, New York Metro Area



Kinney et al. 2006



Baseline Daily Mortality Rate per 100,000



Percent Increase in O_3-related Deaths

2050s

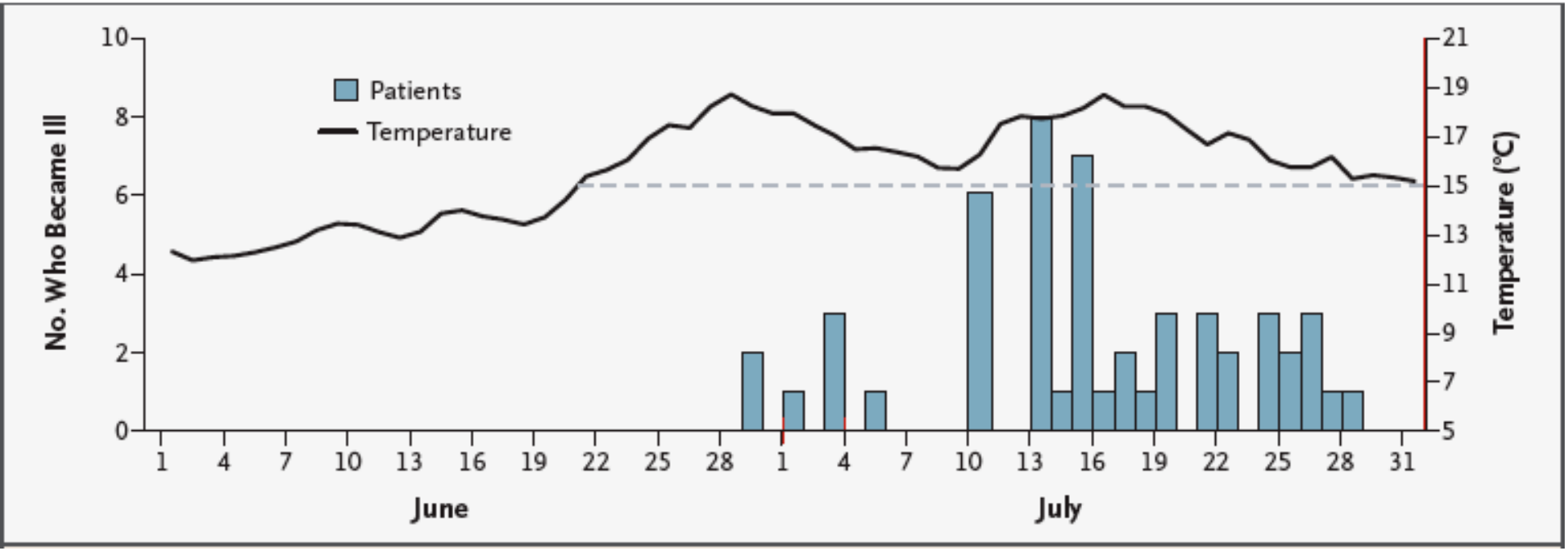
Climate Change Impacts in 2030 under 750 ppm CO_2 Scenario (thousands of cases)

Estimated costs to treat the climate change-related cases = $3,992 to $12,603 million

	Diarrhea	Malnutrition	Malaria
Total	4,513,981	46,352	408,227
Climate change impacts	131,980	4,673	21,787
% increase	3%	10%	5%

Ebi 2008

Vibrio parahaemolyticus Infections by Harvest Date and Mean Daily Water Temperature



McLaughlin et al. 2005

Research Needs

- Improve characterization of exposure- response relationships, particularly at regional and local levels, including identifying thresholds and particularly vulnerable groups
- Collect data on the early effects of changing weather patterns on climate-sensitive health outcomes
- Collect and enhance long-term surveillance data on health issues of potential concern, including vectorborne and zoonotic diseases, air quality, pollen and mold counts, reporting of food- and water-borne diseases, morbidity due to temperature extremes, and mental health impacts from extreme weather events
- Develop quantitative models of possible health impacts of climate change that can be used to explore the consequences of a range of socioeconomic and climate scenarios
- Understand local- and regional-scale vulnerability and adaptive capacity to characterize the potential risks and the time horizon over which risks might arise
- Develop downscaled climate projections at the local and regional scale in order to conduct the types of vulnerability and adaptation assessments that will enable adequate response to climate change, and to determine the potential for interactions between climate and other risk factors, including societal, environmental, and economic
- Improve understanding of the design, implementation, and monitoring of adaptation options
- Understand the co-benefits of mitigation and adaptation strategies
- Enhance risk communication and public health education