Potential Health Effects of Climate Change

Climate change:

- **Weather extremes**
- **Sea level rise**
- **Ecosystem changes**

HEAT	→	Heat stress, cardiovascular failure
SEVERE WEATHER	→	Injuries, fatalities
AIR POLLUTION	→	Asthma, cardiovascular disease
ALLERGIES	→	Respiratory allergies, poison ivy
VECTOR-BORNE DISEASES	→	Malaria, dengue, hantavirus, encephalitis, Rift Valley fever
WATER-BORNE DISEASES	→	Cholera, cryptosporidiosis, campylobacter, leptospirosis
WATER AND FOOD SUPPLY	→	Malnutrition, diarrhea, harmful algal blooms, pesticides
MENTAL HEALTH	→	Anxiety, post-traumatic stress, depression, despair
ENVIRONMENTAL REFUGEES	→	Forced migration, civil conflict

Source: Howard Frumkin (CDC)

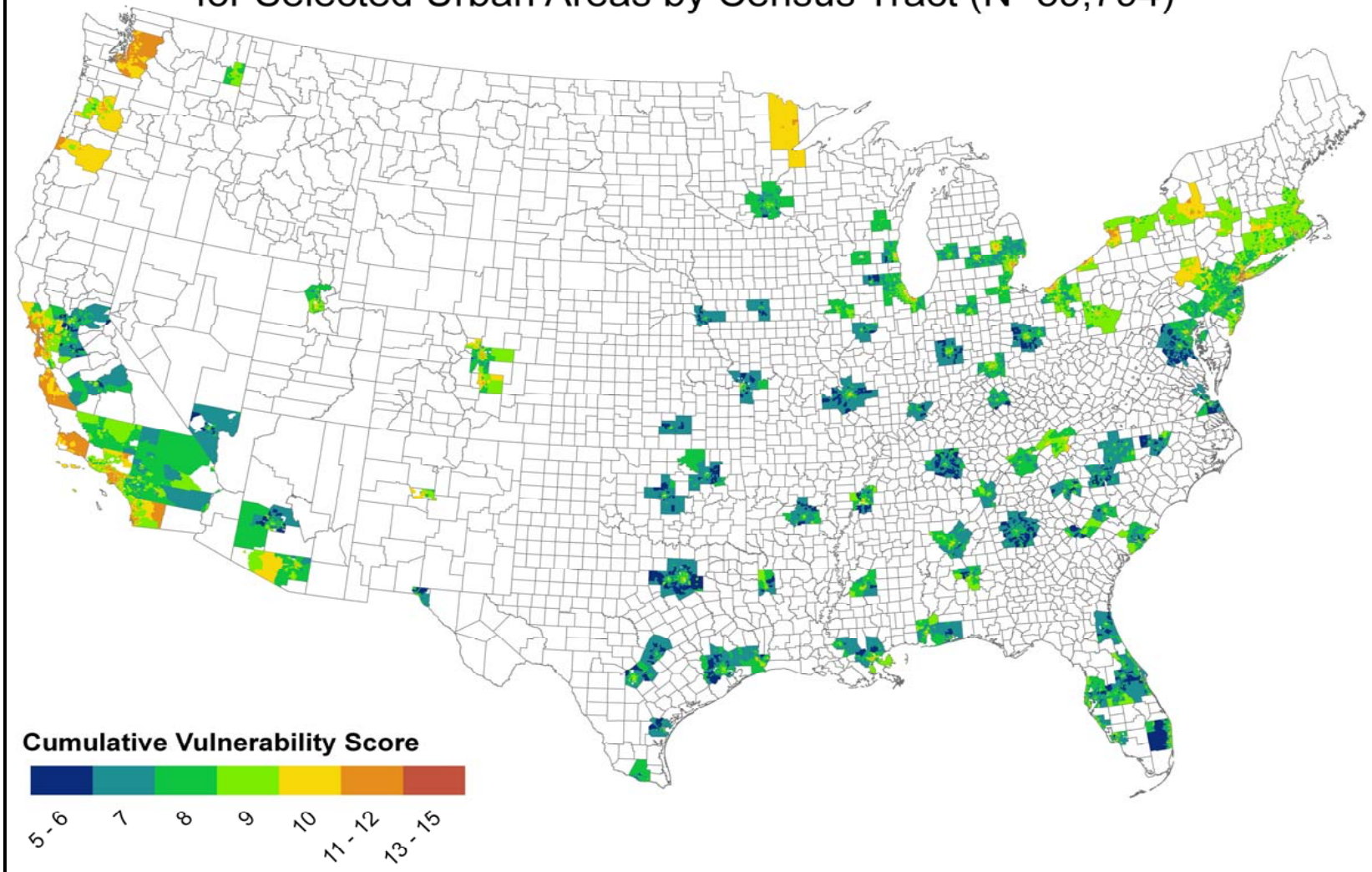
Heat Wave Health Vulnerability Mapping

(Reid CE, O'Neill MS, Gronlund C, Brines SJ, Brown DG, Diez-Roux AV, & Schwartz J. "Mapping Community Determinants of Heat Vulnerability." Submitted for publication in *Environmental Health Perspectives*)

EPA Science to Achieve Results (STAR) grant, #RD832752

- Used nationally available datasets for heat wave vulnerability.
- Mapped for urban census tracts with air conditioning prevalence data with pop >1,000 (n=39,794).
- Conducted factor analysis with four vulnerability factors.
  - Social and environmental vulnerability (poverty, educational attainment, minority population, lack of vegetation)
  - Isolation (population living alone)
  - Air conditioning prevalence
  - Health status (diabetes prevalence, elderly population)
- **Combined these factors and created a vulnerability index.**

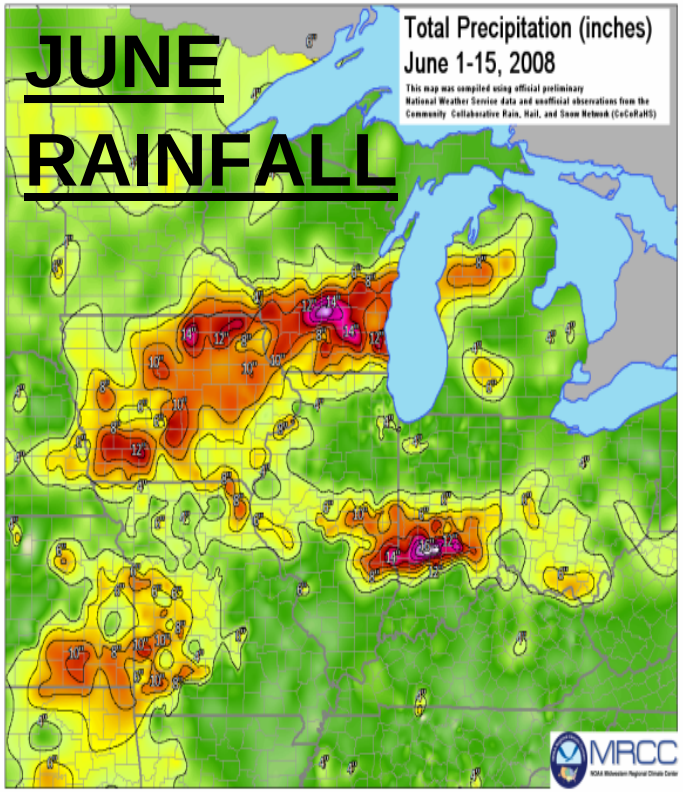
US National Heat-Health Vulnerability Map for Selected Urban Areas by Census Tract (N=39,794)



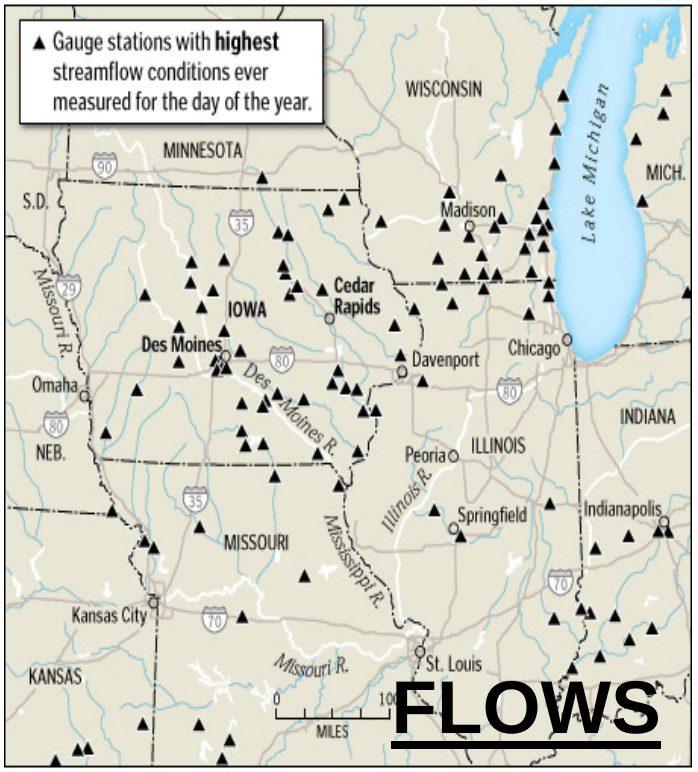
Example Impact:
Human Health – Waterborne Diseases

- Climate variability may cause extremes of the hydrologic cycle.
- Example: Climate models predict that extreme precipitation events will become 10-40% stronger in southern Wisconsin. This may result in greater flooding and an increased presence of **waterborne diseases** that often accompanies high discharge into Lake Michigan (J. Patz et al., 2008).

WEATHER AND CLIMATE RISKS ARE BEST MANAGED AT LOCAL & REGIONAL SCALES



TWO 500-YEAR FLOODS IN 15 YEARS (1993 & 2008)



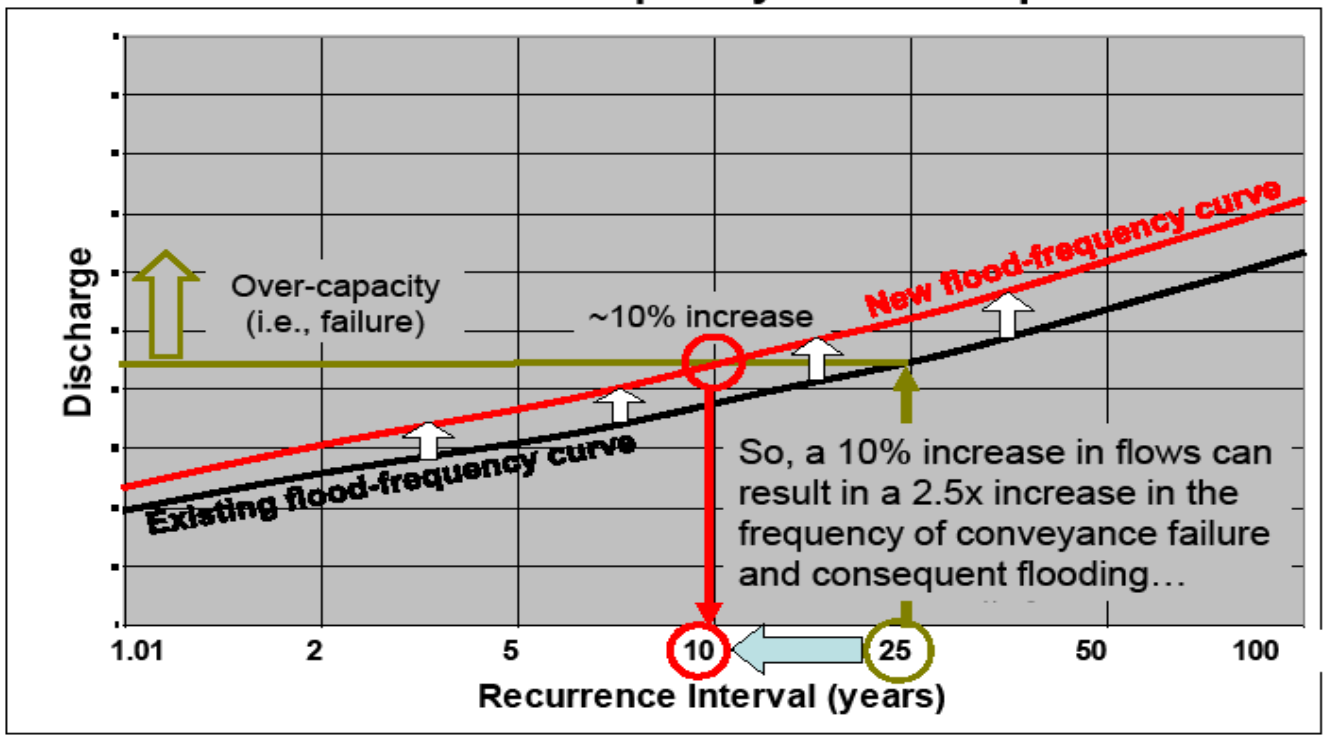
June 14, 2008 Historic Gage Records in 9 States

Source: Josh Foster (Center for Clean Air Policy)

FLOOD FREQUENCY CHANGES

10% increase in flow = 2.5 times chance of failure

Consequences of "modest" changes to the flood-frequency relationship



Source: Derek Booth (Univ. of Washington & Stillwater Science, Inc.)

Combined Sewer Overflow in the Great Lakes Region

(Final Report: Summer 2008)

EPA

- Key Questions:
  - ✓ Does climate change matter to the redesign of combined sewer systems in the Great Lakes Region?
  - ✓ When the climate changes, how might CSO event frequency change, and in how many cases will the four CSO events per year threshold be exceeded?
- If combined sewer systems are designed to meet the EPA's CSO Control Policy design standard of 4 events per year, but fail to plan for climate change:
  - ✓ climate change may result in failure to meet the standard
  - ✓ **there could be an average of 237 events per year above the control policy's objectives across 182 communities**

Source: Joel Scheraga (EPA)