



Health Effects of Exposure to Extreme Heat



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Presentation outline

- An overview of the health effects of heat exposure and the epidemiology of heat waves
- The impact of climate change on extreme heat exposure
- Current CDC activities



Overview of Heat-related Illness

- Heat Rash. A skin irritation caused by excessive sweating during hot, humid weather; most common in young children.
- Heat Cramps: Affect people who sweat heavily during strenuous activity depleting the body's salt and fluids.
- Heat Exhaustion: A milder form of heat-related illness that can develop after several days of exposure to high temperatures.
 - Characterized by paleness, fatigue, muscle cramps, dizziness, headache, nausea or vomiting, and fainting. The skin is typically cool and moist.
- Heat Stroke: A severe form of hyperthermia where the body is unable to regulate its temperature.
 - The sweating mechanism fails, and the body is unable to cool down.
 - Characterized by red, hot, and dry skin (no sweating); rapid, strong pulse; throbbing headache; dizziness; nausea; confusion; and unconsciousness.

Heat Waves

- **High mortality**
 - More deaths than hurricanes, lightning, tornadoes, floods, and earthquakes combined.
 - From 1999–2003, total of 3,442 reported heat-related deaths. Annual mean of 688 (MMWR 2006)
- **Lack of public recognition**
 - No damage to infrastructure (silent killer)
 - Many deaths go unreported or unattributed
- **Every death is preventable**



Silent Killer



Heat Wave Studies

1980 St. Louis

- 1st to highlight the magnitude of mortality from heat waves
- All cause mortality increased 57%

1993 Philadelphia

- Identified cardiovascular mortality as a major cause of death associated with extreme heat

1995 Chicago

- Redefined heat-related death as used by medical examiners
- Assisted with the development of a Heat Wave Response Plan

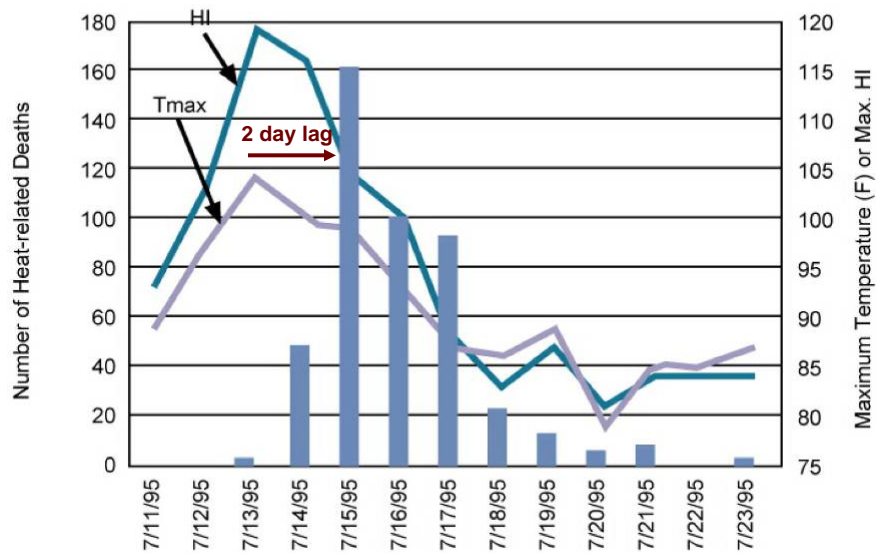
U. S. Agents in Chicago Track a Subtle Health Hazard: Heat



Federal health agents in Chicago are trying to determine the contributing factors to the more than 500 deaths related to the heat in July. Coffins containing the bodies of unclaimed victims were loaded on a truck by a Cook County morgue worker this summer for a mass burial.



Heat Related Deaths in Chicago in July 1995

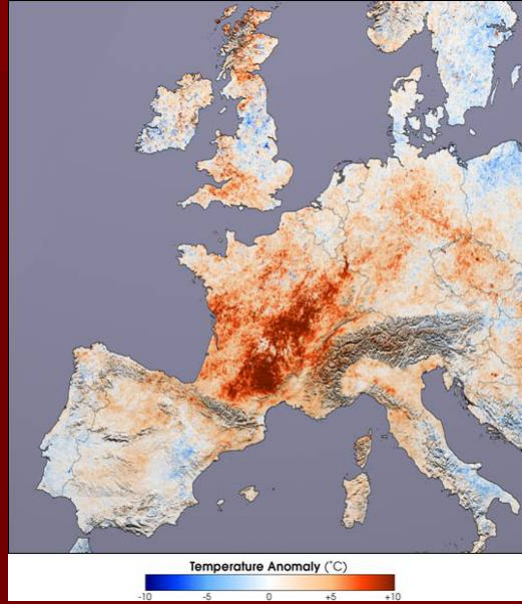


MMWR 1995

Heat Wave Studies

2003 France

- 34,000+ dead in Europe
- 14,000+ dead in France
- Many were elderly in nursing homes
- No effective method to cool



Lessons Learned

Risk factors for hyperthermia:

Individual

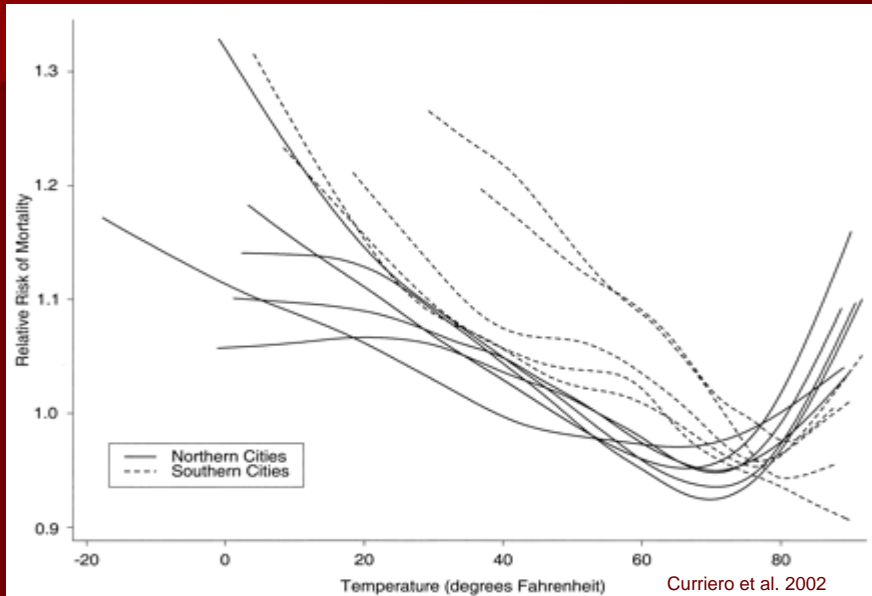


Community Characteristics

- Age
- Underlying medical conditions / mental illness
- Income and poverty status
- Homelessness
- Social isolation
- Access to health care and cooling facilities
- Neighborhood characteristics: land use/ land cover, crime rate, housing type, urban heat island



Temperature-mortality relation for 11 US cities, 1973–1994



Climate Change Predictions

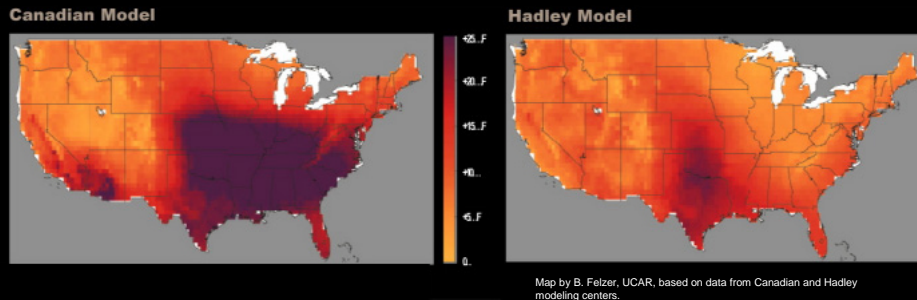
Intergovernmental Panel on Climate Change (IPCC):

“Cities that currently experience heat waves are expected to be further challenged by an increased number, intensity and duration of heat waves during the course of the century.”
[very high confidence]



July Heat Index Change -- 21st Century

July Heat Index Change - 21st Century



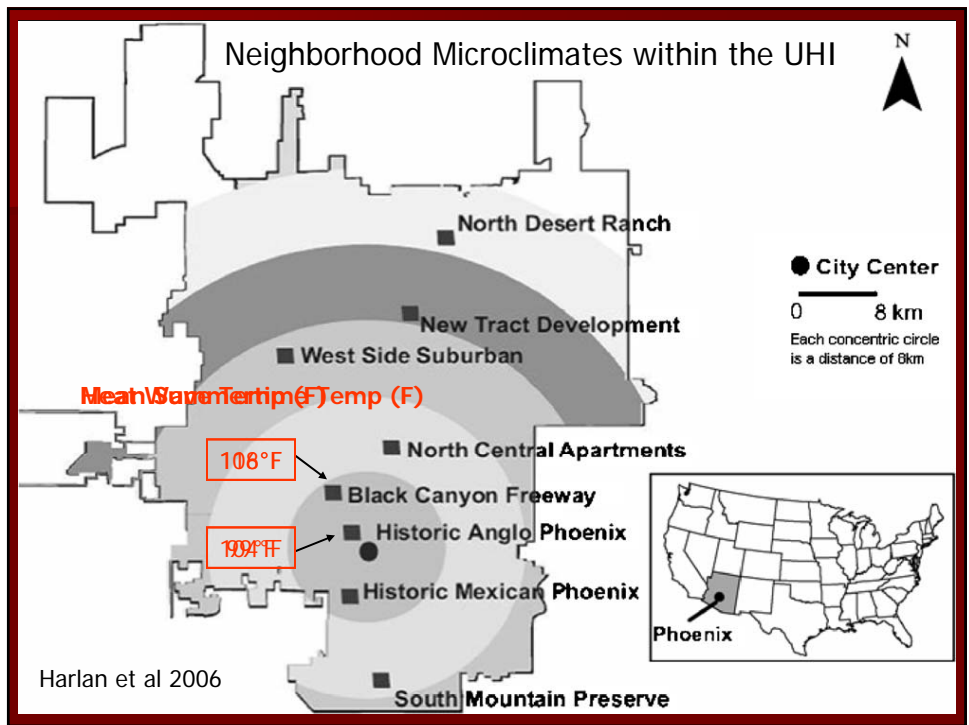
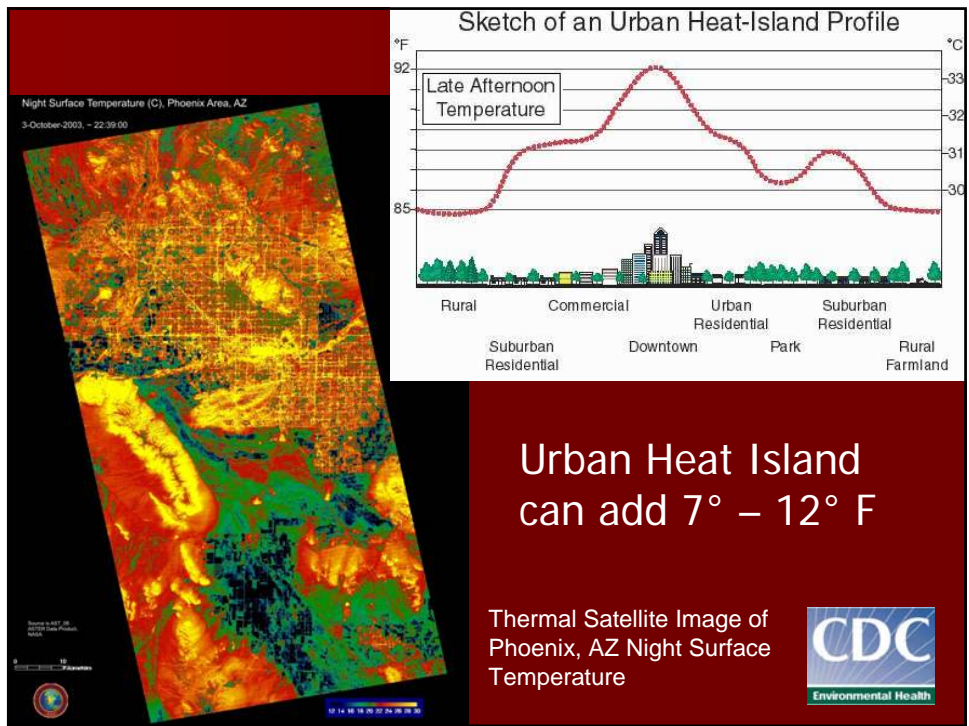
- A July day in Atlanta that now reaches a heat index of 105°F would reach a heat index of 115°F in the Hadley model, and 130°F in the Canadian model.



Urban “built” environments

- Cities and climate are coevolving in a manner that will place more populations at risk.
- Increase in vulnerable populations:
 - Today, more than half of the world’s population lives in cities, up from 30% in 1950.
 - By 2100 there will be 100 million more people > 65 years old (relative to 2000) (Ebi et al. 2006).
- Urban heat islands





CDC activities

- Guidance on the development of city-specific heat response plans
- Vulnerability mapping using remote sensing



Excessive Heat Events (EHE) Guidebook

- City-specific heat response plans
- The guidebook:
 - EPA, NOAA, CDC, FEMA collaboration
 - Options for defining EHE conditions
 - How to assess local vulnerability
 - EHE notification and response actions that work



Vulnerability Mapping using Remote Sensing

Objective:

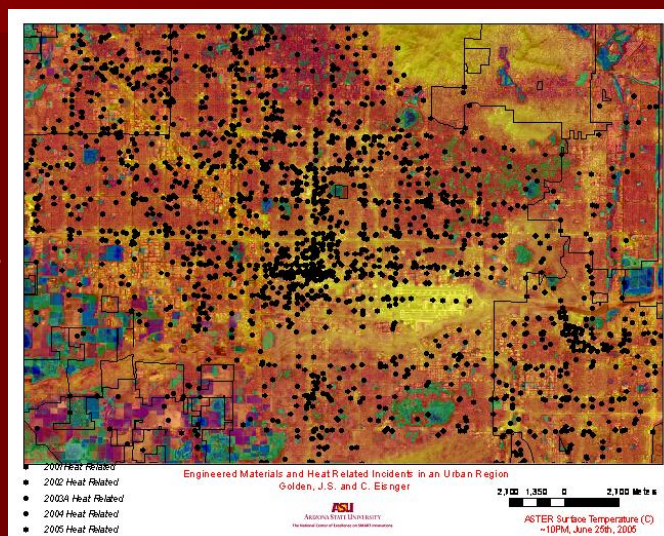
"to develop a new research methodology that provides local and regional governments a new set of skills and tools in prevention and emergency response planning for acute and chronic urban climate impacts."

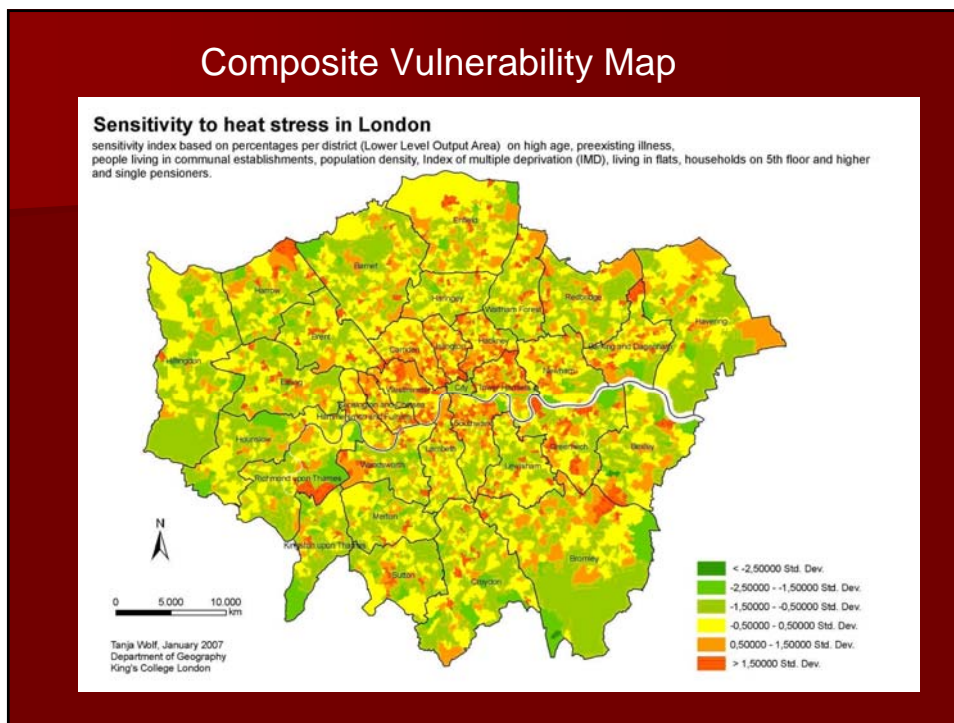
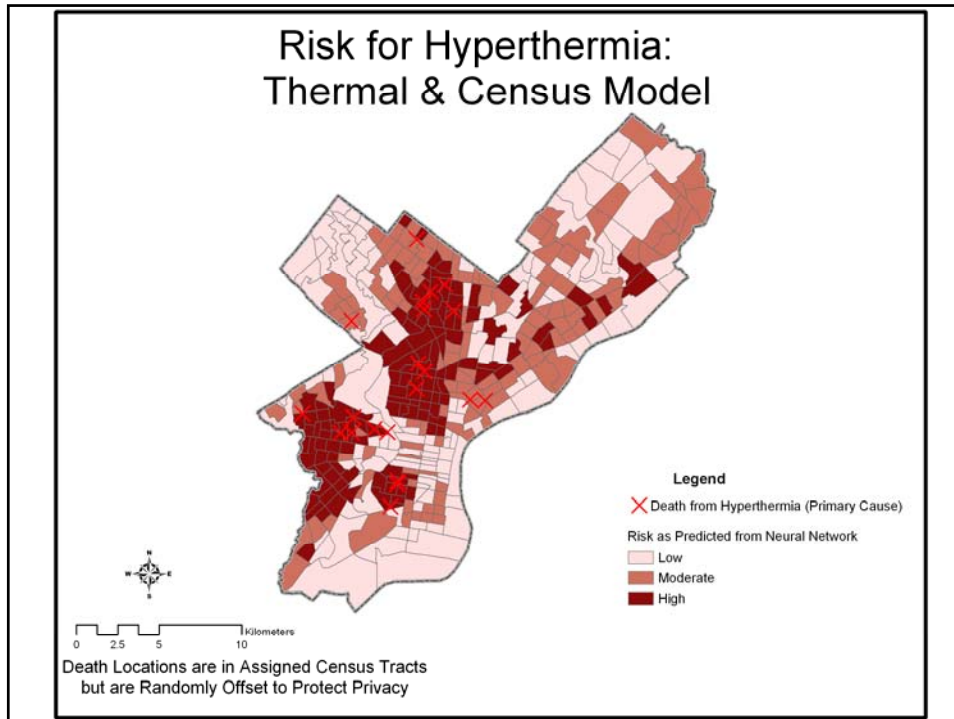


Layers of Vulnerability / Risk Factors

Layers include:

- Surface temp
- Land cover
- Power Outages
- Demographic variables
- Housing stock
- Engineered materials





Final thoughts:

- As a result of Climate Change, heat waves will pose a significant challenge for urban populations
- Morbidity and mortality related to extreme heat exposure can be prevented.
- Adaptation measures such as city-specific Heat Response Plans are essential for prevention.



Thank You

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