

# Emerging Environmental Health Threats: Back to the Future?

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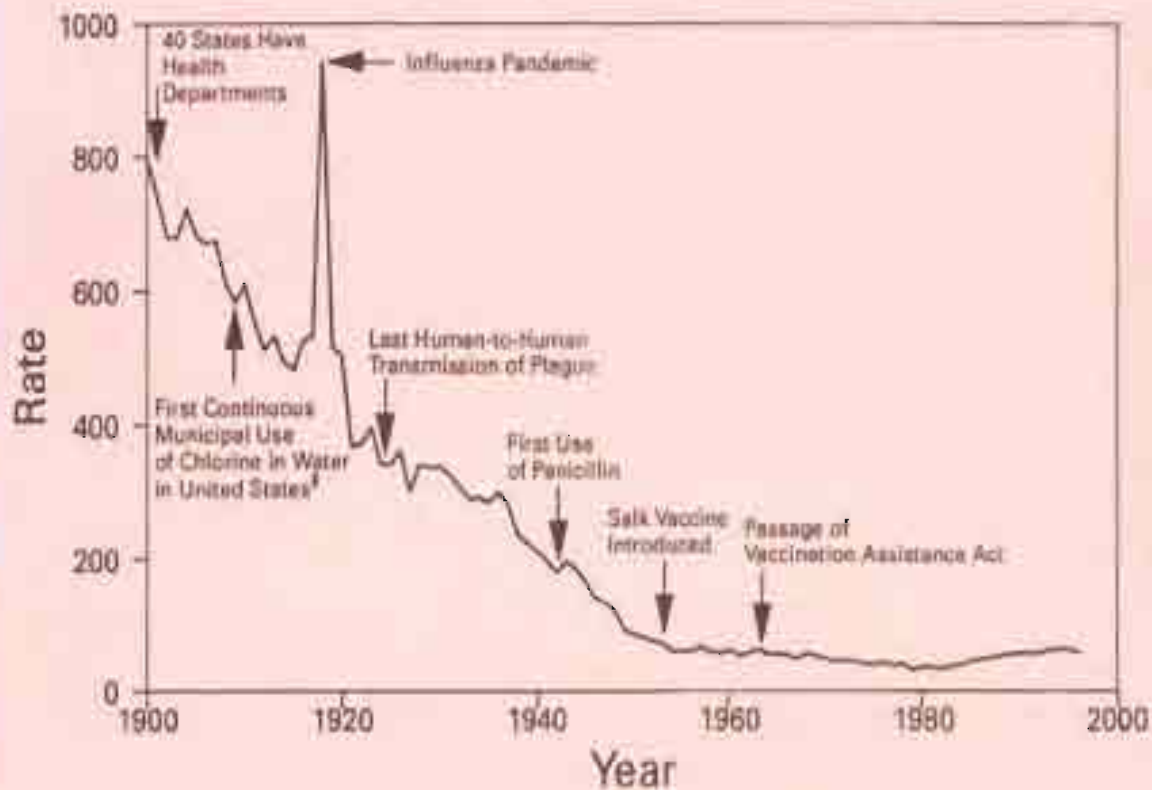
Division of Environmental Hazards and  
Health Effects

National Center for Environmental Health  
Centers for Disease Control and Prevention (CDC)

“We recommend that in laying out new towns and villages, and in extending those already laid out, ample provision be made for a supply, in purity and abundance, of light, air, and water; for drainage and sewerage, for paving and for cleanliness.”

Report of the Sanitary  
Commission of Massachusetts,  
1850

## Crude death rate\* for infectious diseases — United States, 1900–1996†



\*Per 100,000 population per year.

†Adapted from Armstrong GL, Conn LA, Pinner RW. Trends in infectious disease mortality in the United States during the 20th century. *JAMA* 1999;281:61-6.

‡American Water Works Association. *Water chlorination principles and practices: AWWA manual M20*. Denver, Colorado: American Water Works Association, 1973.

**MMWR**  
MORBIDITY AND MORTALITY  
WEEKLY REPORT

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# Emergence of Public Health 1890-1910

- Water/Sanitation
- Infectious Diseases
- Food
- Housing

# Emerging Environmental Health Threats 21<sup>st</sup> Century

## Global and Domestic

- Water
- Infectious Diseases
- Foodborne Illness
- Urbanization
- Climate Change

# Water Quality Issues

- Impacted aquifers
- Crumbling infrastructure
  - 250,000-350,000 breaks per year
- Sewage/storm connections
- Scarcity/Distribution
- Precipitation extremes



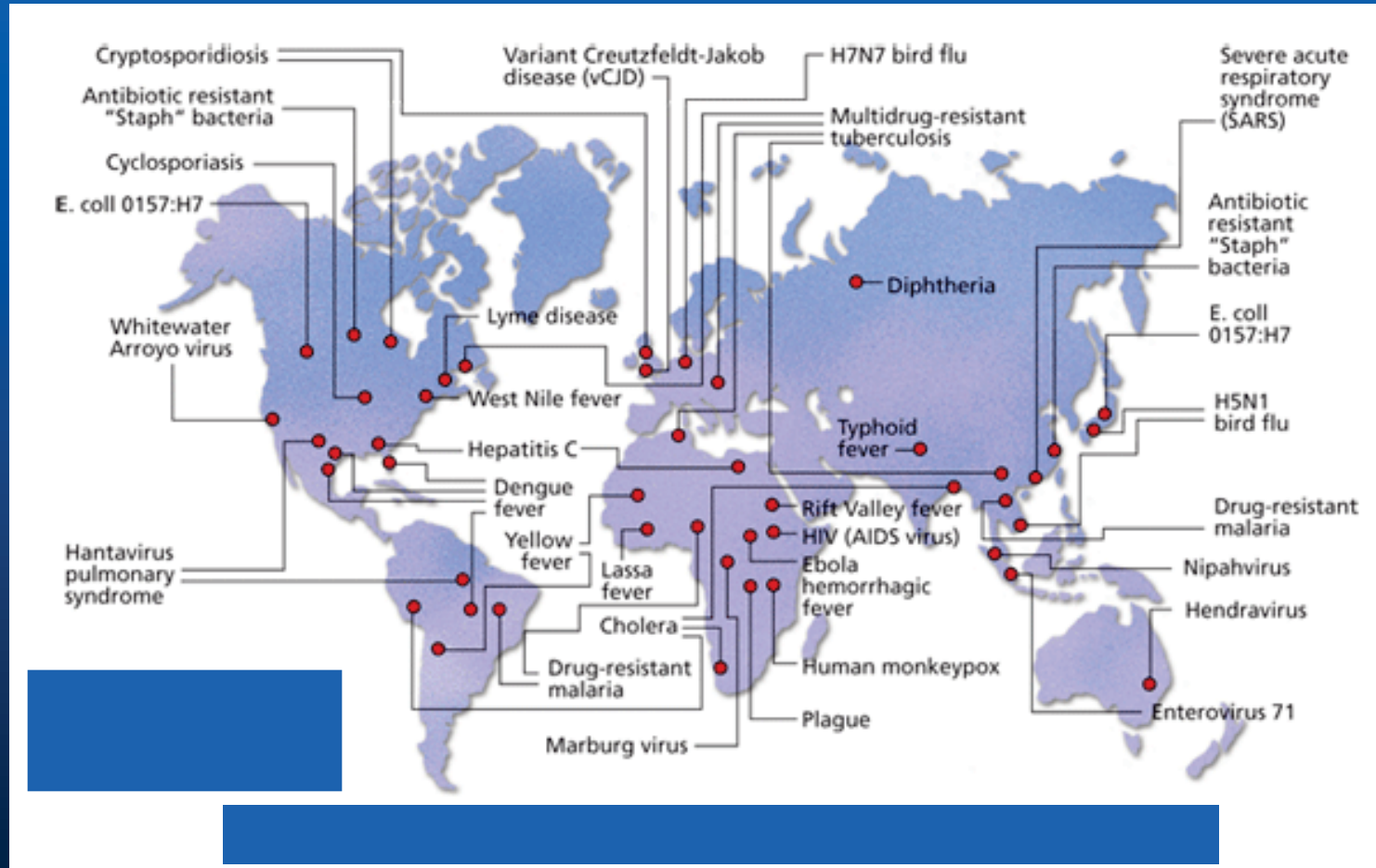
# Factors in Emergence of Infectious Disease

- Microbial adaptation and change
- Host susceptibility to infection
- Climate and weather
- Changing ecosystems
- Economic development and land use
- Human demographics and behavior
- Technology and industry

# Factors in Emergence of Infectious Diseases

- International travel and commerce
- Breakdown of public health measures
- Poverty and social inequality
- War and famine
- Lack of political will
- Intent to harm

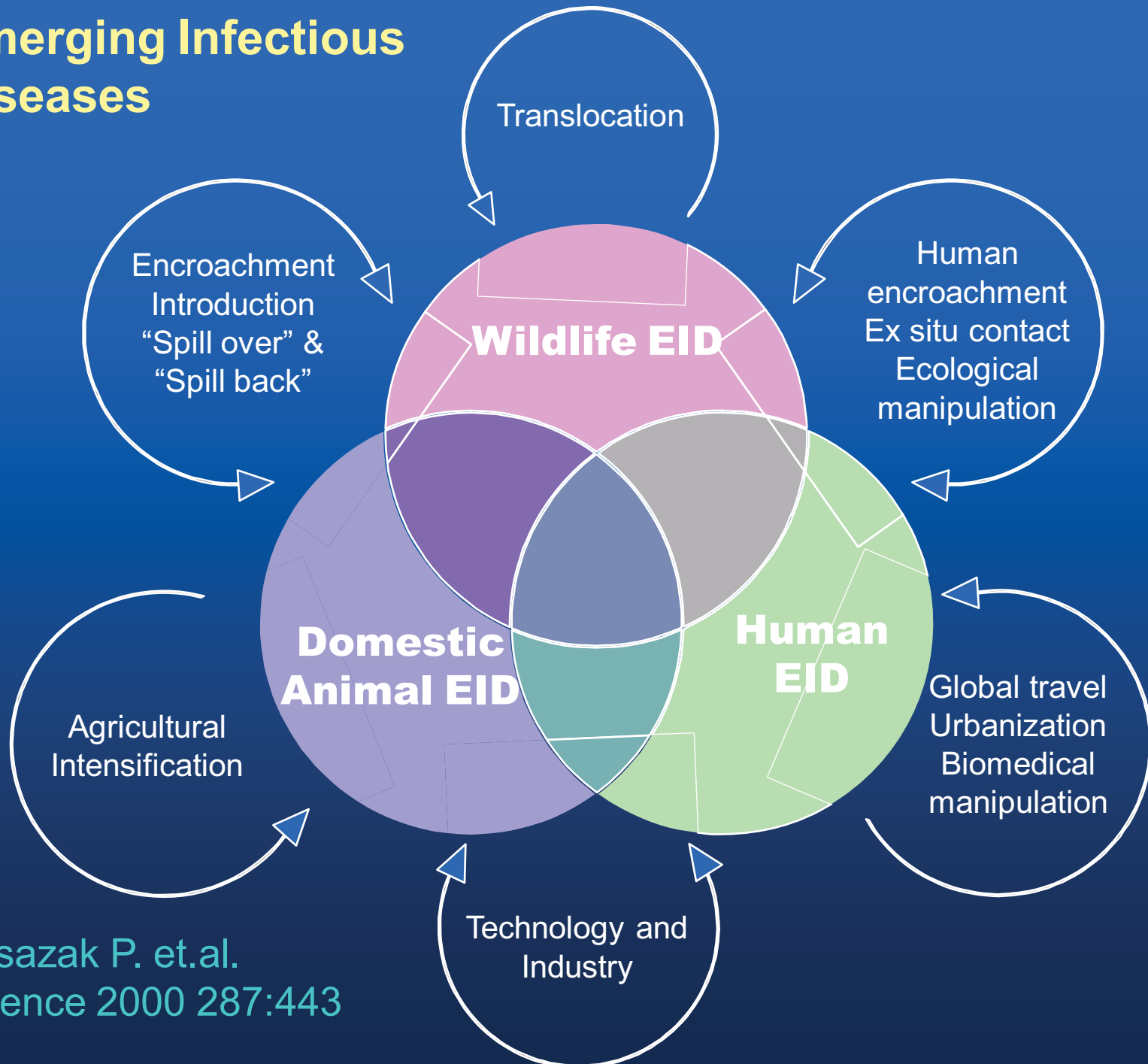
# Emerging and Re-emerging Infectious Diseases



# CDC's Most Significant Global Epidemics Over the Last Decade

- 1993 – Hanta virus
- 1994 – Plague (India)
- Ebola virus (Zaire)
- 1996 – New Variant of CJD (UK)
- H<sub>5</sub>N<sub>1</sub> influenza (Hong Kong)
- 1998 – Nipah virus (Malaysia)
- 1999 – West Nile
- 2000 – Rift Valley Fever
- 2001 – Anthrax
- 2002 – Norwalk-like viruses
- 2003 – SARS

# Emerging Infectious Diseases



Daszak P. et.al.  
Science 2000 287:443

# Foodborne Infections

- Worldwide

- > 2 million people die from diarrhea caused by contaminated food and water each year

- U.S.

- ~ 76 million persons experience foodborne illnesses (1 in 4 people)
  - ~325,000 hospitalizations
  - ~5,000 deaths

# Recent Foodborne Outbreaks

- 2006

- E. coli in bagged lettuce

- 2008

- Melamine in baby formula

- 2008-2009

- Salmonella in peanut butter

*Last year, over 21 billion food animals were produced to help feed a population of over 6 billion people resulting in trillions of pounds of products distributed worldwide. Projections toward 2020 indicate that the demand for animal protein will increase by 50%, especially in developing countries.*







# Microbial View



# Movement and Interactions of People and Commerce

- Distance and speed of travel increased 1000 fold since 1800
- 1.4 billion air travelers/year
- 50 million foreign visitors, to US year through, 102 sites
- Antibiotic resistance
- Global trade of food, animals and plants



“Double, double toil and trouble;  
Fire burn, and caldron bubble.”

William Shakespeare



# Housing and Public Health

- Urbanization
- Indoor Air
  - Molds, allergens, smoke, CO
- Lead poisoning
- Injuries and fires
- Built Environment
  - Heat island
  - Obesity

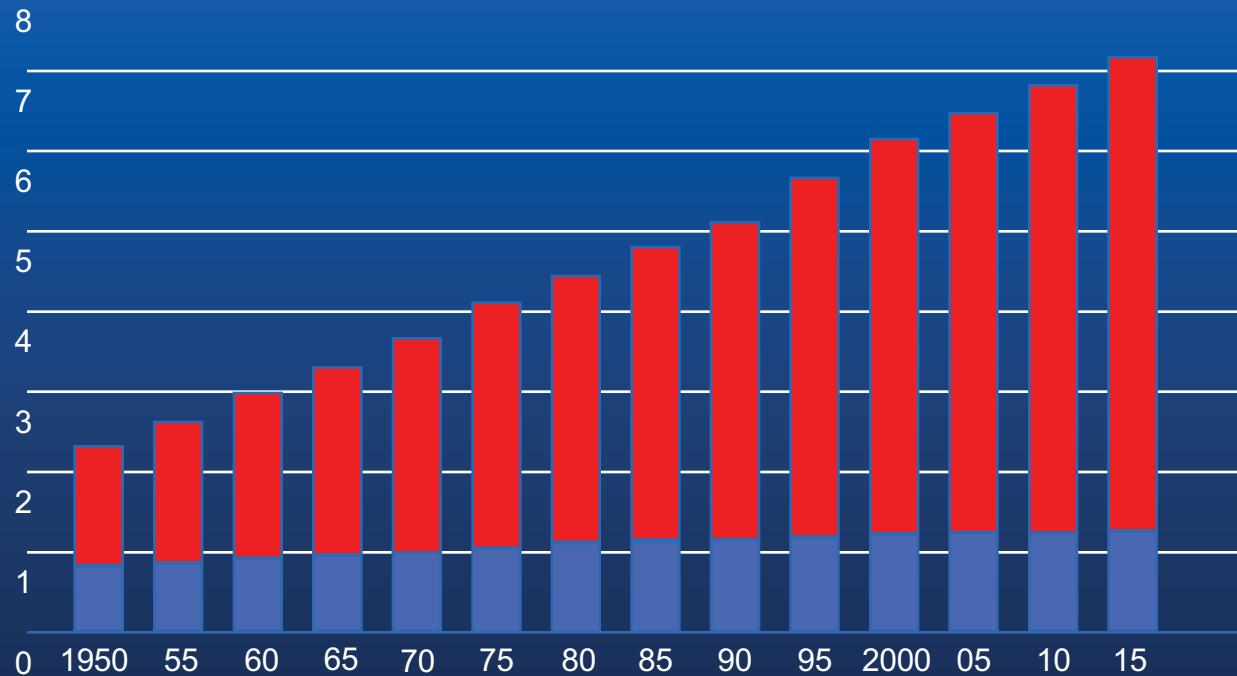
# Trends in Global Population

Global Population: 1950-2015

Total



Billions



Source: US Bureau of the Census

# Rapidly Increasing Urbanization



2000

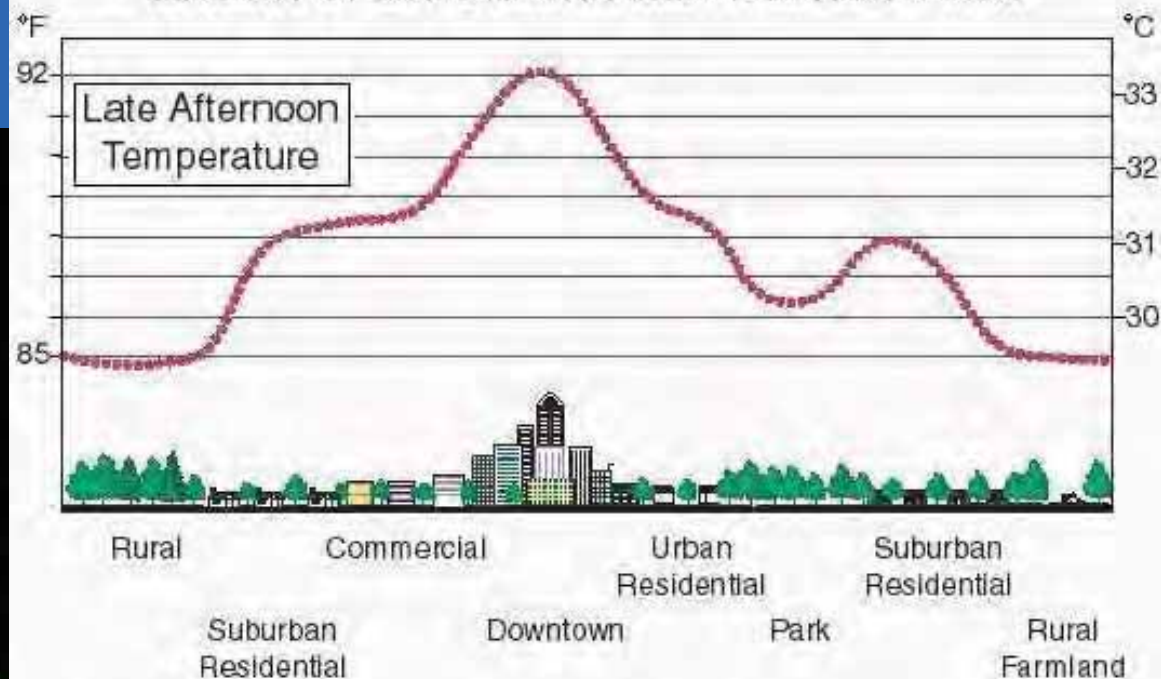
- 47% world population living in urban areas

2030

- 60% world population living in urban areas



## Sketch of an Urban Heat-Island Profile



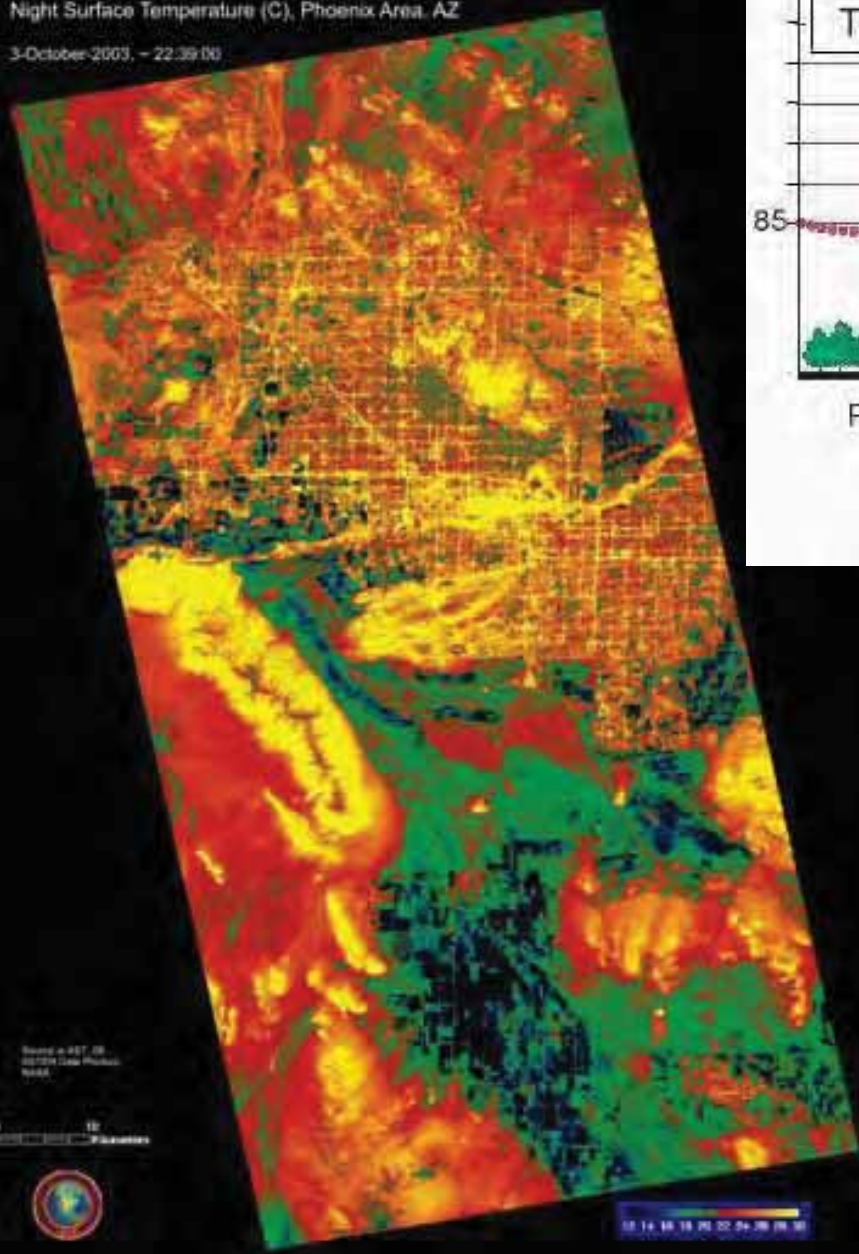
Urban Heat Island  
can add 7 – 12 F

Thermal Satellite Image of  
Phoenix, AZ Night Surface  
Temperature



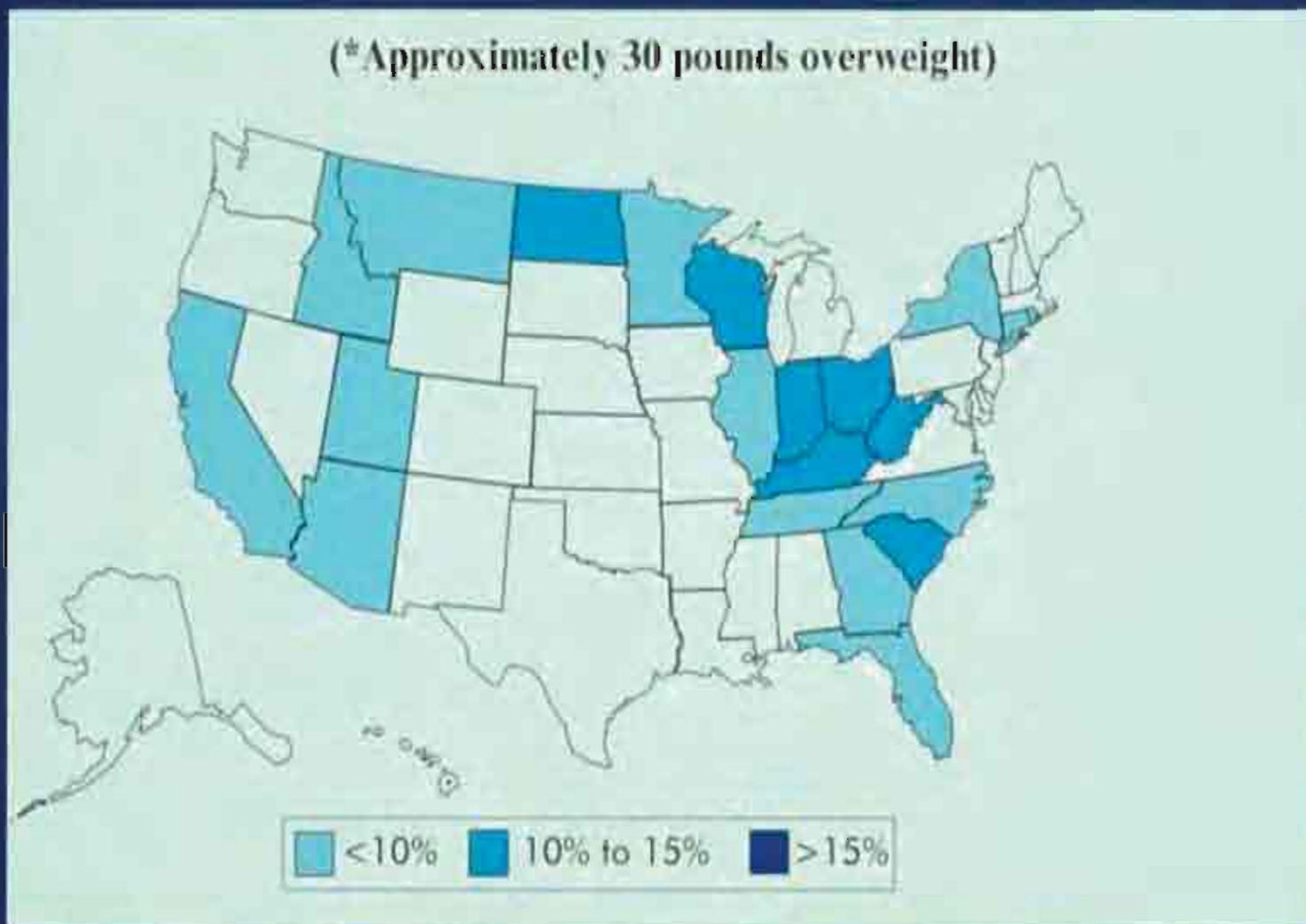
Night Surface Temperature (C), Phoenix Area, AZ

3-October-2003, - 22:39:00



## Prevalence of Obesity\* among U.S. Adults BRFSS, 1985

(\*Approximately 30 pounds overweight)

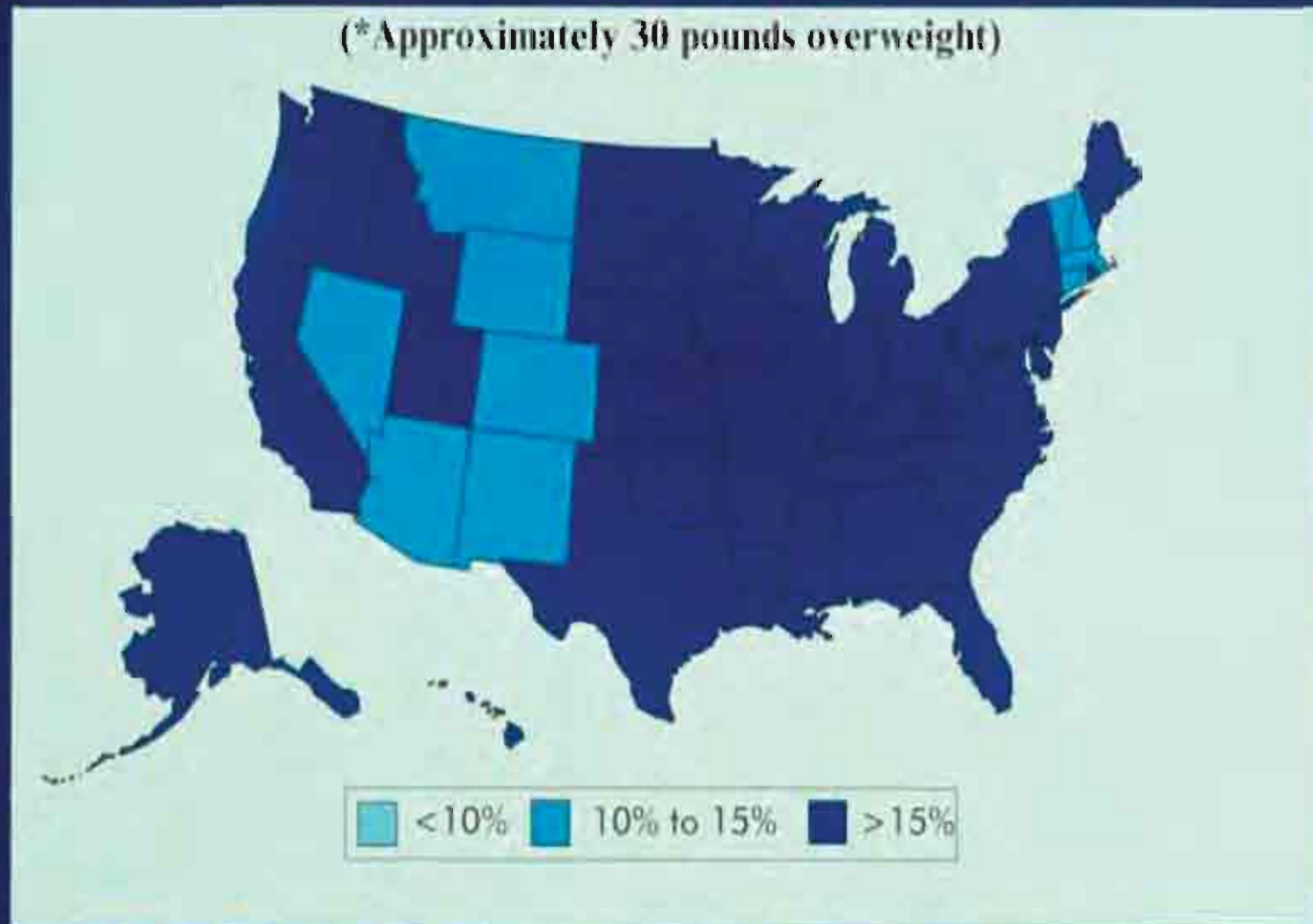


Source: Mokdad, AH, et al. J Am Med Assoc 1999;282:16.



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# Potential Impacts of Climate Change on Human Health

## Climate change effects:

- Temperature
- Sea level
- Precipitation

Heat

Morbidity/mortality

Storms, coastal flooding

Morbidity/mortality/  
displacement

Vector biology

Infectious diseases

Air pollutants

Respiratory diseases

Food supply

Malnutrition

Civil conflict

Morbidity/mortality/  
displacement

# The Impact of Global Climate Change: Areas of Concern for Human Health

- Water- and Food-borne disease
- Vector-borne disease
- Respiratory effects of air pollution
- Heat-related morbidity and mortality
- Injury or illness from extreme weather events



# **Climate Change's Impact on Infectious Diseases**

- **Vector-borne diseases**
- **Water-borne diseases**
- **Agriculture Production**
- **Migration of Animals**
- **Changing ecosystems for wildlife and animals**
- **Built environment**
- **Human-Animal Interface**
- **Ecologies and a new research portfolio**
- **Evidence-based public health impact**



Chicago in summer heat and smog, July 1995 • © Gary Braasch • *Earth Under Fire*

# Heat stalks city elderly



Tribune photo by Phil Green

A body is placed in a refrigerated truck outside the Cook County medical examiner's office after heat deaths overloaded the facility.

## THE VICTIMS

## Fatalities a stark reminder of summer of '95

By Lisa Black  
and Megan O'Matz

TRIBUNE STAFF WRITERS

At 88, Lillian Mitchell is a self-sufficient widow who still drove her 1966 Toyota Terrol and did her own grocery shopping.

But she was stubborn, her family said, and she resisted efforts to put an air conditioner in her South Side apartment.

On Friday night, her son found her dead in a "sweaty warm" bed,

room. Mitchell is one of what Chicago and Cook County officials said were as many as 55 deaths due to heat since Friday.

"She kept telling me her ceiling fan was keeping her cool. Maybe she wasn't aware that it wasn't," said her son Luther Murray.

As in the 1995 heat wave, when more than 700 people died, most of the victims of this summer's heat share a common profile. Most were elderly. Many already suffered from an illness that

made them vulnerable to heat.

While others escaped the weather, uncomfortable in air conditioned homes or seeking temporary respite in movie theaters or city cooling stations, they remained in their homes, clinging to a hard-won independence or simply declining help.

Most died alone, often in homes they believed were cool enough. Most were retired. They died in all sections of the city, though most lived in the city's

poorer neighborhoods—on the South or West Sides.

They had been custodians, postal workers, machinists. Some were unemployed, some were farmhands, and their deaths were the last chapters of difficult lives.

The oldest ones in Cook County were in their 90s, the youngest about half that, according to the medical examiner's office, which on Saturday after-

See Victims, Page 14

Deaths climb;  
officials warn  
risk not over

Thousands hit  
by power outages

By Jeremy Manier  
and John Chase

TRIBUNE STAFF WRITERS

In a frightening echo of 1995's heat disaster, the hottest days in the Chicago area in four years claimed as many as 37 lives Friday and early Saturday, amid power outages that at times left up to 100,000 households virtually defenseless against soaring temperatures.

The Cook County medical examiner's office said Saturday that 21 deaths had been linked to temperatures that topped 100 degrees and heat indexes that

hovered near 130 on Thursday and Friday. Investigators also were looking at 36 additional deaths in Cook County that they believed likely were heat related.

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In addition, Lake County on Saturday reported two heat-related deaths.

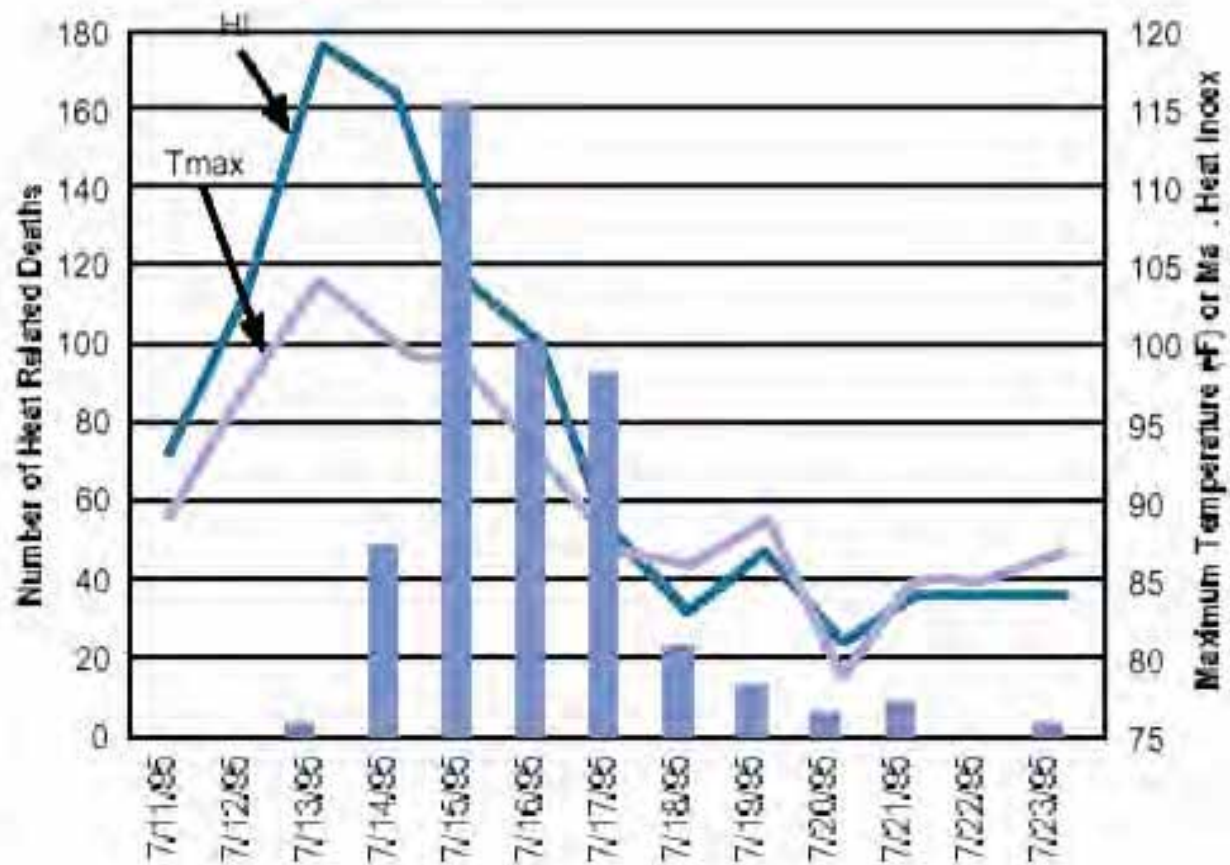
Even with the new victims, the toll trails that of 1995, when 95 heat-related deaths occurred the first day after the hottest temperatures, on the way to a total of more than 700 dead.

The danger is not past, Chicago officials said at a news conference.

"Just because it will be cooler today doesn't mean everyone will be able to get through," said Mayor Richard Daley, who called on residents to help city workers

See Outrage, Page 14

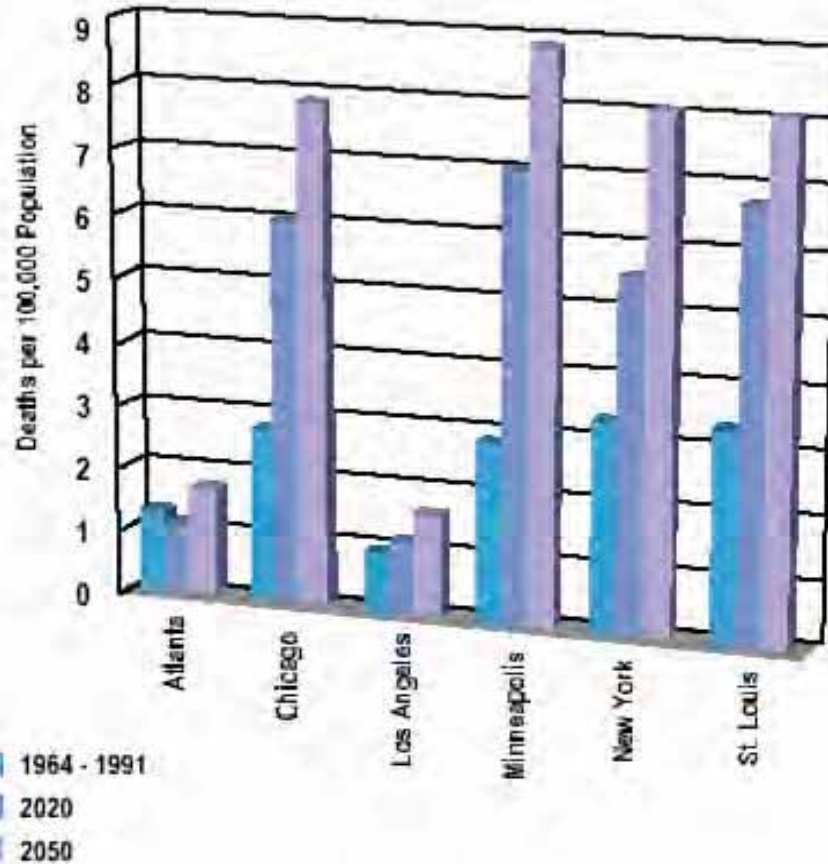
# Heat Related Deaths – Chicago, July 1995







# Average Summer Mortality Rates

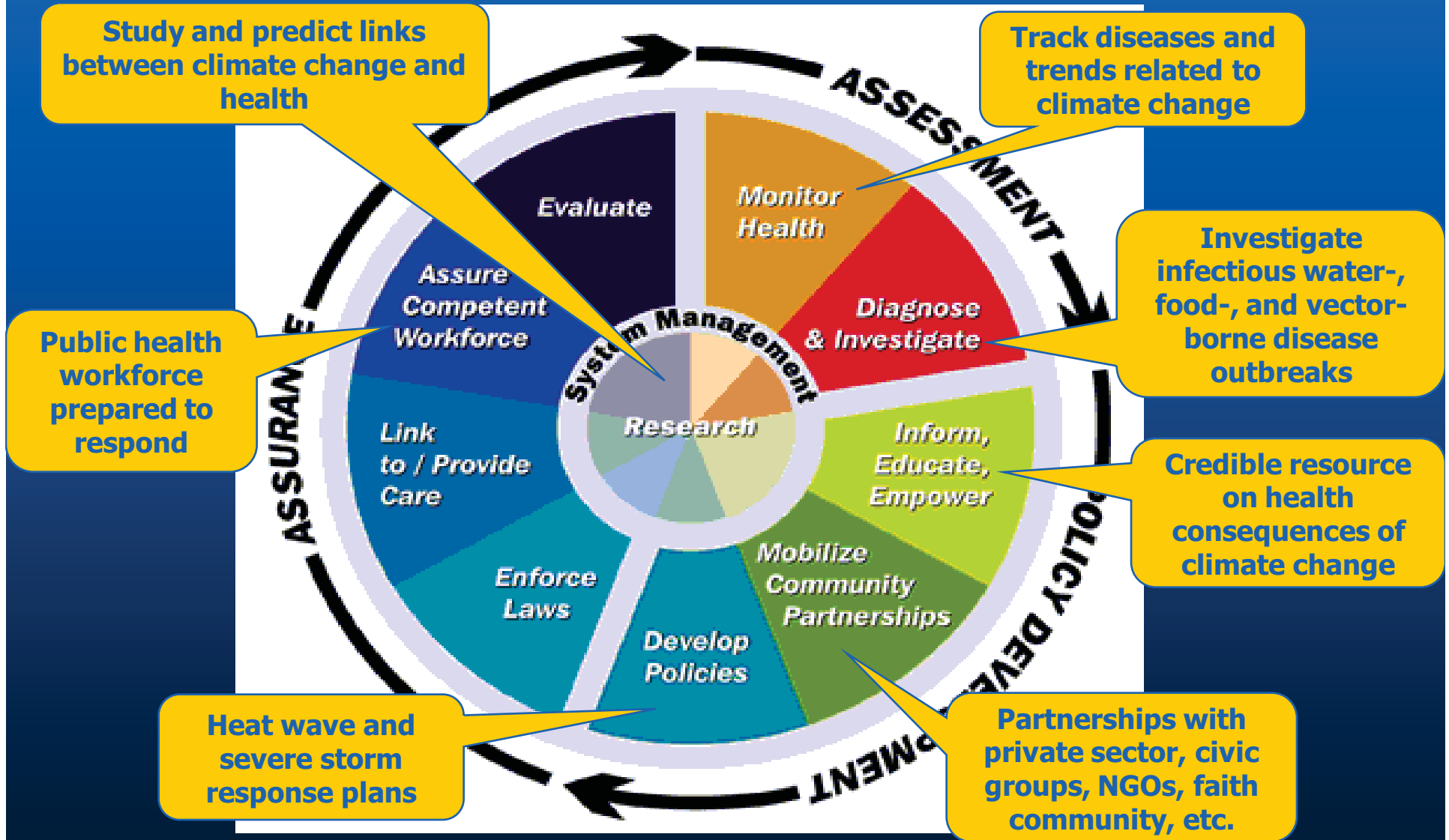


# Public Health Role

- Despite existing breadth of organizations and sectors with initiatives on climate change
- Despite the anticipated health effects of climate change

***Public health effects of climate change remain largely unaddressed***

# Leadership on Climate Change



# Recommendations

- Improve infrastructures
- Integrate surveillance strategies and diagnostics
- Increase R&D investments
- Focus on prevention not just reaction and response – e.g., avian influenza
- Build a new public health workforce
- Consider a global perspective
- Meet the critical need for leadership