Public Health Implications for Heat Early Warning Systems in Arizona

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Who we work with

ARIZONA HEAT SAFETY RESOURCE GUIDE

MAY 2014

RESOURCES FOR LOCAL HEALTH OFFICIALS AND PUBLIC INFORMATION OFFICERS DURING EXTREME HEAT EVENTS

The goal of this Heat Safety Resource Guide is to provide local health officials and public information officers with information on health impacts of Extreme Heat Events (EHE), decision-support tools, and useful resources and expertise for prevention of heat related illnesses. This document also supports the Arizona Department of Health Services Heat Emergency Response Plan.

ACKNOWLEDGEMENT

The primary agencies that partnered to prepare this Heat safety guide's development are:

Arizona Department of Economic Security
Arizona Department of Health Services – Bureau of Emergency Medical Services and Trauma System
Arizona Department of Health Services – Office of Environmental Health
Arizona Department of Health Services – Office of Infectious Diseases
Arizona Department of Health Services – Public Health Emergency Preparedness
Arizona Division of Emergency Management
Arizona Division of Occupational Safety and Health
Arizona State Parks
Arizona State University
City of Phoenix – Human Services Department
City of Phoenix – Public Transit
City of Tucson
Maricopa Association of Governments
Maricopa County Department of Public Health
Mohave County Department of Public Health
National Park Service – Southern Arizona
National Weather Service – Flagstaff Region
National Weather Service – Las Vegas Region
National Weather Service – Phoenix Region
National Weather Service – Tucson Region
Pima County Health Department
Red Cross – Grand Canyon Chapter
Salvation Army
Yuma County Public Health Services District

Intervention Examples

- Extreme Heat
  - Opening Cooling Centers/Hydration Stations
  - Heat Warning Systems
  - Public Education Campaign

ADHS
news release

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Excessive Heat Warning Extended for La Paz, Maricopa, Pinal, and Yuma Counties

FOR IMMEDIATE RELEASE - August 13, 2012
Contact: Office of Environmental Health, (602) 364-3118

An **EXCESSIVE HEAT WARNING** is in effect for La Paz, Maricopa, Pinal, and Yuma Counties.

National Weather Service has extended an Excessive Heat Warning beginning at 10:00 am August 6, 2012 until 5:00 am August 15, 2012 for La Paz, Maricopa, Pinal, and Yuma Counties.

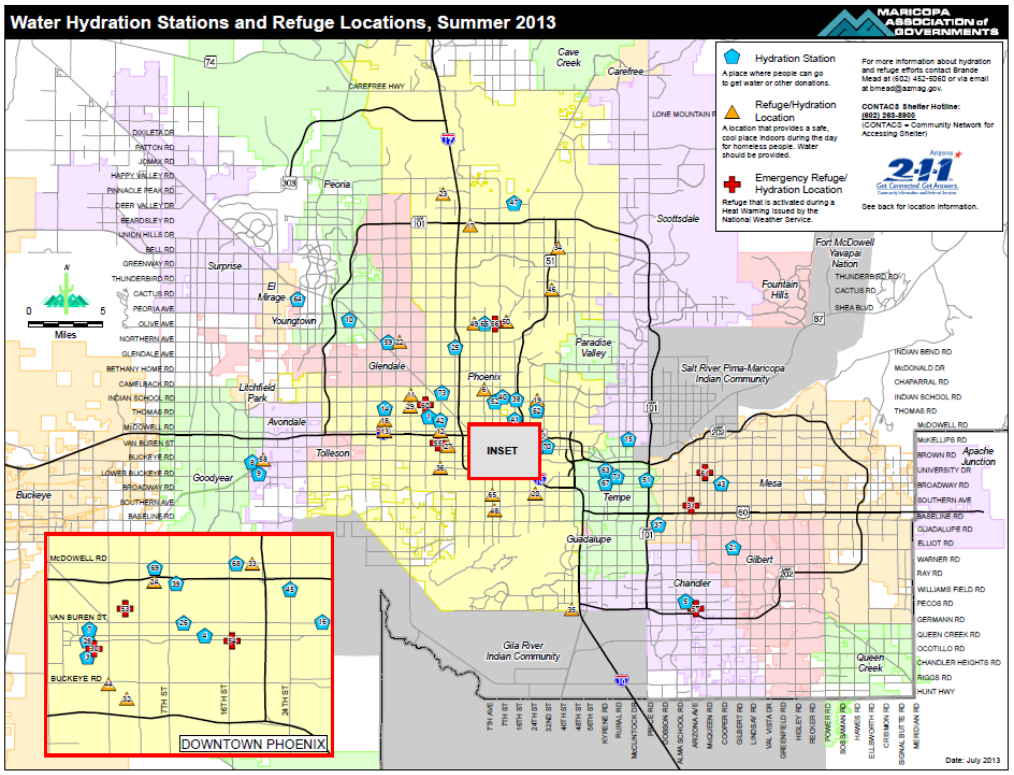
National Weather Service has declared an Excessive Heat Advisory beginning at 1:00 PM until 6:00 PM August 13, 2012 for Pima & Santa Cruz Counties.

Daytime highs are expected to be in the 112° F to 116° F degree range.

For additional information on how to keep students safe, please visit our Excessive Heat Warning page which details ways to stay cool, stay hydrated, and stay informed.

Cooling Centers and Hydration Stations

- Cooling centers- a location that provides a safe, cool place indoors
- Hydration stations- provide free water when excessive heat warnings are in effect



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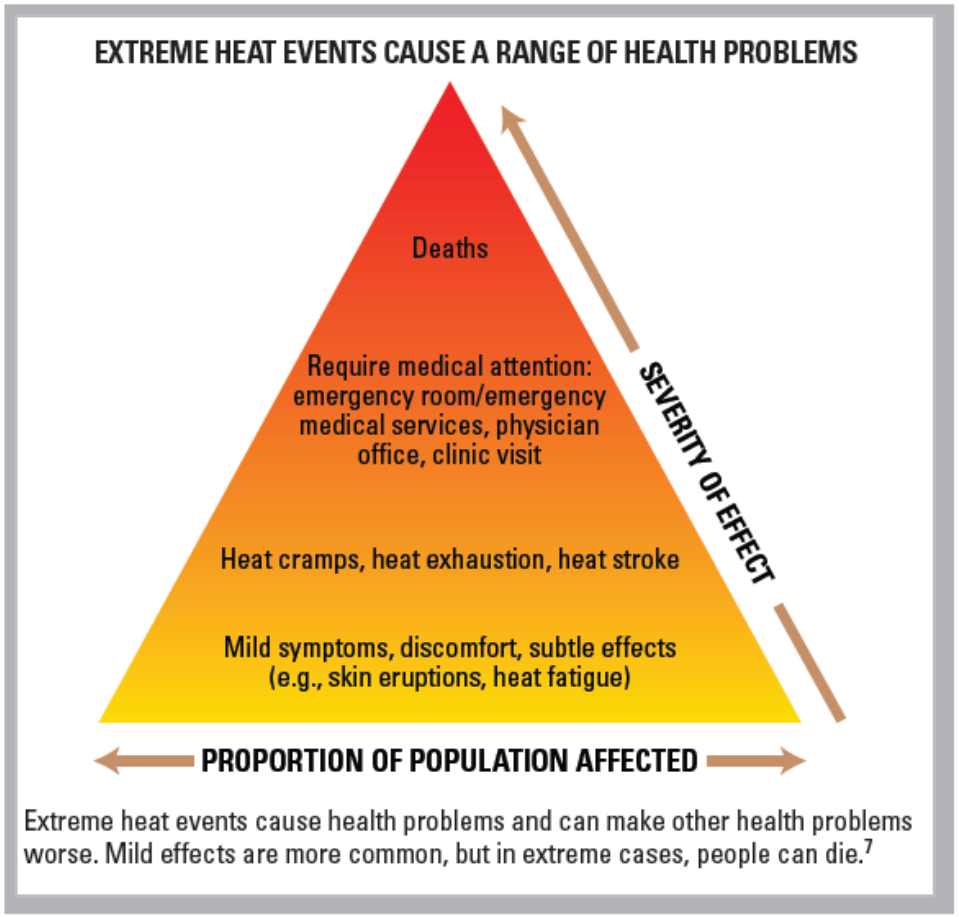
Heat Relief Network Cooling Center Evaluation

- Joint Effort: Maricopa County Department of Public Health, Arizona Department of Health Services, and Arizona State University
- Objectives:
    1. Understand the population using the cooling centers
    2. Utilize information to develop best practices in establishing a heat relief network in other Arizona counties
    3. Learn effective communication strategies on disseminating interventions.

Deaths are only the tip of the heat severity pyramid for health events



http://www.cdc.gov/climateandhealth/publications.htm

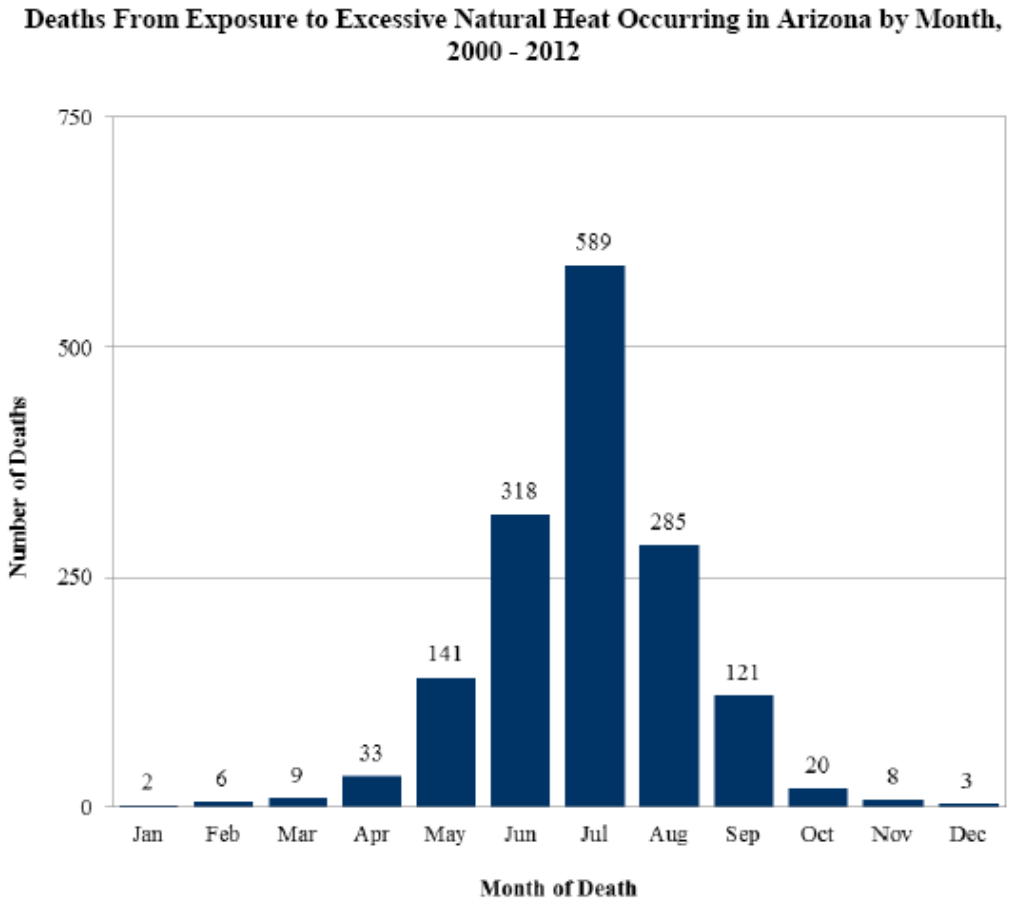
- Evidence that extreme heat events affect the rate of hospitalizations and ED visits

Knowlton et al. 2009. *Environmental Health Perspectives* DOI:10.1289/ehp.11594

- Evidence that extreme temperature events (heat and cold) affect the use of medical services (including doctor services, ED services and hospital services)

Hess et al. 2014. *Environmental Health Perspectives* DOI:10.1289/ehp.1306796

AZ Heat Mortality



- Between 2000-2012 1,535 deaths from exposure to excessive natural heat occurred in AZ
- Most deaths from excessive natural heat occurred during late spring and summer
- Ninety-five percent of all deaths from exposure to excessive heat occurred between May- September

Heat Morbidity & Mortality in Arizona

- Average of 126 heat-caused deaths and 160 heat-associated deaths from 2001-2013
- 2,000+ Heat-Related Emergency Room Visits per year (2008-2013)
- 500+ Heat-Related Inpatient Admissions per year (2008-2013)

Public Health Response During an Extreme Heat Event

- Activation of the HEOC (Health Emergency Operations Center)
  - Communication by Health Alert Network (HAN)
  - Communication by social media
  - WebEOC
  - Public Heat Advisory List/School Heat Advisory List
- Heat Emergency Response Plan
  - Levels of Response : Heat Watch, Heat Warning, Mass Power Outage
  - Objectives:
    - Limit the adverse public health effects
    - Identify conditions to trigger plan
    - Provide a framework for coordinating efforts
    - Provide a list of prevention (cooling shelters), and educational resources (heat illness prevention information)

Response Plan Activation Considerations

- Consistent number of days of triple digit, maximum temperatures (w/ higher night-time temperatures)
- Localized power outage in a community from May-September

Decision-Support

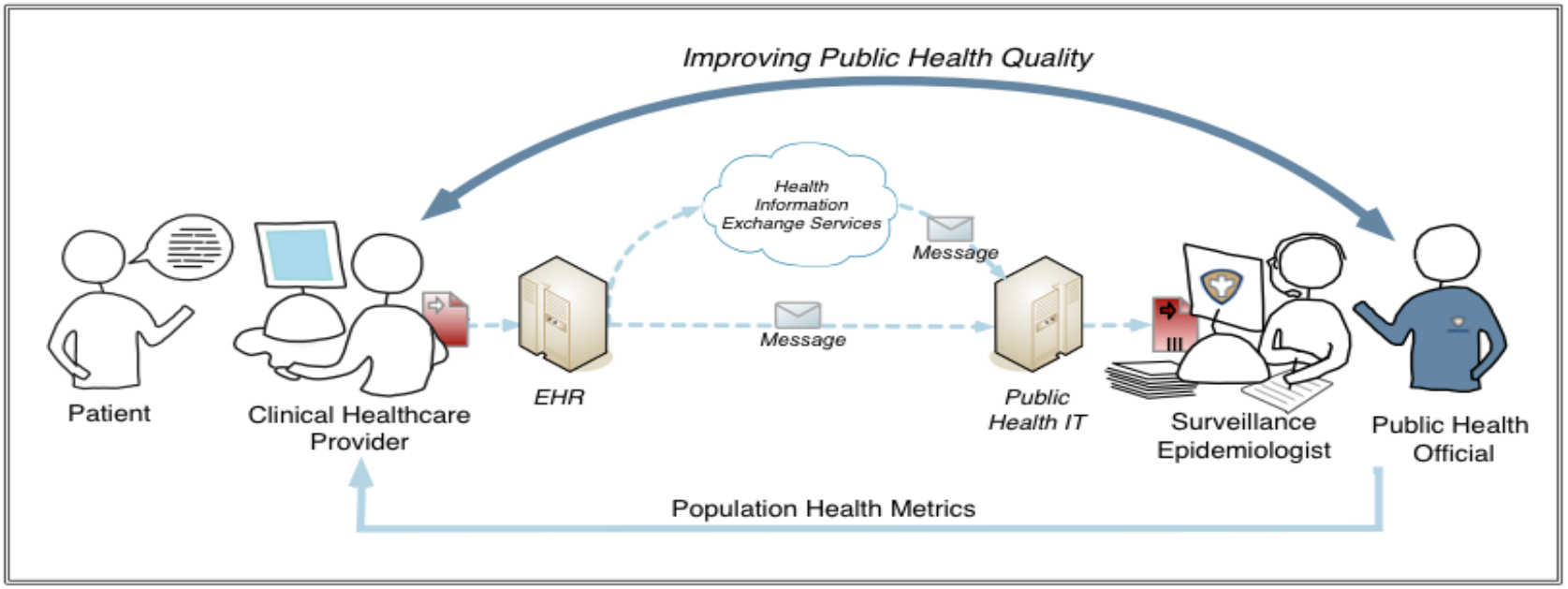
- Syndromic Surveillance
- Hospitalization Data
  - Emergency Department Visits
  - Inpatient Admissions
- Death Records
- INWS (Interactive National Weather Service)
- EWARN

Syndromic Surveillance

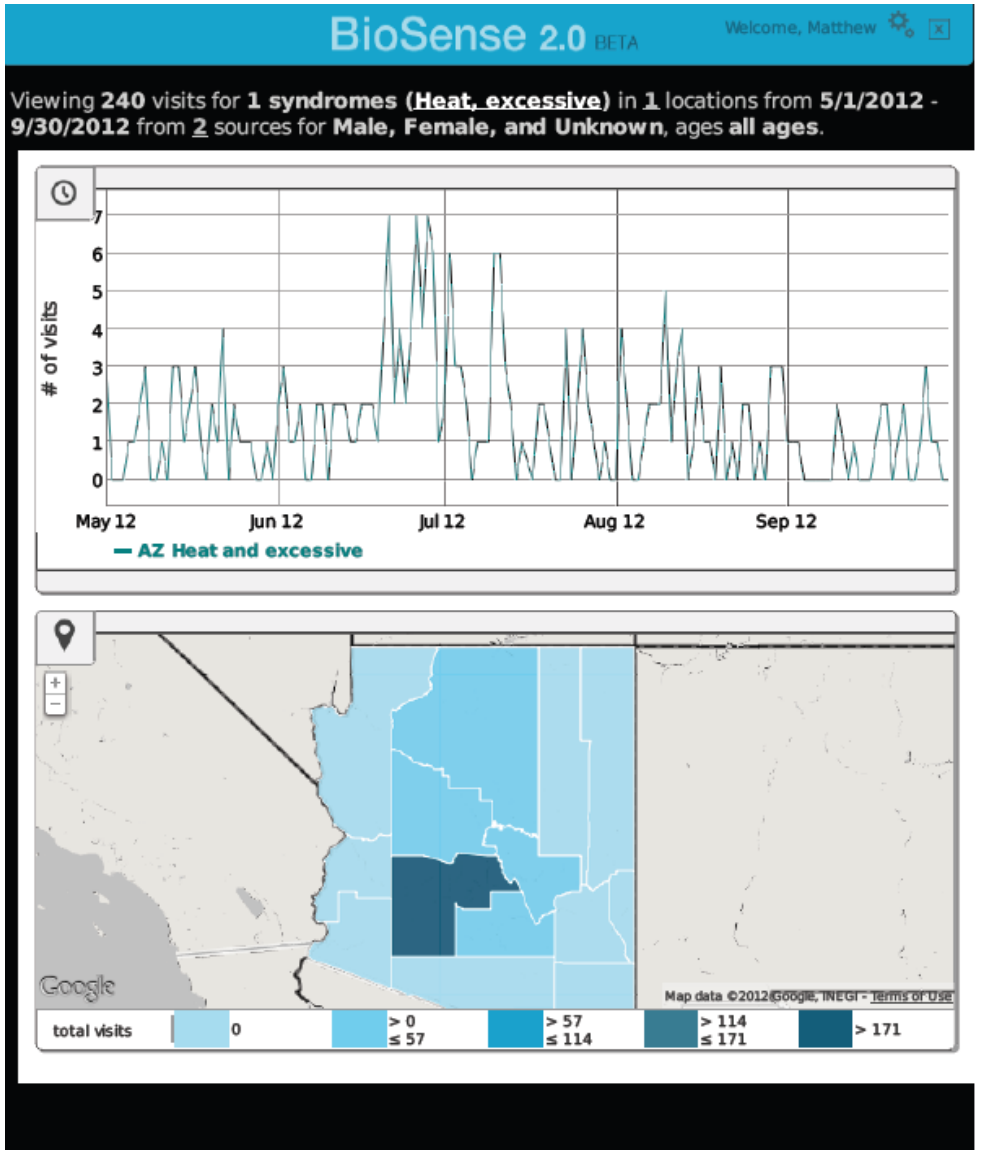
- Investigational approach to monitor disease indicators in real-time or near real-time to detect outbreaks of disease earlier than would otherwise be possible with traditional public health methods
- Can be used to monitor emergency department visits for extreme heat during extreme heat events
- International Climate and Health Syndromic Surveillance Workgroup
  - U.S./Canada public health survey on use of syndromic surveillance for extreme weather hazards

http://www.cdc.gov/mmwr/preview/mmwrhtml/su5301a3.htm

Syndromic Surveillance Data



Excessive Heat Cases using Syndromic Surveillance



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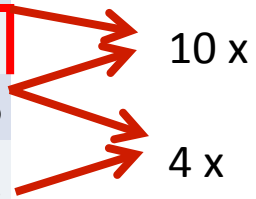
Key Scientific Uncertainties about Heat and Health Outcomes

1. What is the temperature 'threshold' for heat-related deaths and illnesses?
2. What are the temperature metrics that affect health?
3. How do we determine what is a heat-caused or heat-related death or illness?

4. Can we separate the epi heat signal from social vulnerabilities?
5. Are outdoor or indoor temperatures more closely related to health?
6. How might societal adaptations to climate change affect health outcomes?

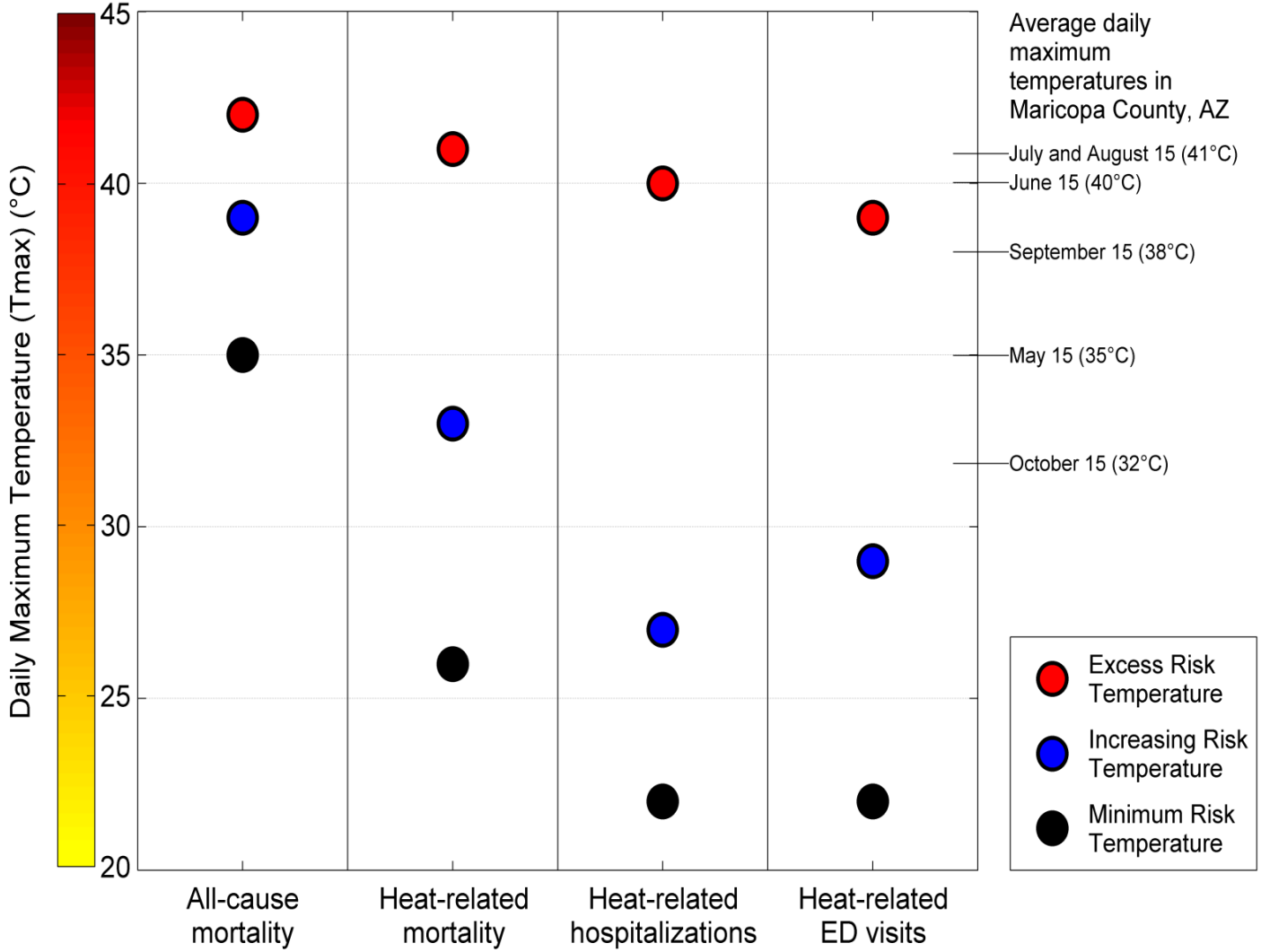
ASU Study Design and Health Data, Maricopa Co.

Category/Event Type	Years in Analysis	Number of Events from May 15– Oct 15	Average Events per Year from May 15- Oct 15
All-cause Mortality	2000–2011	112,853	9,404
Cardiovascular			
Mortality	2000–2011	30,531	2,544
Hospitalization	2008–2012	32,614	6,523
ED visit	2008–2012	6,831	1,366
Heat-related			
Mortality	2000–2011	424	35
Hospitalization	2008–2012	1,731	346
ED visit	2008–2012	68,032	1,361
Consequences of Heat and Dehydration			
Mortality	2000-2011	1,458	122
Hospitalization	2008-2012	357,363	71,473
ED visit	2008-2012	233,636	46,727



Arizona Department of Health Services mortality and morbidity data

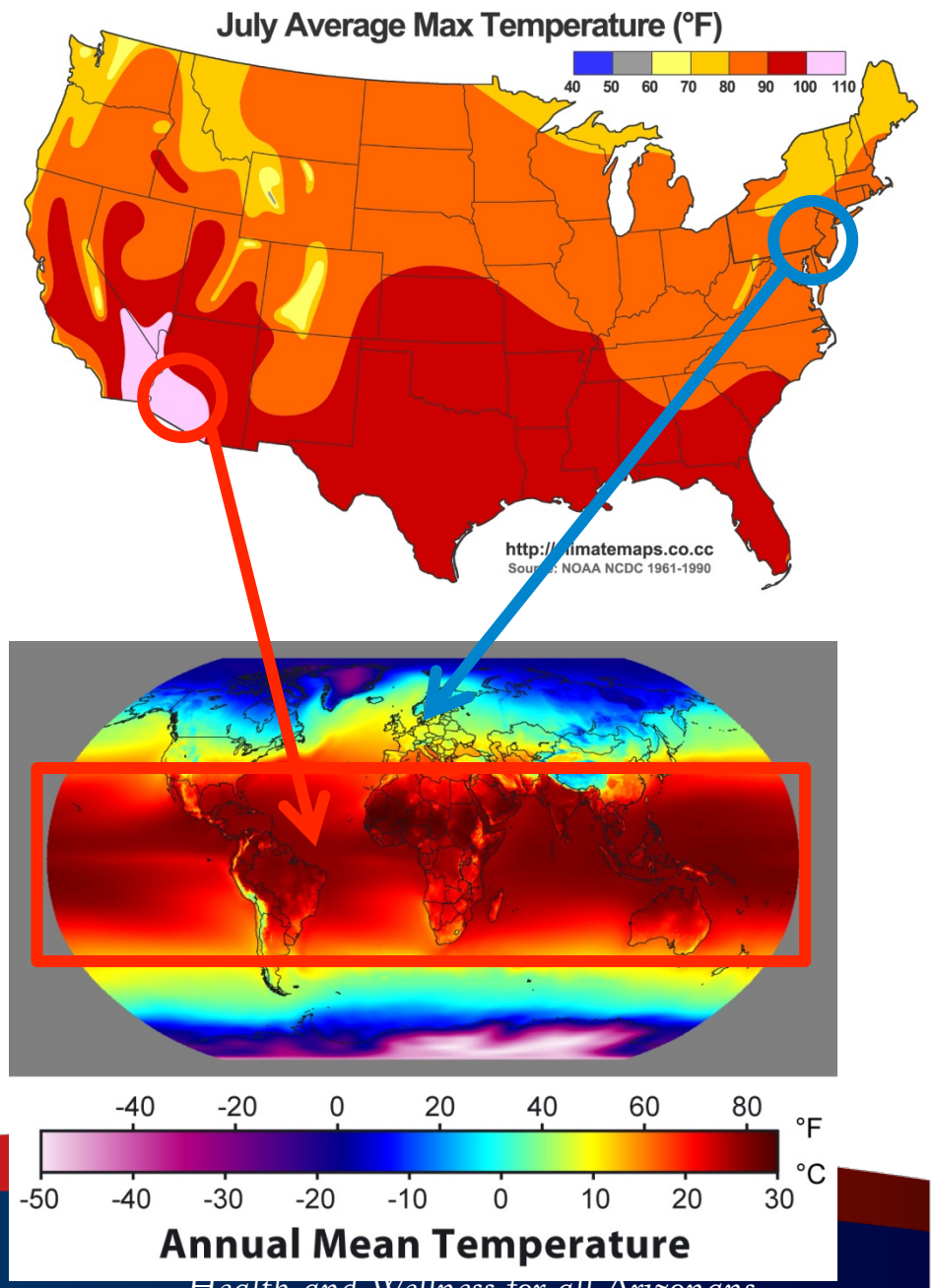
Illustration of Selected Trigger Points for All-Cause Mortality and Heat-Related Health Events: Implications for Practice?



Petitti, Hondula, Yang, Harlan, Chowell. In Review

Chronic vs. Episodic Adapted or Not?

- Heat weather hazard doctrine emphasizes an episodic heat wave warning concept originating from temperate mid latitude context.
- The average summer day in Phoenix, or the global south, meets outcomes-based definitions of a heat wave.
- Chronically hot regions are adapted to heat, both technologically and socially, and do not respond to heat as a weather emergency.
- Increasing temperatures, urban heat islands, and equatorial population growth direct the global trajectory toward a chronic heat paradigm.
- Heat information should also adapt.



Source: Robert A. Rohde, Global Warming Art via Wikipedia

Proposed EHIS: "Extreme Heat Information System"

- *Risk Temperatures* are temperature thresholds indicating the level of absolute heat related health risk on a given forecast day.

  Negligible, Tmax < 79 F

  Minimum, Tmax > 79 F, #239, 98% HR-mortality exceeding

  Increasing, Tmax > 88 F, #186, 97% HR-mortality exceeding

  Excessive, Tmax > 104 F, #79, 82% HR-mortality exceeding

- *Rankings* indicate the relative heat related health risk on a given forecast day, compared with days in the average year. This helps responders weigh the costs and benefits given their unique circumstances and response options, which is the key to decision making in a chronically hazardous environment.
- ***This system complements the existing warnings***

National Weather Service Forecast Office

Phoenix, AZ

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- Severe Weather
- Hurricane Center
- User Defined Area
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- Hydrology
- Rivers and Lakes
- CBRFC

Phoenix Extreme Heat Information System

This prototype website presents to Phoenix-area heat network responders and stakeholders the preliminary results of Arizona State University led project linking urban climate to heat-related health outcomes. The result is an Outcomes-Based Extreme Heat Information System (EHIS) that is based directly on the observed heat-related public health outcomes of high temperatures in Maricopa County during the past decade, combined with National Weather Service (NWS) forecasts. These data are the result of combining mortality for Maricopa County, provided by the Arizona Department of Health Services, and temperature observations at the NWS Sky Harbor International Airport weather station. The results are most accurate for Maricopa County heat responders, but may also be valuable to practitioners in areas with similar climate, social factors, and demographics.

Phoenix Forecast Data

Day	Forecast Temperature	Ranking	Risk
Monday:	MM		MM
Tuesday:	106	59	Excessive
Wednesday:	104	79	Excessive
Thursday:	106	59	Excessive
Friday:	106	59	Excessive
Saturday:	107	49	Excessive
Sunday:	107	49	Excessive
Monday:	106	59	Excessive

Issued: 105 PM MST MON JUL 27 2015

Excessive: ≥ 104°

Increasing: ≥ 88° & < 104°

Minimum: ≥ 79° & < 88°

Negligible: < 79°

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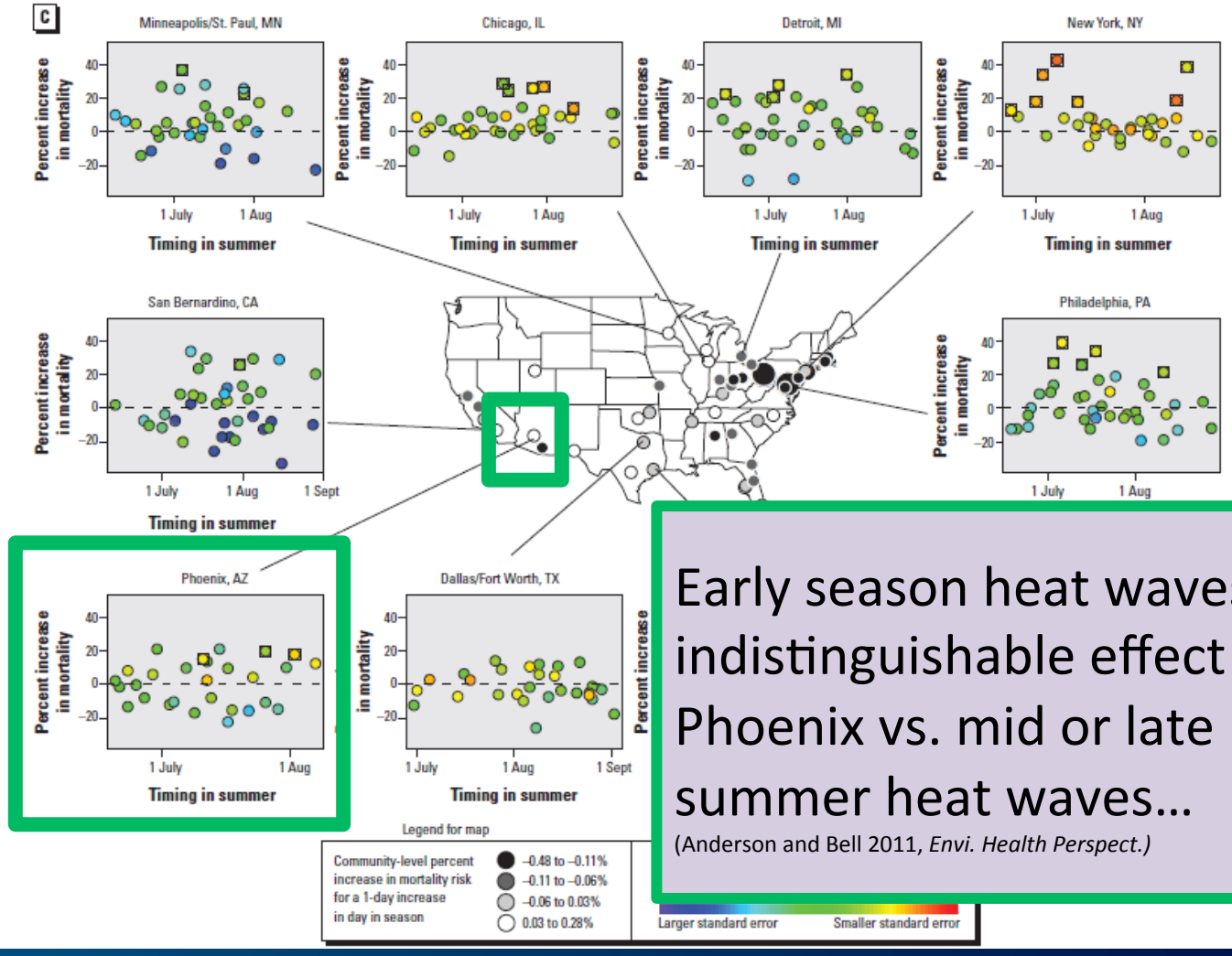
Informing warning system design with health outcome data

Additional questions: Seasonal effects



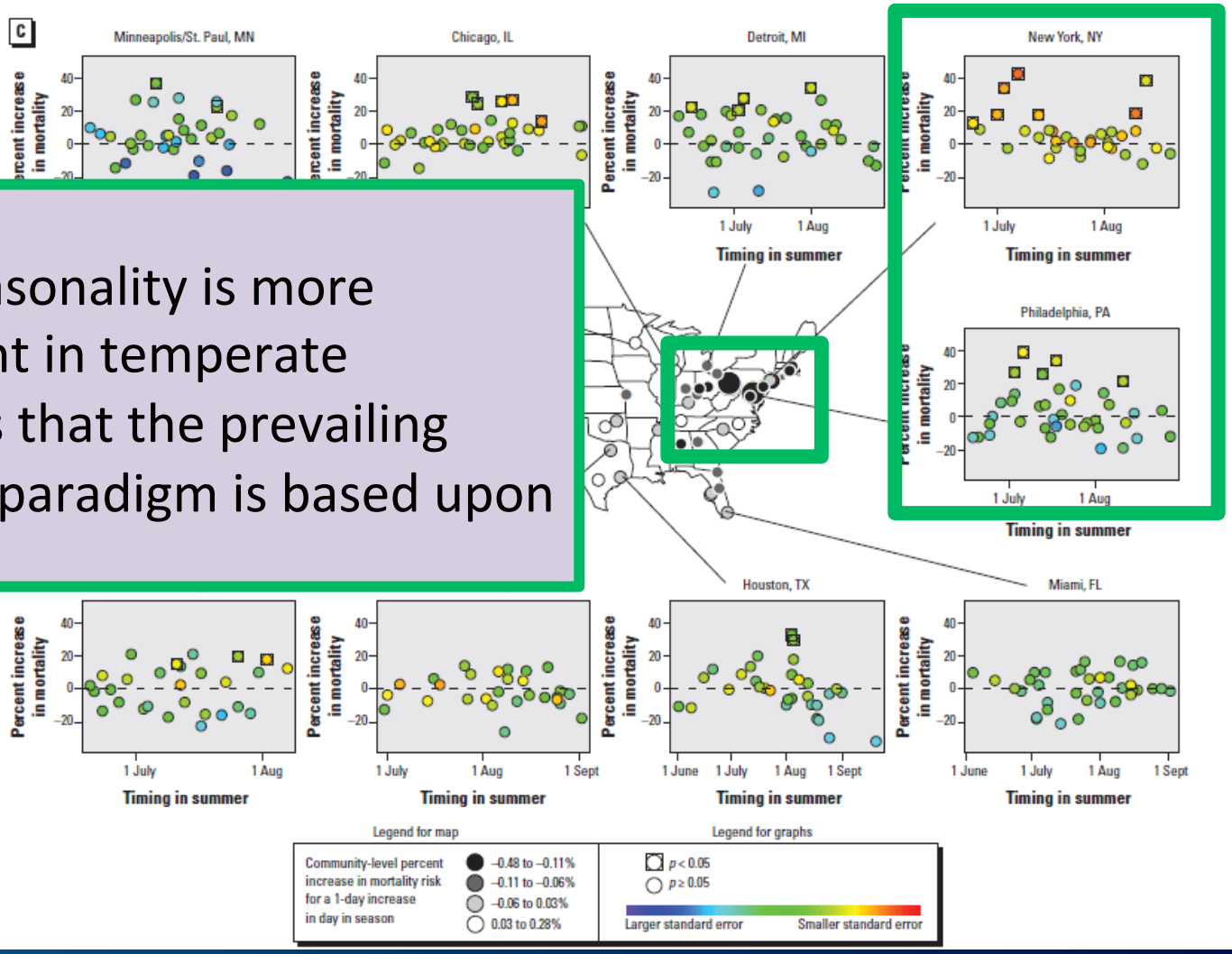
Early season heat waves have indistinguishable effect in Phoenix vs. mid or late summer heat waves…

(Anderson and Bell 2011, *Envi. Health Perspect.)*

Informing warning system design with health outcome data

Additional questions: Seasonal effects

…but seasonality is more important in temperate locations that the prevailing warning paradigm is based upon



Summary

- How do we reduce heat deaths and illnesses?
  - Use both public health data and weather data for decision support
  - Provide information desired by organizations that respond to heat and the public

Acknowledgements

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  - Ben Ruddell, David Hondula, Sharon Harlan, Diana Petitti, Darren Ruddell, Shuo Yang, Gerardo Chowell
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