Environmental Heat Surveillance in Maricopa County

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Objectives

- Background Information
- Surveillance Systems
  - Mortality
  - Morbidity
  - Syndromic
- Partnerships
- Resources and Funding
- Conclusion
Environmental temperatures ≥ 100 ºF start as early as mid May through first week of October
  - Average: 26 days where maximum temperature ≥ 110 ºF
  - Average: 13 days where minimum temperature ≥ 90 ºF

Since 2006, MCDPH implemented a system for tracking heat-associated deaths (HADs)
  - 685 deaths confirmed
  - On average there are 100 deaths
Mortality Surveillance

- Office of the Medical Examiner:
  - Weekly Line Lists
  - PRODs (Preliminary Reports of Death)

- Office of Vital Registration:
  - SAS Queries of Electronic Death Registration System

The Determining Source of Information to Classify the Cases is the **Death Certificate**
ICD-10 codes for Heat Caused and Heat Related Deaths:

<table>
<thead>
<tr>
<th>ICD 10 Code</th>
<th>Corresponding Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>X30</td>
<td>Exposure to excessive natural heat</td>
</tr>
<tr>
<td>T67.X</td>
<td>Effects of heat and light</td>
</tr>
<tr>
<td>P810</td>
<td>Environmental hyperthermia of newborn</td>
</tr>
</tbody>
</table>

Key Phrases:
- HEAT EXPOSURE
- ENVIRONMENT
- EXHAUSTION
- SUN
- HEAT STRESS
- HEAT STROKE
- HYPERTHERMIA
Heat Classifications

“Heat-Associated” Includes:

1) **Heat-Caused** = environmental heat is directly involved in the sequence of conditions causing death. Heat exposure mentioned in Part I of the Death Certificate causes of death.

2) **Heat-Related** = environmental heat contributed to the death but was not in the sequence causing death. Heat exposure is mentioned in Part II of the Death Certificate causes of death.

Additional Classifications:

3) “Pending” – suspect case still under investigation

4) “Ruled Out” – death found not related to environmental heat; not mentioned anywhere on death certificate

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<table>
<thead>
<tr>
<th>COD_A</th>
<th>COD_B</th>
<th>COD_C</th>
<th>COD_D</th>
<th>CDC_II</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTERIOSCLEROTIC HEART DISEASE</td>
<td></td>
<td></td>
<td></td>
<td>HEAT STROKE WITH 10% TOTAL BODY SURFACE BURNS</td>
</tr>
<tr>
<td>OLD AGE</td>
<td></td>
<td></td>
<td></td>
<td>HYPERTHERMIA WITH 30% TOTAL BODY SURFACE BURNS</td>
</tr>
<tr>
<td>HYPERTHERMIA ASSOCIATED WITH ACUTE METHAMPHETAMINE INTOXICATION</td>
<td>ENVIRONMENTAL HEAT EXPOSURE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROBABLE DEHYDRATION</td>
<td>ENVIRONMENTAL HEAT EXPOSURE</td>
<td></td>
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<tr>
<td>PROBABLE DEHYDRATION</td>
<td>ENVIRONMENTAL HEAT EXPOSURE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROBABLE COMPLICATIONS OF HYPERTHERMIA</td>
<td>ENVIRONMENTAL HEAT EXPOSURE</td>
<td></td>
<td></td>
<td>ARTERIOSCLEROTIC CARDIOVASCULAR DISEASE</td>
</tr>
</tbody>
</table>

Part I – “Heat Caused”

Part II – “Heat Related”
Morbidity Surveillance

- MCDPH uses Hospital Discharge Data (HDD) and Inpatient and Outpatient Data to analyze heat morbidity
- Heat related illnesses are extracted from the HDD:
  - ICD-9 codes
  - Injury codes
  - Keyword searches
### Figure 1: Heat-Related Hospital Discharge Data ICD-9 Codes

<table>
<thead>
<tr>
<th>ICD-9 Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>992 (992.0-992.9)</td>
<td>Effects of heat and light (heat stroke and sunstroke, heat syncope, heat edema, heat exhaustion, etc.) Codes to identify associated complications of heat stroke such as:</td>
</tr>
<tr>
<td>780.01-780.09</td>
<td>Alterations of consciousness</td>
</tr>
<tr>
<td>995.93-995.94</td>
<td>Systemic inflammatory response syndrome</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Injury Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E900</td>
<td>Excessive heat</td>
</tr>
<tr>
<td>E900.0</td>
<td>Due to weather conditions</td>
</tr>
<tr>
<td>E900.1</td>
<td>Excessive heat as the external cause of:</td>
</tr>
<tr>
<td></td>
<td>Ictus solaris</td>
</tr>
<tr>
<td></td>
<td>Siriasis</td>
</tr>
<tr>
<td></td>
<td>Sunstroke</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXCLUDED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>940.0-949.5</td>
<td>Burns</td>
</tr>
<tr>
<td>705.0-705.9</td>
<td>Diseases of sweat glands due to heat</td>
</tr>
<tr>
<td>995.86</td>
<td>Malignant hyperpyrexia following anesthesia</td>
</tr>
<tr>
<td>692.71, 692.76-692.77</td>
<td>Sunburn</td>
</tr>
<tr>
<td>E900.1</td>
<td>Of man-made origin (heat in boiler room, drying room, factory, furnace room, generated in transport vehicle, kitchen)</td>
</tr>
<tr>
<td>E900.9</td>
<td>Of unspecified origin</td>
</tr>
<tr>
<td>276.5</td>
<td>Volume depletion</td>
</tr>
<tr>
<td>276.50</td>
<td>Volume depletion, unspecified</td>
</tr>
<tr>
<td>276.51</td>
<td>Dehydration</td>
</tr>
<tr>
<td>276.52</td>
<td>Hypovolemia - Depletion of volume of plasma</td>
</tr>
<tr>
<td>705.1</td>
<td>Prickly heat</td>
</tr>
<tr>
<td>708.2</td>
<td>Urticaria due to cold and heat</td>
</tr>
</tbody>
</table>
AZ-PIERS

Arizona Pre-Hospital & EMS Registry System (AZ-PIERS) is Arizona’s **FREE** pre-hospital data registry that gives its EMS agencies the ability to generate and transmit electronic Patient Care Records (ePCRs) at the scene, in the hospital or at the station.

Receive aggregate de-identified data based on:

**Primary/Secondary Impression:**
- Hyperthermia
- Heat Exhaustion/Stroke
- Dehydration
- Syncope Fainting
- Altered Level of Consciousness
- Nausea/Vomiting
- Weakness

**Cause of Injury:**
- Excessive Heat

**Billing Code:**
- Heat Exposure
- Dehydration
- Altered Level of Consciousness
- Unconscious/Syncope/Dizziness
BioSense 2.0

- Bio Sense 2.0 is a public health surveillance system that provides a picture of what is happening right now with any health condition.
- Provides situational awareness for all-hazard health-related threats.
- Pulls together information on emergency department visits and hospitalizations.
- Currently limited number of hospitals are reporting.
- There are over 130 syndromes in Bio Sense.
- Bio Sense alarms can be created to track syndromes that exceed the normal threshold.
- For heat-associated cases Bio Sense tracks the syndrome “Heat, excessive”.
Partnerships

MCDPH’s surveillance efforts have allowed for building strong collaborations with internal and external partners:

- Office of the Medical examiner
- Arizona Department of Health Services
- Arizona State University
- And several other local, state, and national organizations
- Heat relief network

These collaborations have led to some of the following projects:

- Medical Examiner Retrospective Chart Review (2012)
- Cooling Center Evaluation (2014)
- Syndromic Surveillance (AZ-PIERS)
- Community Assessment for Public Health Emergency Response (CASPER)
Due to a lack of funding the heat surveillance program is heavily assisted by interns or Public Health Associates (PHAP Fellows).

MCDPH is in need of:

- Funding for additional staff
- Funding for heat surveillance projects
  - Relationship between morbidity/mortality and temperatures
  - Evaluation studies
  - Collaboration with other local jurisdictions
  - Develop evidence based prevention measures
- Funding to continue and enhance our heat surveillance program
Conclusion

Pros of MCDPH Heat Surveillance Systems:
- MCDPH has been able to build strong collaborations with internal and external partners
- Heat Surveillance information is being used for morbidity and mortality prevention efforts
- MCDPH has been able to create best practices which has sparked interest from other counties

Heat Surveillance Constraints:
- Time constraints (no real time data except for Bio Sense)
- Heat-associated mortality/morbidity is not reportable, therefore cases may be under reported
- If it became reportable we would enhance our collaboration with healthcare providers not only in the area of communicable diseases but also in the area of environmental health
Questions