Webinars
Series of scientific webinars that provide a forum for discourse on scientific issues.
Live and On-Demand
Case Conferences
Journal Clubs
Grand Rounds
CE Available

Online Courses
Evidence-based online courses on a variety of children’s environmental health topics.
Interactive and Self-Paced
CE Available

Resource Catalog
Fact sheets, journal publications, reports, and other resources for parents, community members, patients and healthcare professionals
Topics included: Air Quality, Pesticides, Natural Disasters, BPA, Mold, Lead, Mercury
Summer Like it Hot, 
Some Like it Hotter! 

-Public Health Impact of Environmental Exposure and Extreme Heat
This material was supported by the American College of Medical Toxicology (ACMT) and funded (in part) by the cooperative agreement FAIN: U61TS000238-04 from the Agency for Toxic Substances and Disease Registry (ATSDR).

Acknowledgement: The U.S. Environmental Protection Agency (EPA) supports the PEHSU by providing partial funding to ATSDR under Inter-Agency Agreement number DW-75-95877701-4. Neither EPA nor ATSDR endorse the purchase of any commercial products or services mentioned in PEHSU publications.
Summer Like it Hot, Some Like it Hotter!
- Public Health Impact of Environmental Exposure and Extreme Heat

Scott Crawford MD, FACEP
PEHSU Grand Rounds
Objectives:

1. Describe the scope and trends in global temperature and regional microclimates

2. Identify the physiologic health effects of extreme heat to different at risk populations

3. Outline support systems and public health programs regionally and nationally to assist with support in extreme heat events

4. Understand the treatment considerations and evaluation of pregnant and pediatric patients with core temperature elevation.
Temperature Trends
Land surface temperature map June 17–24, 2016; compared to average 2001-2010. Areas in red were hotter, areas in blue were cooler. (NASA Earth Observations, 2016)
Extreme Heat Event
Chicago, July 1995
Chicago, October 2004

Photo- José M. Osorio/Chicago Tribune, via Associated Press
Chicago, January 2014
Microclimate
<table>
<thead>
<tr>
<th>Vector</th>
<th>Major diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mosquitoes</td>
<td>Malaria, filariasis, dengue fever, yellow fever and West Nile fever</td>
</tr>
<tr>
<td>Sandflies</td>
<td>Leishmaniasis</td>
</tr>
<tr>
<td>Triatomines</td>
<td>Chagas disease</td>
</tr>
<tr>
<td>Ixodes ticks</td>
<td>Lyme disease and tick borne encephalitis</td>
</tr>
<tr>
<td>Tsetse flies</td>
<td>African trypanosomiasis</td>
</tr>
<tr>
<td>Blackflies</td>
<td>Onchocerciasis</td>
</tr>
<tr>
<td>Snails (intermediate host)</td>
<td>Schistosomiasis</td>
</tr>
</tbody>
</table>
Climate Variability and Change → Regional and Local Weather Change → Extreme Weather Temperature Precipitation

Change in Sea Level → Coastal Flooding → Coastal Aquifer Salinity

Changes in Intermediate Factors:
- Air Pollution Concentration and Distribution
- Pollen Production
- Microbial Contamination and Transmission
- Crop Yield

Adverse Health Effects:
- Heat-Related Illnesses and Deaths
- Extreme Weather-Related Health Effects
- Air Pollution-Related Health Effects
- Allergic Diseases
- Infectious Diseases
- Water- and Food-Borne Diseases
- Vector- and Rodent-Borne Diseases
- Malnutrition
- Storm Surge-Related Drowning and Injuries
- Health Problems of Displaced Populations

Modulating Influences and Adaptation Measures

Haines, (2004) JAMA
Population and Physiology Effects
Proposed mechanism for heat stress and adverse birth outcomes

Maternal exposure to heatwave and preterm birth in Brisbane, Australia, Volume: 120, Issue: 13, Pages: 1631-1641
Extreme temperatures could increase preterm birth risk

NIH researchers find more preterm births among women exposed to extremes of hot and cold.

Extreme hot or cold temperatures during pregnancy may increase the risk of preterm birth, according to study by researchers at the National Institutes of Health.

The study authors found that extremes of hot and cold during the first seven weeks of pregnancy were associated with early delivery. Women exposed to extreme heat for the majority of their pregnancies also were more likely to deliver early.

“Our findings indicate that it may well be prudent to minimize the exposure of pregnant women to extremes in temperature.”

—Pauline Mendola, Ph.D., Senior Author
Is there risk of fever in pregnancy?
FIGURE 1. Age-specific Crude Death Rate for Heat-Related Deaths, by Gender and Age Group for U.S. Residents—United States, 1999–2010 (n=6850)°

Public Health Support
<table>
<thead>
<tr>
<th>Health outcome</th>
<th>Public health</th>
<th>Surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality and morbidity due to heat waves</td>
<td>Public health education</td>
<td>Enhance health surveillance of routine data for early detection of heat wave effects (e.g. monitoring from funeral homes, calls to NHS direct)</td>
</tr>
<tr>
<td></td>
<td>Health warning systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emergency preparedness</td>
<td></td>
</tr>
<tr>
<td>Floods</td>
<td>Public health education, boil water notices</td>
<td>Surveillance for flood effects, with long-term follow-up. Coordinated national surveillance for flood deaths, injuries and illnesses</td>
</tr>
<tr>
<td></td>
<td>Emergency preparedness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check list for post-flood activities</td>
<td></td>
</tr>
<tr>
<td>Air quality</td>
<td>Warnings for high pollution days</td>
<td>Daily air pollution measurements</td>
</tr>
<tr>
<td>Vector-borne diseases</td>
<td>Public education, especially to avoid contact with ticks</td>
<td>Monitoring of vectors, and reservoir hosts, integrated surveillance for human and animal diseases</td>
</tr>
<tr>
<td>Food borne disease</td>
<td>Maintenance and strengthening of food hygiene measures</td>
<td>Integrated surveillance for human and animal diseases</td>
</tr>
<tr>
<td>Water-borne diseases</td>
<td>Risk assessment for extreme rainfall events</td>
<td>Increased microbiological monitoring of public water supplies and private wells, and enhanced surveillance during and following heavy rainfall events</td>
</tr>
<tr>
<td></td>
<td>Risk assessment of health effects of algal blooms</td>
<td></td>
</tr>
</tbody>
</table>
RIO GRANDE CANCER FOUNDATION

reminds you to be

SunSmart

1. Place hand in dispenser for 2 seconds
2. Apply plenty of sunscreen to all exposed skin
3. Reapply immediately after swimming, sweating or towel drying

SPF 30 SPORT SUNSCREEN
Due to extreme temperatures in central Arkansas, the City of Little Rock will be opening four cooling centers on Thursday and Friday.

Author: THV11 Digital, KTHV
Published: 10:45 AM CDT July 20, 2017

-LITTLE ROCK, Ark. (KTHV) – Due to extreme temperatures in central Arkansas, the City of Little Rock will be opening four cooling centers on Thursday and Friday
<table>
<thead>
<tr>
<th>Category</th>
<th>Level</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>0</td>
<td>No Elevated Risk</td>
</tr>
<tr>
<td>Yellow</td>
<td>1</td>
<td>Low Risk for those extremely sensitive to heat, especially those without effective cooling and/or adequate hydration</td>
</tr>
<tr>
<td>Orange</td>
<td>2</td>
<td>Moderate Risk for those who are sensitive to heat, especially those without effective cooling and/or adequate hydration</td>
</tr>
<tr>
<td>Red</td>
<td>3</td>
<td>High Risk for much of the population, especially those who are heat sensitive and those without effective cooling and/or adequate hydration</td>
</tr>
<tr>
<td>Magenta</td>
<td>4</td>
<td>Very High Risk for entire population due to long duration heat, with little to no relief overnight</td>
</tr>
</tbody>
</table>
Syndromic Surveillance Steps

1-Data sources
2-System architecture
3-Syndrome definition
4-Alert rules
5-Health outcomes vs weather information
Global Sub Seasonal Excessive Heat Outlook System (GSEHOS)

Prob. for dry EHF > 50% perc. Week-3. Valid: 12-Jun-2018 to 18-Jun-2018
Council of State Territorial Epidemiologists (CSTE) Surveillance system – Maricopa County Arizona 2015

- Positive Predictive Value of CSTE 88% vs traditional BioSense 74%

- Diagnosis Code
- Chief Complaint Text Terms
- Exclusion Criteria

More accurate during the heat season May 1 to Sept 30
92% and 85% vs 55% and 29%
Zika Risk

As the state prepares for additional local transmission of the Zika virus during the 2017 mosquito season, the Texas Department of State Health Services is expanding its testing guidance for residents of six South Texas counties.

DSHS Friday issued a health alert that now recommends testing all pregnant residents of Cameron, Hidalgo, Starr, Webb, Willacy and Zapata counties in both the first and second trimesters of pregnancy and any resident who has a rash plus at least one other common Zika symptom: fever, joint pain or eye redness.
Temperature drives Zika virus transmission: evidence from empirical and mathematical models


doi: https://doi.org/10.1101/259531
<table>
<thead>
<tr>
<th>ELEMENTS OF AN EFFECTIVE EXTREME HEAT PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>- A written and publicly approved program plan that identifies program partners and vulnerable populations</td>
</tr>
<tr>
<td>- Clear criteria that define extreme heat events and help to evaluate weather forecasts and conditions</td>
</tr>
<tr>
<td>- Coordinated outreach to public and partners, with consistent messaging, information, and instructions via public broadcast, websites, email, and social media</td>
</tr>
<tr>
<td>- Strategic action plans that include formal check-in and buddy systems and in-person assessments for vulnerable persons</td>
</tr>
<tr>
<td>- Strategies and recommendations for staying cool at home and work</td>
</tr>
<tr>
<td>- Designated public cooling shelters</td>
</tr>
<tr>
<td>- Cancellation policies for outdoor activities and events</td>
</tr>
<tr>
<td>- Post-season reviews of program performance by partners</td>
</tr>
<tr>
<td>- Public input on ways to improve the program</td>
</tr>
</tbody>
</table>
Heat Syndromes and Management
Dehydration and Acclimatization
Hydration Urine Chart

Check the color of your urine as a good indicator of your hydration status.

**Target Hydration**
Keep drinking water

**Dehydrated**
Drink more water and liquids with electrolytes

**Extremely Dehydrated**
(consult a health care provider)
Drink more water immediately

*This color chart is not for clinical use.
It is important to note that some food, vitamins, and medications can change the color of your urine.*
WHAT TO LOOK FOR

**HEAT RASH**

- Red clusters of small blisters that look like pimples on the skin (usually on the neck, chest, groin, or in elbow creases)

WHAT TO DO

- Stay in a cool, dry place
- Keep the rash dry
- Use powder (like baby powder) to soothe the rash
<table>
<thead>
<tr>
<th>WHAT TO LOOK FOR</th>
<th>WHAT TO DO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUNBURN</strong></td>
<td></td>
</tr>
<tr>
<td>Painful, red, and warm skin</td>
<td>Stay out of the sun until your sunburn heals</td>
</tr>
<tr>
<td>Blisters on the skin</td>
<td>Put cool cloths on sunburned areas or take a cool bath</td>
</tr>
<tr>
<td></td>
<td>Put moisturizing lotion on sunburned areas</td>
</tr>
<tr>
<td></td>
<td>Do not break blisters</td>
</tr>
<tr>
<td>WHAT TO LOOK FOR</td>
<td>WHAT TO DO</td>
</tr>
<tr>
<td>------------------</td>
<td>------------</td>
</tr>
<tr>
<td>HEAT CRAMPS</td>
<td></td>
</tr>
<tr>
<td>- Heavy sweating during intense exercise</td>
<td></td>
</tr>
<tr>
<td>- Muscle pain or spasms</td>
<td>- Stop physical activity and move to a cool place</td>
</tr>
<tr>
<td></td>
<td>- Drink water or a sports drink</td>
</tr>
<tr>
<td></td>
<td>- Wait for cramps to go away before you do any more physical activity</td>
</tr>
<tr>
<td></td>
<td>- Get medical help right away if:</td>
</tr>
<tr>
<td></td>
<td>- Cramps last longer than 1 hour</td>
</tr>
<tr>
<td></td>
<td>- You’re on a low-sodium diet</td>
</tr>
<tr>
<td></td>
<td>- You have heart problems</td>
</tr>
<tr>
<td>WHAT TO LOOK FOR</td>
<td>WHAT TO DO</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td><strong>HEAT EXHAUSTION</strong></td>
<td></td>
</tr>
<tr>
<td>Heavy sweating</td>
<td>Move to a cool place</td>
</tr>
<tr>
<td>Cold, pale, and clammy skin</td>
<td>Loosen your clothes</td>
</tr>
<tr>
<td>Fast, weak pulse</td>
<td>Put cool, wet cloths on your body or take a cool bath</td>
</tr>
<tr>
<td>Nausea or vomiting</td>
<td>Sip water</td>
</tr>
<tr>
<td>Muscle cramps</td>
<td></td>
</tr>
<tr>
<td>Tiredness or weakness</td>
<td>Get medical help right away if:</td>
</tr>
<tr>
<td>Dizziness</td>
<td>You are throwing up</td>
</tr>
<tr>
<td>Headache</td>
<td>Your symptoms get worse</td>
</tr>
<tr>
<td>Fainting (passing out)</td>
<td>Your symptoms last longer than 1 hour</td>
</tr>
</tbody>
</table>
HEAT STROKE

**WHAT TO LOOK FOR**
- High body temperature (103°F or higher)
- Hot, red, dry, or damp skin
- Fast, strong pulse
- Headache
- Dizziness
- Nausea
- Confusion
- Losing consciousness (passing out)

**WHAT TO DO**
- Call 911 right away—heat stroke is a medical emergency
- Move the person to a cooler place
- Help lower the person’s temperature with cool cloths or a cool bath
- Do not give the person anything to drink
Case Discussions
In Case of Emergency
Cooling Methods in Heat Stroke

Radiation- Simple loss of heat across the skin barrier to the ambient air

Conduction- Transfer of heat through contact with a cooler object or cold water

Evaporation- Transfer of heat to evaporating sweat or water on the skin

Convection- Evaporative heat loss enhanced by wind or air currents

References

- https://sis.nlm.nih.gov/dimrc/extremeheat.html#a1
- https://www.epa.gov/heat-islands
- https://www.cdc.gov/disasters/extremeheat/warning.html
- http://www.nws.noaa.gov/om/hazstats.shtml
- https://www.wrh.noaa.gov/wrh/heatrisk/
- https://www.weather.gov/lot/1995_heatwave_anniversary
- https://www.weather.gov/media/sti/ngpps/Presentations%202017/Day%202%202017/11%20Vintrileos_MAPP_2017_ExcessiveHeat.pdf
- https://www.cdc.gov/mmwr/preview/mmwrhtml/su5301a3.htm
References


• Huang, L., Li, J., Zhao, D., & Zhu, J. (2008). A fieldwork study on the diurnal changes of urban microclimate in four types of ground cover and urban heat island of Nanjing, China. *Building and environment, 43*(1), 7-17


Webinars
Series of scientific webinars that provide a forum for discourse on scientific issues.

Live and On-Demand
Case Conferences
Journal Clubs
Grand Rounds
CE Available

Online Courses
Evidence-based online courses on a variety of children's environmental health topics.

Interactive and Self-Paced
CE Available

Resource Catalog
Fact sheets, journal publications, reports, and other resources for parents, community members, patients and healthcare professionals

Topics included:
Air Quality, Pesticides, Natural Disasters, BPA, Mold, Lead, Mercury