Impact of Extreme Heat in the Region

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https://www.maxpixel.net/Climate-Earth-Hour-Planet-Climate-Change-Globe-4776711
Outline

Extreme Heat in Florida

BRACE

Vulnerability Mapping
Older Adults (Aged 65+)

Infants, Children, Pregnant People

Chronic Conditions

Low Income, Unhoused

Athletes

Outdoor Workers

https://www.cdc.gov/disasters/extremeheat/specificgroups.html
<table>
<thead>
<tr>
<th></th>
<th>Cardiovascular disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ED</td>
</tr>
<tr>
<td>Under 5 years</td>
<td>1.53*</td>
</tr>
<tr>
<td>Over 65 years</td>
<td>2.52*</td>
</tr>
<tr>
<td>Over 65 years in nursing facilities</td>
<td>1.02*</td>
</tr>
<tr>
<td>Female</td>
<td>-</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>-</td>
</tr>
<tr>
<td>Housing units with no automobile</td>
<td>-1.21*</td>
</tr>
<tr>
<td>Children under 18 years living in one-parent families</td>
<td>2.16*</td>
</tr>
</tbody>
</table>

Jung et al. (2021)

Productivity ↓ 30%
Outdoor Workers

• class of worker
• gender and job roles
• compensation
• citizenship
## Municipal Workers

<table>
<thead>
<tr>
<th>Department</th>
<th>Temp. (°C)</th>
<th>Temp. range</th>
<th>Heat index</th>
<th>Heat index range</th>
<th>Outdoor (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet</td>
<td>0.1 (1.9)</td>
<td>−5.8 to 2.8</td>
<td>0.3 (2.9)</td>
<td>−7.7 to 5</td>
<td>41.9</td>
</tr>
<tr>
<td>Parks and recreation</td>
<td>0.7 (3.8)</td>
<td>−7.4 to 6.5</td>
<td>1.3 (5.7)</td>
<td>−11.6 to 10.1</td>
<td>74.7</td>
</tr>
<tr>
<td>Public works</td>
<td>3.3 (0.7)</td>
<td>2.0 to 4.5</td>
<td>5.2 (1.2)</td>
<td>3.0 to 7.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Solid waste</td>
<td>0.6 (3.3)</td>
<td>−8.1 to 8.8</td>
<td>0.2 (5.1)</td>
<td>−11.5 to 13.1</td>
<td>60.0</td>
</tr>
<tr>
<td>Underground utility</td>
<td>−0.2 (2.7)</td>
<td>−5.5 to 3.4</td>
<td>0.3 (3.4)</td>
<td>−6.4 to 3.8</td>
<td>63.8</td>
</tr>
</tbody>
</table>
a. ED

- ~4
  - Patients reporting SSN: 1.164 [0.934, 1.451]
  - Patients not reporting SSN: 1.112 [1.092, 1.134]

- 5~24
  - Patients reporting SSN: 1.184 [1.027, 1.366]
  - Patients not reporting SSN: 1.111 [1.098, 1.124]

- 25~44
  - Patients reporting SSN: 1.148 [1.050, 1.254]
  - Patients not reporting SSN: 1.123 [1.112, 1.135]

- 45~64
  - Patients reporting SSN: 1.264 [1.192, 1.340]
  - Patients not reporting SSN: 1.146 [1.136, 1.157]

- 65~84
  - Patients reporting SSN: 1.122 [1.094, 1.151]
  - Patients not reporting SSN: 1.127 [1.116, 1.139]

- 85+
  - Patients reporting SSN: 1.060 [1.038, 1.082]
  - Patients not reporting SSN: 1.109 [1.068, 1.130]

Odds Ratio (95% CI)

- Patients reporting SSN
- Patients not reporting SSN
Direct + Indirect Health Costs

$667 Million

Liu et al. (2019)
Outline

Extreme Heat in Florida

Building Resilience Against Climate Effects

Vulnerability Mapping
“My health department has ample expertise to assess public health impacts associated with climate change”

Maibach et al. (2008); Rosser-Renouf et al. (2016)
Building Resilience Against Climate Effects

01. Projecting the Disease Burden
02. Assessing Public Health Interventions
03. Developing and Implementing a Climate and Health Adaptation Plan
04. Evaluating Impact and Improving Quality of Activities
05. Forecasting Climate Impacts and Assessing Vulnerabilities

BRACE
Building Resilience Against Climate Effects

Marinucci et al. (2014)
What Is Your Plan? Important Issues

- Communication: Walkie Talkies, contacts, local help numbers
- Transportation: Maps, evacuation and alternate routes, public or medical
- Safety: Personal/family, dwelling, possessions, avoiding illness and injury
- Food: Special dietary needs for all family members and pets, enough for all
- Water: 7 gallons per person per day, Pets 1 gallon per 3 days, extra for medications, hydrating meals, etc.
Outline

Extreme Heat in Florida

Building Resilience Against Climate Effects

Vulnerability Mapping
<table>
<thead>
<tr>
<th>Causes of Extreme Heat Mortality</th>
<th>Mechanism</th>
<th>Treatment/ Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>Overheating Body’s Systems Fail</td>
<td>Cooling Body Down Rehydration</td>
</tr>
<tr>
<td>Societal</td>
<td>Homelessness Living Alone Crime Historical Zoning</td>
<td>Coordinate Public Broadcasts Cooling Refugee Energy Subsidy A/C Dissemination</td>
</tr>
</tbody>
</table>
Common Approaches

Health Outcome = Exposure + Risk Factors - Adaptations

Mapping

Overlay Analysis

Spatial Ecologic Study
Ex: Overlay Analysis

Vulnerability + Social Isolation + Lack A/C + Comorbidity

Reid et al. (2009)
Observed

Fitted

Uejio et al. (2012)
<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio</th>
<th>Std.Err</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Night time Surface Temperature (°C)</td>
<td>1.17</td>
<td>0.040</td>
<td>1.09 : 1.25</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Imperviousness Surface (%)</td>
<td>1.01</td>
<td>0.004</td>
<td>1.01 : 1.02</td>
<td>0.001</td>
</tr>
<tr>
<td>Housing Density (100 houses/km²)</td>
<td>0.82</td>
<td>0.033</td>
<td>0.76 : 0.89</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Renting (%)</td>
<td>1.01</td>
<td>0.022</td>
<td>1.00 : 1.01</td>
<td>0.003</td>
</tr>
<tr>
<td>Linguistically Isolated (%)</td>
<td>1.01</td>
<td>0.000</td>
<td>1.00 : 1.02</td>
<td>0.010</td>
</tr>
<tr>
<td>Population aged 65 or older (per 100 people)</td>
<td>0.86</td>
<td>0.045</td>
<td>0.78 : 0.95</td>
<td>0.003</td>
</tr>
<tr>
<td>Hispanic (%)</td>
<td>1.01</td>
<td>0.003</td>
<td>1.01 : 1.02</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>People Living Alone (%)</td>
<td>1.03</td>
<td>0.005</td>
<td>1.02 : 1.04</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Black (%)</td>
<td>1.03</td>
<td>0.007</td>
<td>1.01 : 1.04</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Asian (%)</td>
<td>0.93</td>
<td>0.030</td>
<td>0.87 : 0.99</td>
<td>0.015</td>
</tr>
<tr>
<td>Vacant Households (%)</td>
<td>1.03</td>
<td>0.005</td>
<td>1.02 : 1.04</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total Population (per 1000 people)</td>
<td>1.36</td>
<td>0.077</td>
<td>1.21 : 1.51</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Imperviousness Surface X Housing Density</td>
<td>1.002</td>
<td>0.001</td>
<td>1.001 : 1.003</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Applications

Everyone @ risk

Guiding decision making
Thanks!

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Yoonjung Ahn
Dr. Leiqiu Hu (University of Alabama Huntsville)
Dr. Arthur Yancey II (Grady)

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