The Health Effects of Heat Waves in North Carolina

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Objectives

• Examine the specific forms of heat-related illness (HRI) associated with heat waves in North Carolina

• Characterize the underlying health conditions and disease processes associated with heat waves

• **Outcomes:**
  – **Inform efforts and strategies to prevent HRI and mitigate the health effects of extreme temperatures**
  – **Provide health officials with estimates of the public health burden of heat waves**
Data and Methods

• Identification of heat waves
  – National Weather Service (NWS) advisories and warnings for extreme heat
  – At least one (1) heat product issued and verified across four (4) or more NWS regions in North Carolina for three (3) or more consecutive days
  – Focus on long-duration heat events affecting a wider population
Heat-Related Products from the NWS

• **Heat Advisory**
  – Issued when the heat index is expected to reach between 105-109 degF for two (2) or more hours or is expected to reach between 102-105 degF for three (3) or more consecutive days

• **Excessive Heat Warning**
  – Issued when the heat index is expected to reach 110 degF or higher for any duration
  – “Watch” may be issued if conditions expected in the next 24 to 48 hours
Data and Methods

• Health data
  – ED visit data obtained from **NC DETECT**
  – Includes principal diagnoses and any secondary diagnoses (co-morbidities)
  – In addition to HRI, several different disease outcomes and sub-groups were analyzed:
    • **Cardiovascular diseases** (e.g. heart disease)
    • **Cerebrovascular diseases** (e.g. stroke, aneurysm)
    • **Respiratory diseases** (e.g. asthma, COPD)
    • **Other diseases** (e.g. diabetes, nephritis)
North Carolina Disease Event Tracking and Epidemiologic Tool
Data and Methods

• Statistical analysis
  – Daily average number of ED visits during the heat wave period (observed) compared to the daily average number of ED visits during four (4) control periods (expected)
  – Control periods account for seasonality, day of week, lag effects, and possible displacement
  – Expected number of visits subtracted from observed number of visits to determine an excess or deficit in ED visits during heat waves
  – Difference in ED visits between heat wave and control periods assessed for statistical significance using two-tailed Student’s $t$-test (95% confidence interval)
Heat Wave Events

7-11 August 2007
Maximum heat index values 120-125 degF

5-11 June 2008
Maximum heat index values 100-105 degF
Rates of Heat-Related ED Visits by Age

7-11 August 2007

5-11 June 2008
Observed vs. Expected Visits for Different Forms of Heat-Related Illness

5-11 June 2008
Total Expected HRI Visits = 43
Total Observed HRI Visits = 603

7-11 August 2007
Total Expected HRI Visits = 73
Total Observed HRI Visits = 542
Percent Excess ED Visits for Cardiovascular and Cerebrovascular Diseases

7-11 August 2007
5-11 June 2008

* > 60% of visits 65+ years old
Percent Excess ED Visits for Respiratory Diseases

7-11 August 2007
5-11 June 2008

* > 60% of visits 65+ years old
Percent Excess ED Visits for Other Diseases

7-11 August 2007
5-11 June 2008

* > 60% of visits 65+ years old
Summary

• Roughly 70% of HRI visits were for various forms of heat exhaustion; only about 2-5% for heat stroke

• **Elderly** at increased risk for HRI during early season heat wave; teenagers and younger adults at increased risk during late season heat wave

• Significant increase in cardiovascular diseases, acute renal failure, complications from CVA, and influenza/pneumonia during early season heat wave, particularly among the elderly

• Significant increase in hypotension, dehydration, fainting, acute renal failure, and mental disorders during late season heat wave

• Notable decrease in **aneurysm** during both heat waves and **hemorrhagic stroke** during late season heat wave
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Disclaimer

The NC DETECT Data Oversight Committee does not take responsibility for the scientific validity or accuracy of methodology, results, statistical analyses or conclusions presented.

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