Emergency Response Planning for Extreme Heat

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MINNESOTA
MDH
DEPARTMENT of HEALTH

Thank you!

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Overview

- Public health approach

- Addressing vulnerabilities

- Reducing exposures: Response strategies

- System trigger: Defining heat event

- MDH-NOAA study collaboration

- Resources

Heat: obvious problem, difficult solution

Hazard + | Exposure + | Vulnerability = | RISK

Public Health Approach

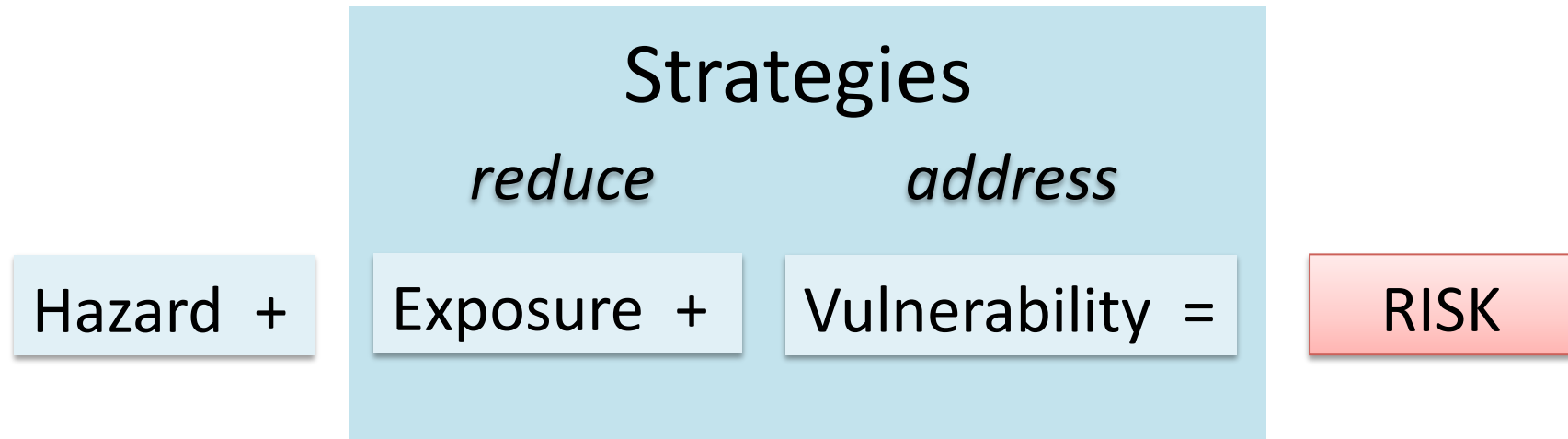**Strategies**

reduce   *address*

Hazard +   Exposure +   Vulnerability =   RISK

Reducing exposure: current approaches & challenges

Addressing vulnerability: what are they & why they matter

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Heat Vulnerability: because not everyone is "equal"
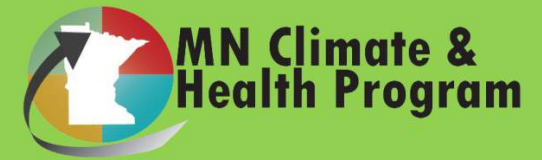

Elderly, children, pre-existing conditions, lower income, housing, occupation, physical activity, acclimatization, social ties
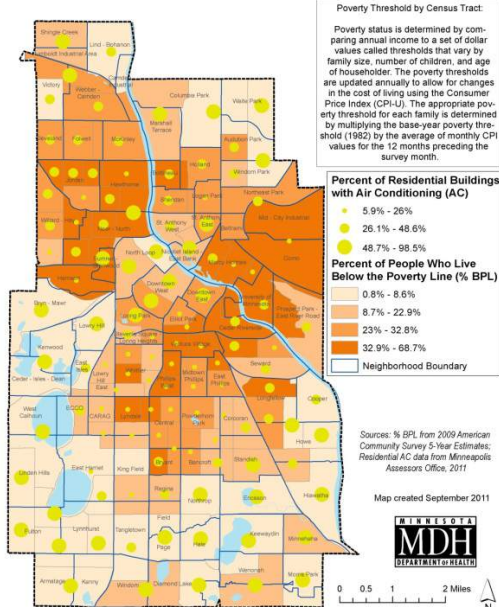
Want to reduce overall health burden?

Start with vulnerable groups.
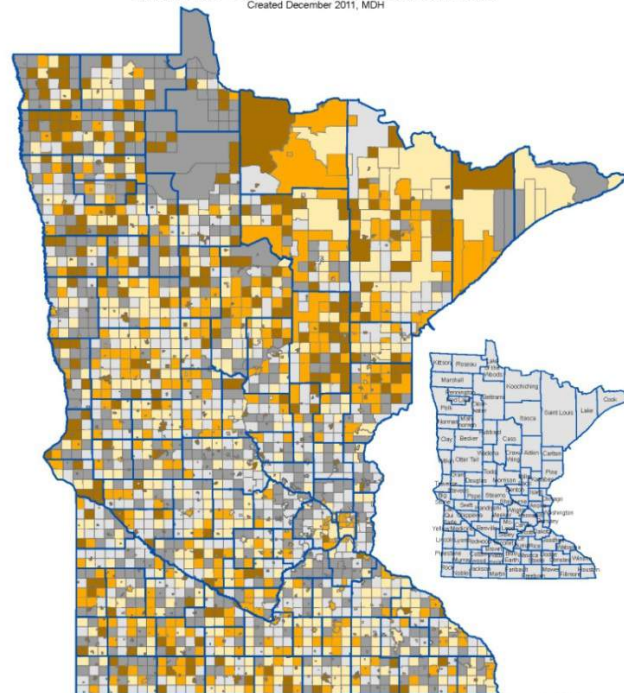
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Addressing Vulnerability

Air Conditioned Residential Buildings &
Percent of People Who Live Below the Poverty Line

Percent of Elderly Living Alone
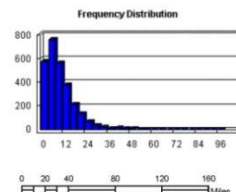by County Subdivision in Minnesota

Source: 2010 American Community Survey 5-Year Estimates
Elderly Living Alone = Households with persons 65 Years-Old or Older living alone
Created December 2011, MDH
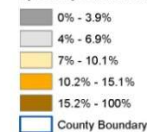
Minneapolis Land Cover
Impervious Surfaces

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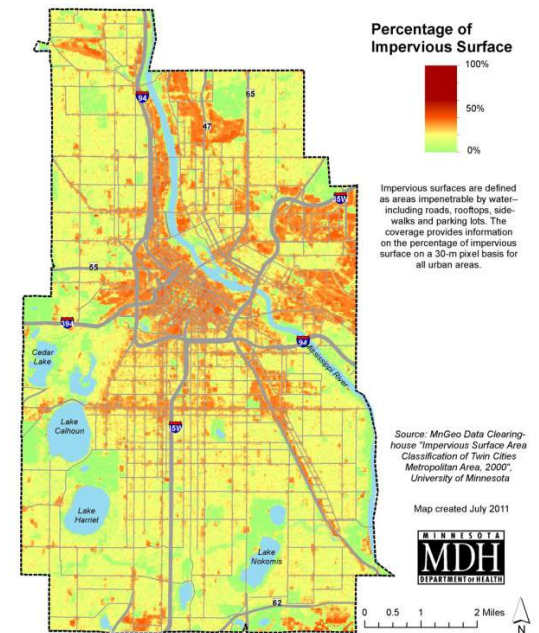
Heat Response Plan

- Identify lead agency
- Define criteria for activating plan
- Define roles and activities
- Outline communication network
- List strategies for prevention

MINNESOTA EXTREME HEAT TOOLKIT

MDH — Public Health Response to Climate Change in Minnesota
Minnesota Department of Health
Environmental Impacts Analysis Unit

MDH DEPARTMENT of HEALTH

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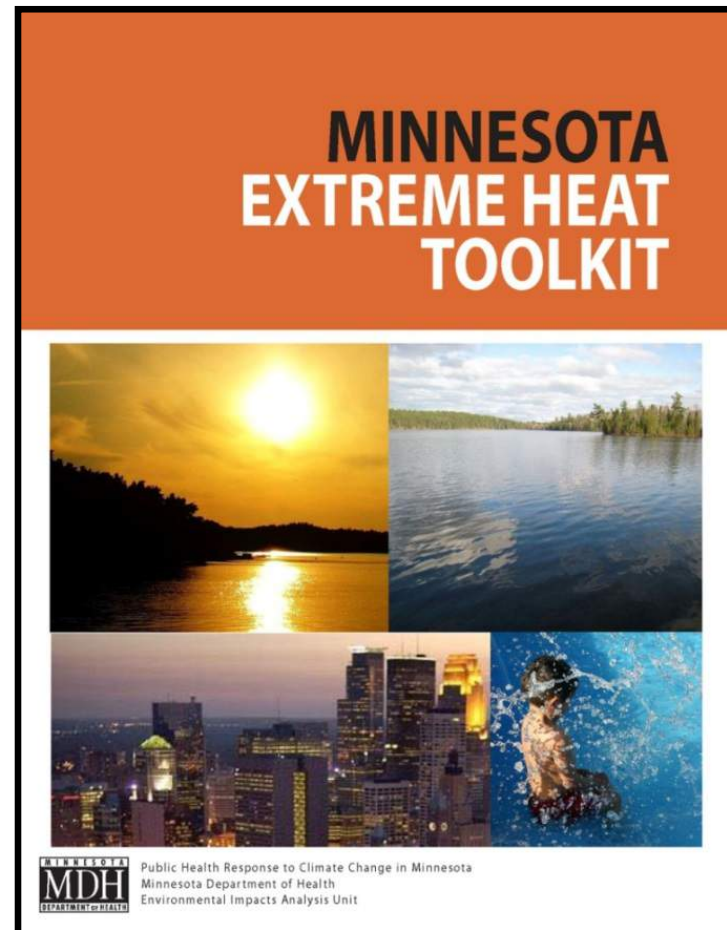
Example strategies:

- Public broadcasts

- Heat line

- Cooling centers

- Outreach to vulnerable persons

- Extra staffing of emergency services

- Suspend utility shutoffs, prepare for outages

- Provide water at public places

- Reschedule outdoor events

Defining a Heat Event

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Weather Surveillance
Air temp
Dew point temp
Wind speed
Solar radiation
Black globe temp
AQI

→ **Trigger** → **Response** →

Watch
Advisory
Alert
Warning

Syndromic Surveillance
Mortality
Heat-related
Cardiac
Respiratory
Metabolic
Renal
Homicide/suicide

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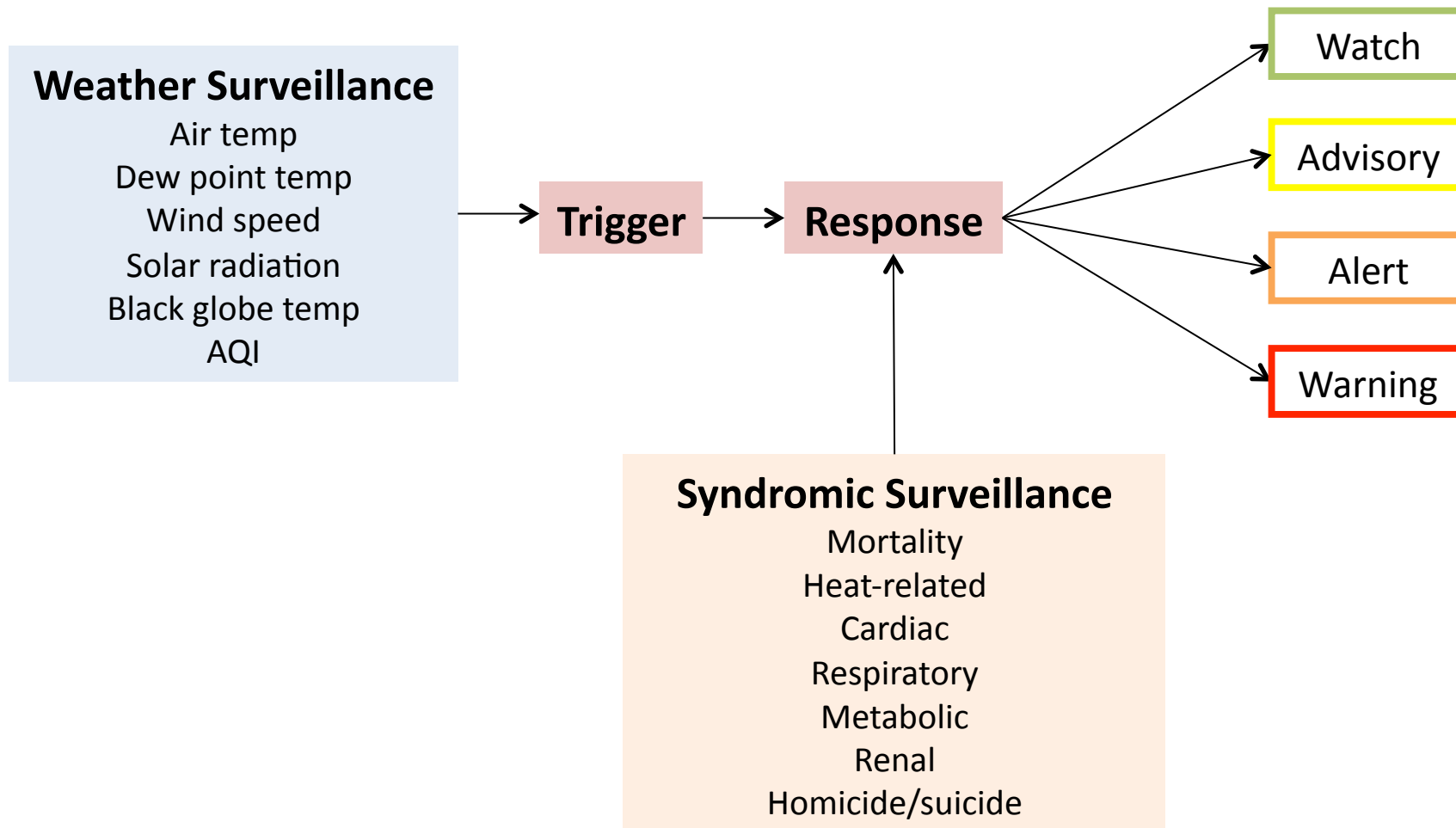
No standard definition of extreme heat event

- Built environment, acclimitazation, population level factors = alert thresholds vary (Hajat et al., 2010)

- What mix of weather parameters create tipping point? Temp, Humidex, SSC, WBGT, HI......

- Dose-response curve: Where's the threshold?

Diagram of Dose Response Relationship

Percent Individuals Responding — 1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.0

Increasing Dose (mg/kg) →

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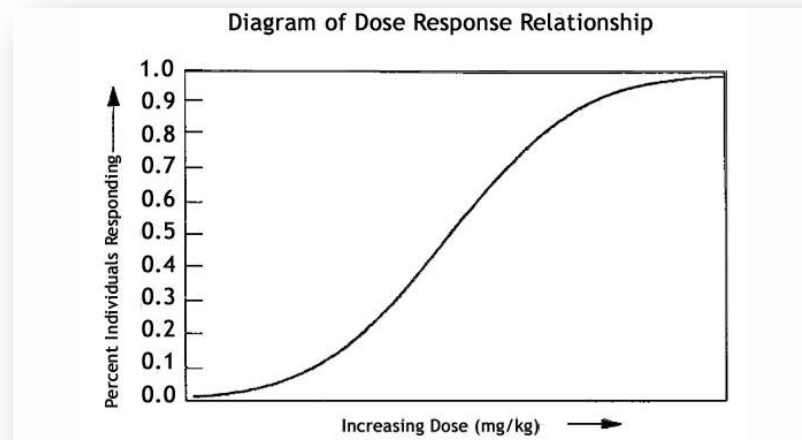
MDH-NOAA heat alert study

• When do we sound the alarm? How many bells?

• Aim: Assess relationship between heat mortality and morbidity measures and standard meteorological parameters and those less typically relied for determining heat alerts

NWS MINNESOTA/WISCONSIN COUNTY RESPONSIBILITY

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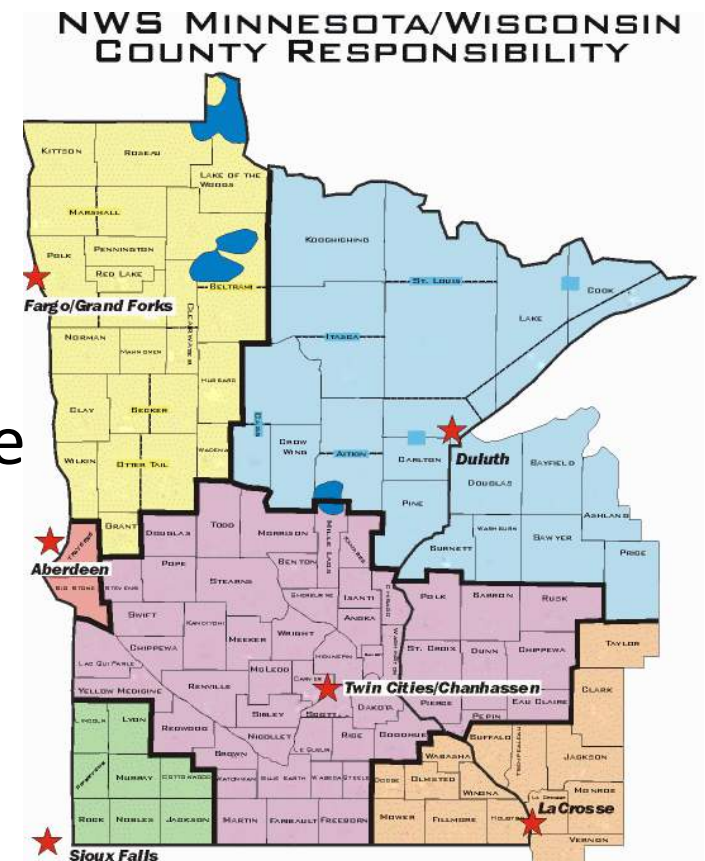
Benefits

- Results immediately useful for alerts

- Numbers tell a compelling story

- Initiates efforts needed to develop syndromic surveillance
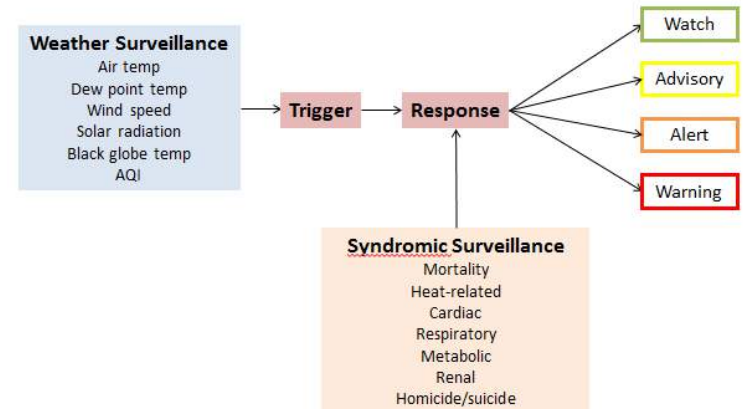
Challenges

- Getting the data

- Finding statistical expertise

- Quantifying the optimal "trigger"

Resources

- *Minnesota Extreme Heat Toolkit*

- Health Canada: *Heat Alert & Response Systems to Protect Health*

- USEPA: *Excessive Heat Events Guidebook*

- City of Boston: *Preparing for Heat Waves in Boston*

- Eric Klinenberg. *Heat Wave: A Social Autopsy of Disaster in Chicago*

- Hajat et al. (2010) *Heat-health warning systems: a comparison of the predictive capacity of different approaches to identifying dangerously hot days.*

- Yardley et al. (2011) *Heat health planning: the importance of social and community factors.*

- Lowe et al. (2011) *Heatwave early warning systems and adaptation advice to reduce human health consequences of heatwaves.*

- Josseran et al. (2010) *Assessment of syndromic surveillance system based on morbidity data: results from Oscour network during heat wave.*

- Jurisdictions with a heat syndromic surveillance system: Arizona, Florida, Maine, Michigan, New Hampshire, New York City, France (Oscour), Canadian provinces (Ontario)
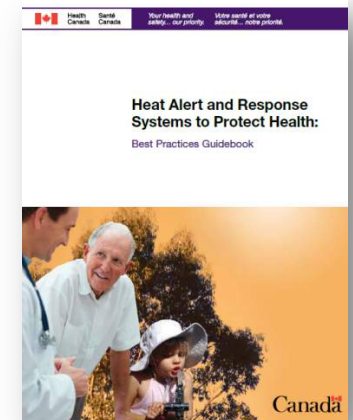
Minnesota Extreme Heat Toolkit

Extreme Heat Toolkit :

- **Introduction to extreme heat events**
  - Why care about extreme heat events
  - Minnesota is warming
  - Defining extreme heat events
- **Extreme heat events and public health**
  - Health issues caused by extreme heat
  - Characteristics that increase the risk of heat-related illnesses
- **Preparing Minnesota for extreme heat events**
  - Key steps for planning for and responding to extreme heat events
  - Developing a heat response plan
  - Additional strategies to prevent heat-related illnesses
  - Mitigation/adaptation to extreme heat
  - Training and resources for extreme heat
- **Appendices:**
  - Draft language for extreme heat response plans
  - A tip sheet for individuals to prevent heat-related illnesses
  - Data sources for mapping risk factors
  - Sample media release

http://www.health.state.mn.us/divs/climatechange/extremeheat.html
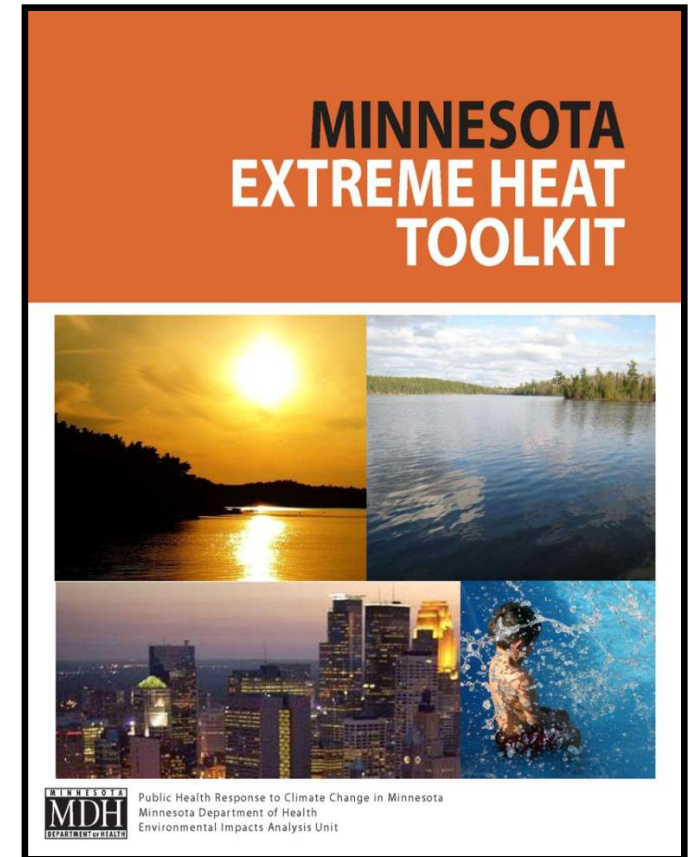
Table 4: Checklist of response plan elements and strategies implemented by Olmsted County and the City of Minneapolis

| Strategies	Olmsted County	City of Minneapolis
Response Plan Elements[1]		
Lead agency responsible for the response plan	✓	✓
Criteria for activating and deactivating the plan	✓	✓
Assigned roles and activities of agencies and organization involved with the plan	✓	✓
Communications plan for communicating heat-related information to partners and the public before and during an extreme heat event		✓
Identification of vulnerable persons	✓	✓
Strategies for preventing morbidity and mortality from extreme heat (see below)	✓	✓
Evaluation of the response plan	✓	✓
Response Plan Strategies		
Prediction		
Establish partnership with local National Weather Service (NWS) station to ensure access to weather forecasts capable of predicting extreme heat conditions a few days in advance of an event	✓	✓
Ensure timely transfer of weather forecasts to lead agency	✓	✓
Assessment, Activation and Notification		
Review activation criteria based on predicted meteorological characteristics and health impacts and determine activation of the response plan	✓	✓
Coordinate distribution of information about the anticipated timing, severity, and duration of extreme heat event; heat exposure symptoms; and tips on how to stay cool during an extreme heat event for public broadcasts	✓	✓
Implementation		
Disseminate information related to preventing heat-related illnesses to community organizations and facilities with concentrations of high-risk individuals	✓	✓
Activate a heat line		✓
Identify and designate buildings with air conditioning as public cooling centers and extend hours of operation	✓	✓
Work with the public and private sector to allow public gathering at buildings with air conditioning and extend hours of operation		✓
Outreach to vulnerable populations	✓	✓
Arrange for extra staffing of emergency support services		✓

[1] Table and strategies adapted from U.S. Environmental Protection Agency. 2006. Excessive heat events guidebook. www.epa.gov/heatisland/about/heatguidebook.html.

Data sources

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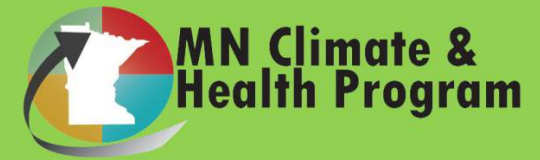
Data sources for characteristics that increase the risk of heat-related illnesses

This document provides a list of data sources for identifying a community's vulnerable populations and risk factors associated with extreme heat events. The vulnerability and risk characteristics have been selected from a thorough literature review and categorized into three areas: 1) demographic characteristics, 2) social/behavioral factors and 3) geographic/locational factors.

Each characteristic has two sets of data sources: 1) data that has already been summarized at the county level, and 2) data that is still raw or not compiled by meaningful geography, but potentially provided at smaller geographies for making GIS maps or creating unique summaries. The data sources for the characteristics are based on best practices and are current as of the time of this writing, April 2012. Local communities may have their own local knowledge or data sources that are not included in this review. This list provides initial guidance on where to find data from large, standard data sources and is not comprehensive of all data sources that may be available to a particular jurisdiction.

For questions about identifying vulnerable populations in your area, contact the Minnesota Department of Health's Climate & Health team at health.climatechange@state.mn.us.

Characteristic	County-Summarized Data	Raw/Non-summarized Data
Demographic characteristics		
Elderly: persons 65 years old and older	1. Minnesota County Health Tables, Demographics Table 3: Selected Minnesota Population Statistics, *Population 65+ years* 2. Minnesota Compass, Population age 65+ by county (projects data to 2030; only for 7-county metro area)	Data is available through the U.S. Census Bureau's American FactFinder 1. 2000 Census SF1: 'Age Groups and Sex: 2000' (ID: QT-P1) 2. 2010 American Community Survey 5-year Estimates: 'Age and Sex' (ID: S0101) 3. 2010 Census SF1: 'Age Groups and Sex: 2010' (ID: QT-P1)
Children: persons less than 5 years old	Minnesota County Health Tables, Demographics Table 1: Minnesota Population Estimates, 2010, *Age Group 00-04*	Data is available through the U.S. Census Bureau's American FactFinder 1. 2000 Census SF1: 'Age Groups and Sex: 2000' (ID: QT-P1) 2. 2010 American Community Survey 5-year Estimates: 'Age and Sex' (ID: S0101) 3. 2010 Census SF1: 'Age Groups and Sex: 2010' (ID: QT-P1)
Economically constrained: persons living at or below poverty line[1], and persons living at or below 200% of poverty	1. Poverty: MDH Vital Statistics Trend Report 1991-2010, *Percent of All Ages Living in Poverty* 2. 200% of Poverty: Minnesota County Health Tables, 2011, Demographics Table 6: Selected Minnesota Socioeconomic Statistics by State and County, *Percent of people of all ages living at or below 200% of poverty*	Data is available through the U.S. Census Bureau's American FactFinder 1. 2000 Census SF3: Poverty Status in 1999 of individuals: 2000 (ID: QT-P34) 2. 2010 American Community Survey 5-year Estimates: 'Poverty Status in the Past 12 Months' (ID: S1701)

[1] Population below the poverty level. Poverty threshold is determined by the U.S. Census Bureau, and is adjusted for inflation but does not vary geographically. Therefore the income threshold for poverty is the same nation-wide and does not consider local variation in cost-of-living. Data is compiled nationwide by the U.S. Census Bureau.

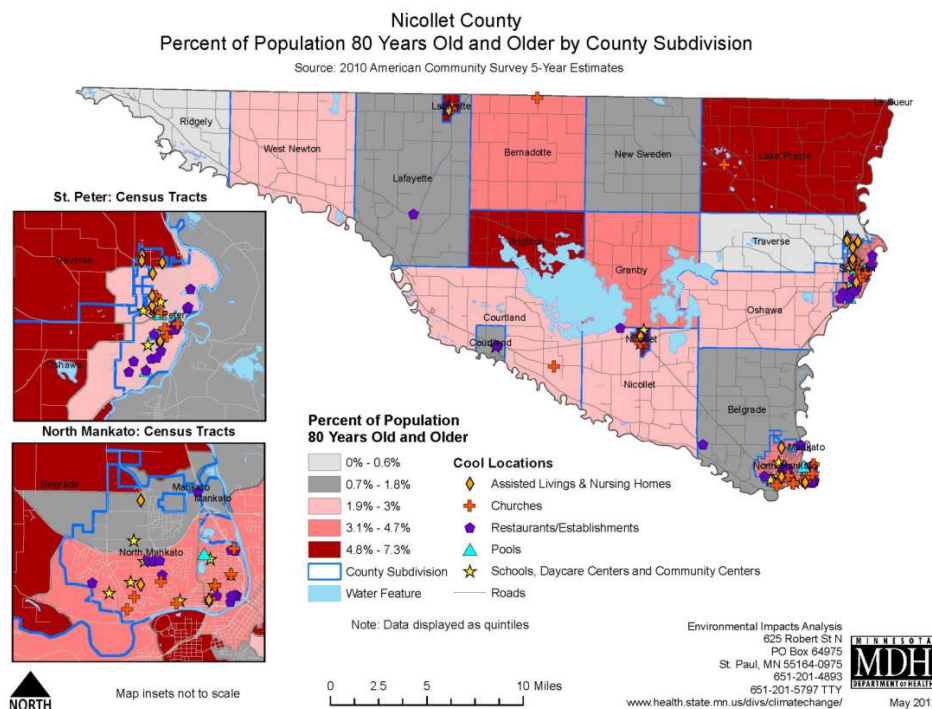| Characteristic	County-Summarized Data	Raw/Non-summarized Data
Demographic characteristics (cont.)		
Low socioeconomic status: educational attainment	1. Minnesota County Health Tables, Demographics Table 6: Selected Minnesota Socioeconomic Statistics by State and County, Percent of Population aged 25 years and older with less than or equal to high school education or equivalent (e.g., GED) 2. Minnesota Compass, High School Graduation, Breakdown: by county (map), 7-county metro area only	Data is available through the U.S. Census Bureau's American FactFinder 1. 2000 Census SF3: 'Educational Attainment by Sex: 2000' (ID: QT-P20) 2. 2010 American Community Survey 5-year Estimates: 'Educational Attainment' (ID: S1501)
Persons with pre-existing diseases or mental health conditions	1. Asthma: Minnesota Public Health Data Access 2. Diabetes: a. CDC Diabetes Data & Trends b. National Environmental Public Health Tracking Network Reporting Tool, Search Data, Climate Change, Heat Vulnerability, Age-adjusted, estimated percent of adults >= 20 years with diagnosed diabetes c. Local Surveys (see list of local surveys in Additional Information Regarding the Data Sources on page E-5) 3. Cardiovascular/Heart Disease: a. CDC Heart Disease & Stroke Maps b. Heart Attack Hospitalizations: Minnesota Public Health Data Access c. Local Surveys, page E-5	1. CDC Behavioral Risk Factor Surveillance System (BRFSS) Data only available at Metropolitan Statistical Area, or county level for Hennepin, Anoka, Dakota, and Ramsey counties. Indicators include: Asthma, Cardiovascular Disease, and Diabetes. 2. Local Surveys (see list of local surveys in Additional Information Regarding the Data Sources on page E-5)
Persons on certain medications	Data not available	Data not available
Social/Behavioral factors		
Social isolation: Elderly living-alone[2]	1. Minnesota County Health Tables, Demographics Table 4: Percent of households in which the resident is 65 and over and living alone 2. Minnesota Department of Human Services: Living Alone Age 65 and Older by Household, Householder and County	Data is available through the U.S. Census Bureau's American FactFinder 1. 2000 Census SF1: 'Relationship by Household Type for the Population 65 Years and Over' (ID: P030) 2. 2010 American Community Survey 5-year Estimates: 'Relationship by Household Type (Including Living Alone) for the Population 65 Years and Over' (ID: B09017) 3. 2010 Census SF1: 'Household Type by Relationship for the Population 65 Years and Over' (ID: P34)
Prolonged exposure to sun	Minnesota Department of Employment and Economic Development Local Employment Dynamics – State of Minnesota county reports of quarterly workforce indicators. Data is searchable by county, industry, year, quarter, age, and education.	Minnesota Department of Employment and Economic Development Local Employment Dynamics – State of Minnesota county reports of quarterly workforce indicators. Data is searchable by county, industry, year, quarter, age, and education.

[2] Elderly living-alone are age 65 and older, living in non-family households, alone. Data is compiled nationwide by the U.S. Census Bureau.

Appendix F

F-2

Extreme Heat Toolkit

Minnesota Department of Health

F-3

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Nicollet County
Percent of Population 80 Years Old and Older by County Subdivision
Source: 2010 American Community Survey 5-Year Estimates
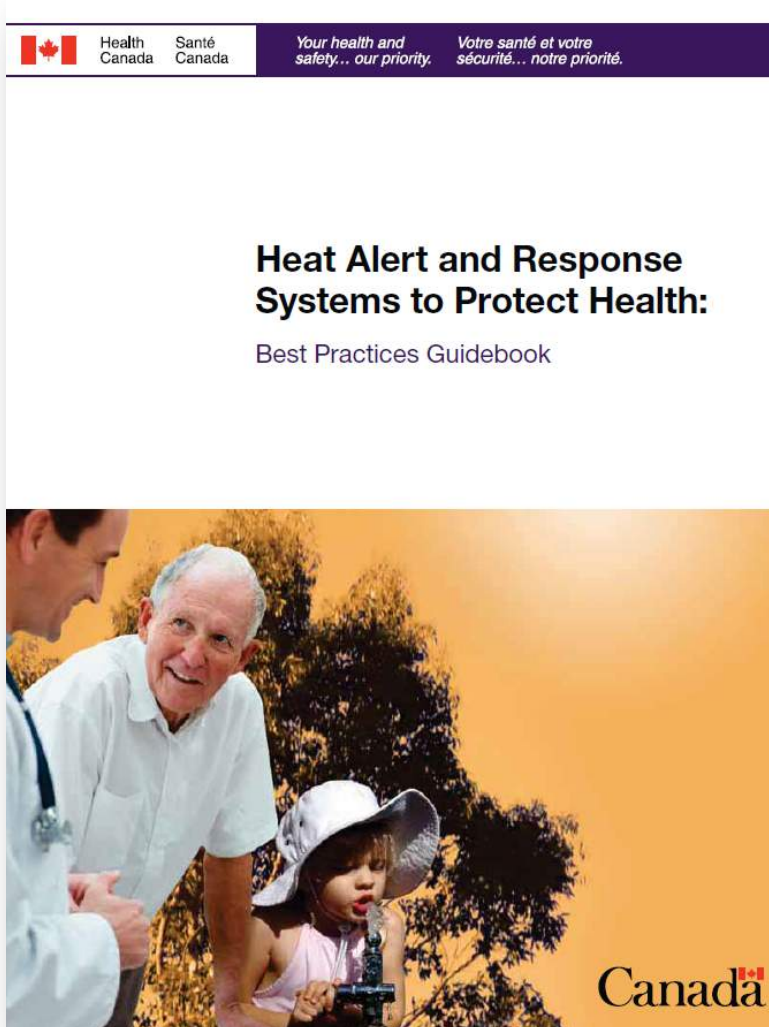
Characteristics mapped:

- child/day care facilities
- schools
- community centers
- libraries
- pools
- assisted living facilities & nursing homes
- churches
- restaurants
- movie theaters
- museums
- parks and recreation
- shopping malls
- impervious surface/land cover
- percentage of residential buildings with central A/C

http://www.health.state.mn.us/divs/climatechange/extremeheat.html

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Heat Alert and Response Systems to Protect Health:

Best Practices Guidebook

An alert trigger approach that is transferable to all communities and is most effective in accurately identifying different levels of health risk has not been identified in the literature to date.[41,95,h] Few communities in Canada and elsewhere have systematically examined the association between the trigger they are using and resultant health outcomes, or other measures of effectiveness.[41]

An alert system may include more than one trigger to allow for activation of different levels of community response. Some systems include:

- a trigger to notify key partners (e.g. heat watch)

- a trigger to notify a broader range of stakeholders, often accompanied by a public alert (e.g. heat warning)

- an enhanced trigger (e.g. heat emergency) to initiate an aggressive community response to help people requiring assistance

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Challenges:

- Little consensus over how to define heat as exposure metric

- Most studies use primary diagnosis only

- Number of confounding factors (air quality)

- Not clear how lag time modifies effect

- Most studies focus on mortality, miss morbidity