



Wisconsin Climate and Health Profile Report

Wisconsin BRACE Program:
Building Resilience to
Natural Disasters in
Wisconsin

Wisconsin Department of
Health Services, Division of
Public Health, Bureau of
Environmental and
Occupational Health,
Madison, WI



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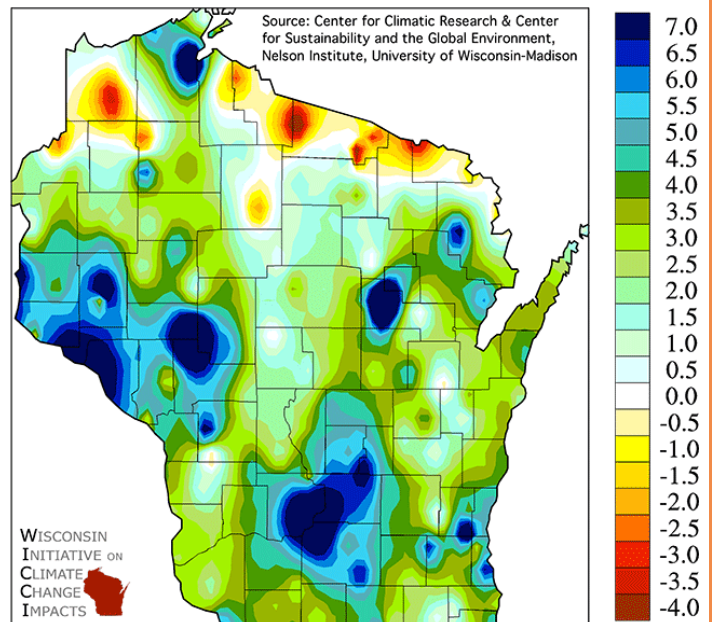
“Encouraging people to consider human health impacts from climate...provides a useful and engaging frame of reference.”¹

In 2012, the Wisconsin Department of Health Services (DHS), Bureau of Environmental and Occupational Health (BEOH) was awarded a Centers for Disease Control and Prevention (CDC) Building Resilience Against Climate Effects (BRACE) project grant to study and prepare for anticipated climatic effects on the public’s health. The goal of this grant project is to enhance the statewide capacity of DHS to assess, prepare for, and effectively respond to climate and extreme weather events and reduce or prevent related negative health effects to Wisconsin’s citizens. The Wisconsin BRACE program seeks to expand partnerships, provide expertise, foster collaboration, and develop strategies that will address health risk factors related to severe weather event indicators. The Wisconsin Climate and Health Profile Report highlights evidence-based data related to extreme weather events, corresponding health outcomes, and the development of projects and best practices to adapt to and prepare for future extreme weather events.

Over the past 60 years, Wisconsin has become warmer and wetter, especially during the winter months. A warmer and wetter Wisconsin will affect our health. Climate-sensitive human health impacts will likely be affected by:

- Precipitation Changes
- Heat Extremes
- Drought
- Winter Weather Changes
- Disease Vectors
- Surface Water
- Groundwater²

Annual Average Precipitation Change (inches), Compared to Wisconsin’s Annual Average of 33 Inches: 1950-2006³







“Climate” vs. “Weather”

While “Climate” and “Weather” are related, the terms are not interchangeable. The difference is a measure of time.

“Weather” is defined as the short-term atmospheric conditions of an area and is measured in minutes to months. Weather is what you get: “a hot summer day.”

“Climate” is the atmospheric conditions of an area or region averaged over a long period of time. Climate is measured over years or decades and represents an average over that specific time period. Climate is what you expect: “long, hot summers.”

 <p>Spring</p>	<p>Health Impacts:</p> <ul style="list-style-type: none"> ↑ Stress and mental health disorders ↑ Foodborne and waterborne illnesses ↑ Injuries ↑ Drowning ↑ Death <p>Flooding</p> <p><i>More frequent and intense rain events may lead to more flooding.</i></p>
 <p>Summer</p>	<p>Health Impacts:</p> <ul style="list-style-type: none"> ↑ Heat stress ↑ Respiratory distress ↑ Allergic Reactions ↑ Death <p>Extreme Heat</p> <p><i>Southern Wisconsin may experience ~28 more days exceeding 90°F.</i></p>
 <p>Fall</p>	<p>Health Impacts:</p> <ul style="list-style-type: none"> ↑ Water and food insecurity ↑ Respiratory distress ↑ Allergic reactions ↑ Death <p>Drought</p> <p><i>Extended periods of warming could cause more droughts.</i></p>
 <p>Winter</p>	<p>Health Impacts:</p> <ul style="list-style-type: none"> ↑ Traffic accidents ↑ Power outages ↑ Injuries ↑ Death <p>Ice, Sleet, Rain</p> <p><i>Warmer winters might cause more ice, sleet, and rain.</i></p>

Evidence and research drawn from the Wisconsin Initiative on Climate Change Impacts (WICCI) suggests the following climate and health impacts:

- **Precipitation Changes:** A general increase in precipitation may occur across the state. Seasonal changes in precipitation may cause extended dry periods during the summer, but also flooding during heavy and intense rain periods.² Potential health impacts include risk of stress and mental health disorders,⁴ flood-related food and waterborne illnesses,⁵ injuries, and drowning.⁶
- **Heat Extremes:** Average annual temperatures in Wisconsin could increase by 4-9°F by 2055.² Extreme heat is associated with increased loss of life.⁷ Certain populations, especially the elderly and socially isolated individuals, are at increased risk of heat-related death.⁸ Air quality degradation due to heat may lead to respiratory distress, and additional airborne pollen may lead to allergic reactions.^{9,10}

- **Drought:** Drought conditions could lead to reduced drinking water in the late winter and spring, followed by an extended period of warming and drought.² Drought conditions may lead to reduced drinking water availability, food insecurity, and respiratory distress from dust, pollen, and airborne particulates.⁶
- **Winter Weather Changes:** Winter storms producing heavy snowfall or ice can lead to more traffic accidents, deaths, and injuries due to poor travel conditions. Winter weather patterns in much of the state may shift to more rain, sleet, or ice, which can damage power lines, leading to power outages which place chronically ill patients on medical devices at greater risk.^{2,5}
- **Disease Vectors:** A warmer, wetter climate could produce more human cases of West Nile Virus, carried by mosquitoes, and Lyme Disease, carried by deer ticks. Changing environmental conditions may also support new mosquito-borne diseases in Wisconsin, and a migration of the Lone Star Tick and new tick-borne diseases into Wisconsin.^{11,12}
- **Surface Water:** Changes to precipitation volume, seasonality, and intensity may all lead to increased risk for flooding and flood-related health problems.² Flood events can produce increases in bacterial and viral infections and waterborne outbreaks among customers of municipal drinking water systems, and recreational users of lakes and rivers.⁵ Contamination of surface water with phosphorous and nitrogen may lead to blooms of toxin-producing blue-green algae, that will pose a risk to residents, visitors, and their pets.¹³
- **Groundwater:** Extremely intense and frequent rainfall events may lead to excessively fast recharge of local groundwater levels, leading to “groundwater flooding.” Conversely, water demands during extended dry periods may quickly draw down the local water table, leading to shallow wells going dry.¹⁴ Drought conditions can potentially threaten and impact all water users. Residents utilizing groundwater for drinking water may notice water with different tastes or odors due to changes in water chemistry, and may be at risk for consuming heavy metals, organics and other contaminants.^{5,13}
- **Bottom Line: Wisconsin may experience more extreme and variable weather events putting Wisconsin citizens at increased risk of adverse health effects. Not everyone will be affected equally, and it is important to be aware of which sectors of the population are most vulnerable.**

Who is most vulnerable?

Extreme weather and climatic events can place an increased risk on the most vulnerable sectors of the population:



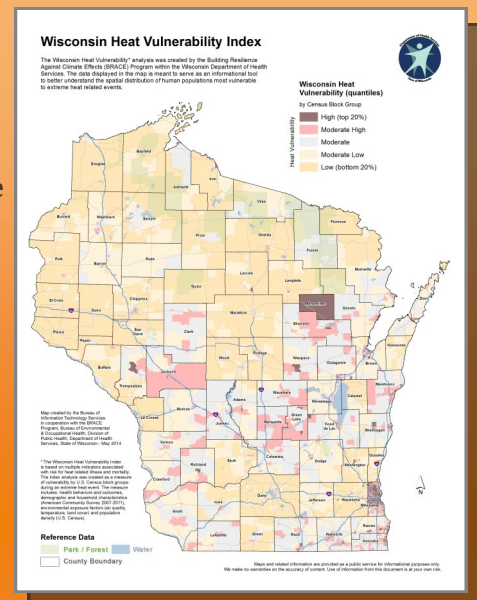
In many communities, the most vulnerable also include those most affected by the “social determinants of health”: persons of color, non-English speakers, those with less than a high school education, persons facing discrimination due to gender or religion, and persons living in poor housing conditions.¹⁵

Increasing our understanding of the short-term and long-term public health impacts of extreme weather and climate requires a framework based on the following: collaboration across multiple societal sectors and professions; a comprehensive assessment of vulnerabilities; measurable health indicators; a systematic collection and analysis of data; the knowledge and skills to conduct environmental epidemiology; and an incorporation of findings into actions and policy decisions. The Wisconsin BRACE program has adopted the premise that the public health impacts related to climate and weather must be identified and studied, and then sustainable plans and strategies must be developed to assure that Wisconsin residents can adapt to these changes moving forward.

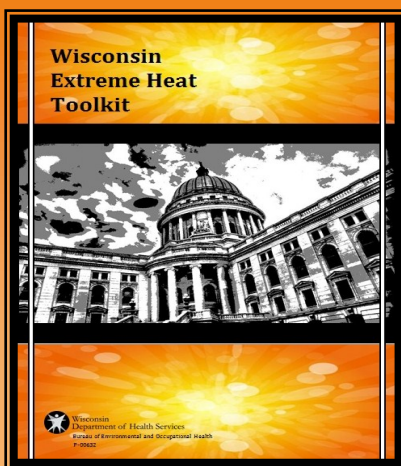
Following the CDC BRACE framework, the Wisconsin BRACE Program has identified and sought out many potential partners within federal, state, and local agencies, the private sector, and professional associations, forming the Wisconsin BRACE Science Advisory Group (SAG). Initial discussions with SAG partners focused on climate and extreme weather events, the roles and goals of the Wisconsin BRACE Program, and basic background information related to the identification of climate-related health impacts. As these relationships have progressed, they have become task and action-oriented, and have led to the identification and development of research projects and collaborative opportunities highlighted here.

BRACE Projects

Heat Vulnerability Assessment: Utilizing the methodology developed by the San Francisco Department of Public Health,¹⁶ Wisconsin BRACE staff conducted a geo-spatial analysis of heat-related morbidity and mortality of the State of Wisconsin and the Greater Milwaukee urban area, with assistance from the DHS Bureau of Information Technical Services (BITS) Geographic Information System (GIS) staff. This analysis resulted in a heat vulnerability index (HVI) based on existing population and census data, GIS environmental data layers, climate and weather data, and disease prevalence rates to identify areas of greatest risk for negative health impacts due to extreme heat. Identified high risk neighborhoods and



populations will receive targeted messaging related to heat events and additional resources during extreme heat events. Extreme heat events- cause more deaths than hurricanes, lightning, tornadoes, floods, and earthquakes *combined*.¹⁷



Extreme Weather Toolkits: A series of informational ‘toolkits’ providing one- to two -page guides that can be given to the public, and used by local governments, health departments, and emergency response personnel, have been developed to better prepare Wisconsin residents for extreme heat events, flooding, winter weather, and wildfire events. Additional toolkits are being developed for drought, chemical spills, and other environmental risks.

Community Engagement Protocols and Pilot Projects: In partnership with University of Wisconsin Masters of Public Health (MPH) interns, the Wisconsin BRACE staff are developing protocols, data packages, and capacity-building educational materials for local public health agencies. Four local public health agencies (LPHAs) will be selected in Summer 2014 to pilot the use of community engagement models in an effort to incorporate climate and extreme weather-related public health impacts into their ongoing planning and preparedness efforts.

Vector Study: Tick surveillance and tracking projects will begin in the northwest corner and south central parts of Wisconsin in collaboration with the UW Department of Entomology, DHS Bureau of Communicable Disease and Emergency Response (BCDER), and Eau Claire City-County Health Department, to assess disease prevalence, varying tick phenology, and habitat changes.



Adult Female Deer Tick




Flooding in Lake Delton, Wisconsin, 2008 (Source: [USDA](#))

Flood Vulnerability Study: Utilizing the recently developed storm transposition model and expertise from UW-Madison engineering staff and the Center for Climate Research, the Wisconsin BRACE Program will identify areas of flood vulnerability in Wisconsin, expected frequency of flooding events, and public health impacts. Further collaboration with the Minnesota BRACE Program is possible.

Wisconsin Strategic Health Adaptation Plan: A statewide Wisconsin Strategic Health Adaptation Plan will be created incorporating feedback from the four LPHAs and in collaboration with other local, state, and national partners.

For more information about Wisconsin's Climate Health Profile Report, please contact: Jeff Phillips, BRACE Program Manager, at Jeffrey.Phillips@dhs.wisconsin.gov.



Through collaborative partnerships, community stakeholder engagement, active research to remove knowledge gaps, and leveraging of existing programs and projects, the Wisconsin BRACE Program will achieve the goal of building capacity to project, prepare for, assess, and effectively respond to extreme weather and climate events to reduce or prevent negative health outcomes for the citizens and visitors of the State of Wisconsin.

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