

HOW CLIMATE IMPACTS HEALTH: MICHIGAN PERSPECTIVE

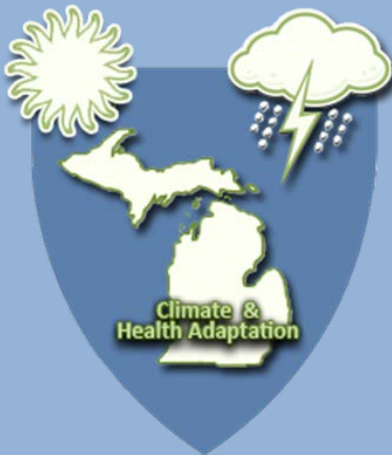
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Asthma Initiative of Michigan

June 3, 2016



Michigan Climate & Health Adaptation Program *MICHAP*

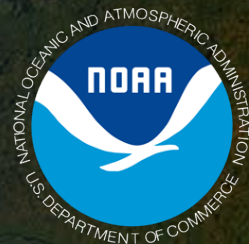
- *Federal/ State /Local Partnership*
- *Integrating Climate Adaptation into Public Health Practice*
- *Promote Adaptation Strategies to Protect Public Health*



Outline

- Michigan's Climate Basics
- How Climate Change Affects Health
- Public Health Response

Michigan's Current and Projected Climate



Laura Briley and
Daniel Brown

MICHIGAN STATE
UNIVERSITY

GLISA

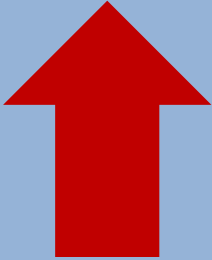
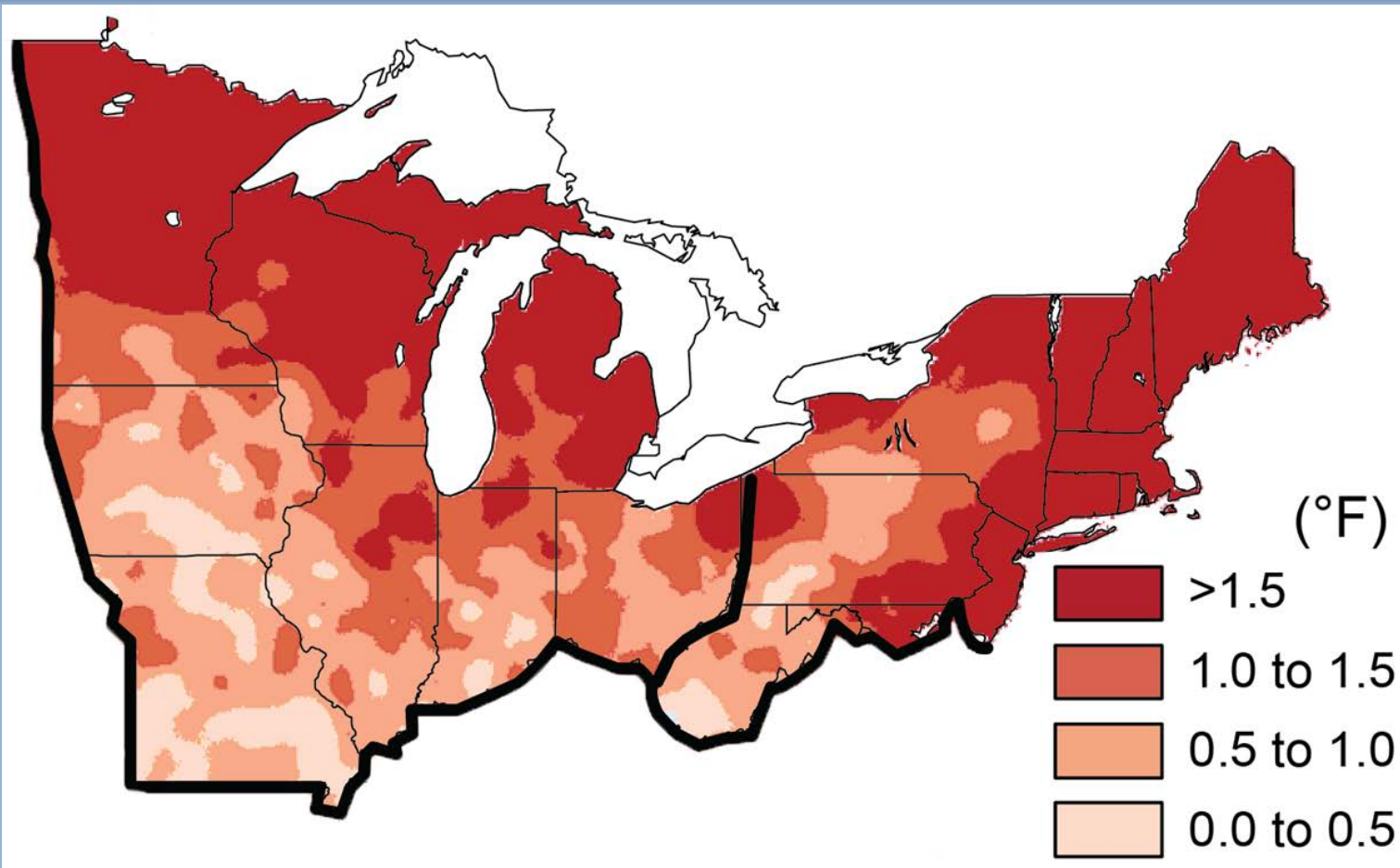
GREAT LAKES INTEGRATED SCIENCES + ASSESSMENTS

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Definitions

- ***Weather*** - **Short-term** conditions at a location (temperature, wind, rain, etc)
- ***Climate*** - **Long-term average of weather** for an extended period of time **at a certain location**
- ***Climate change*** - **Long-term continuous increase or decrease** to average weather conditions or range of weather.

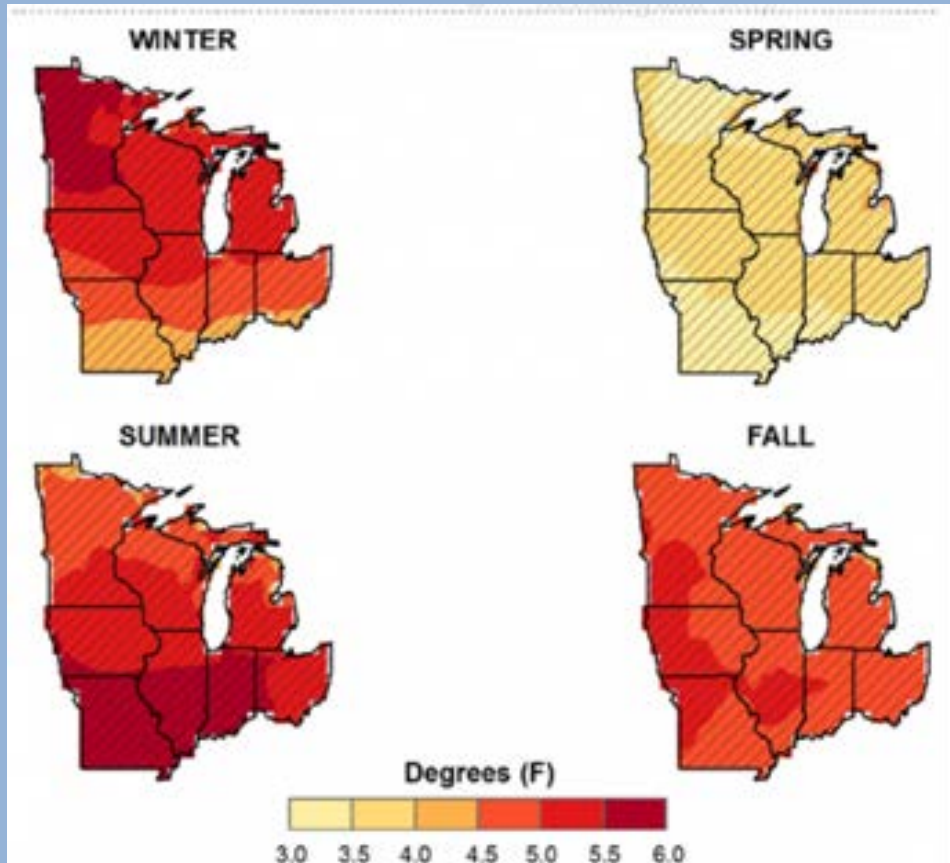
Observed Michigan Temperature



2.9°F
1960-2012

Michigan has warmed faster than the global and national rates.

Projected Temperature Changes, 1971-2000 to 2041-2070



1.5–4.5°F
(annual)

Winter temperatures to **increase the most in the North**, and
Summer temperatures to **increase the most in the South**

More Extreme Heat by 2070

The background of the slide features a photograph of people at a water fountain. The scene is backlit by bright sunlight, creating a hazy, golden atmosphere. In the foreground on the right, a man stands with his back to the camera, holding a white cloth to his face. To his left, a young boy is captured in mid-stride, splashing water. In the background, several other people are visible, some with their hands raised to their faces, suggesting they are cooling off. The overall mood is one of relief and refreshment in a hot environment.

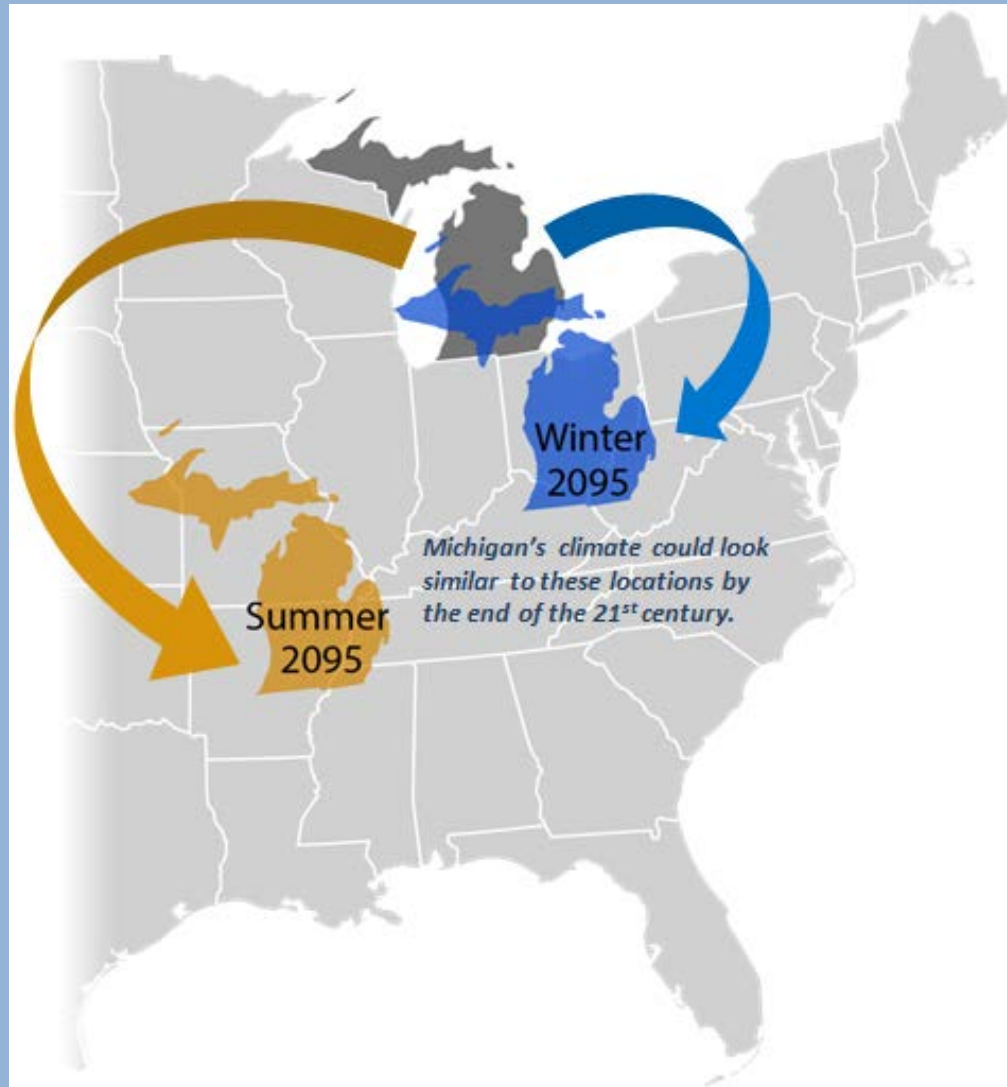
Most of Michigan:

Modest increases in number of days/year over 95°F

Southern Michigan may see greatest increase

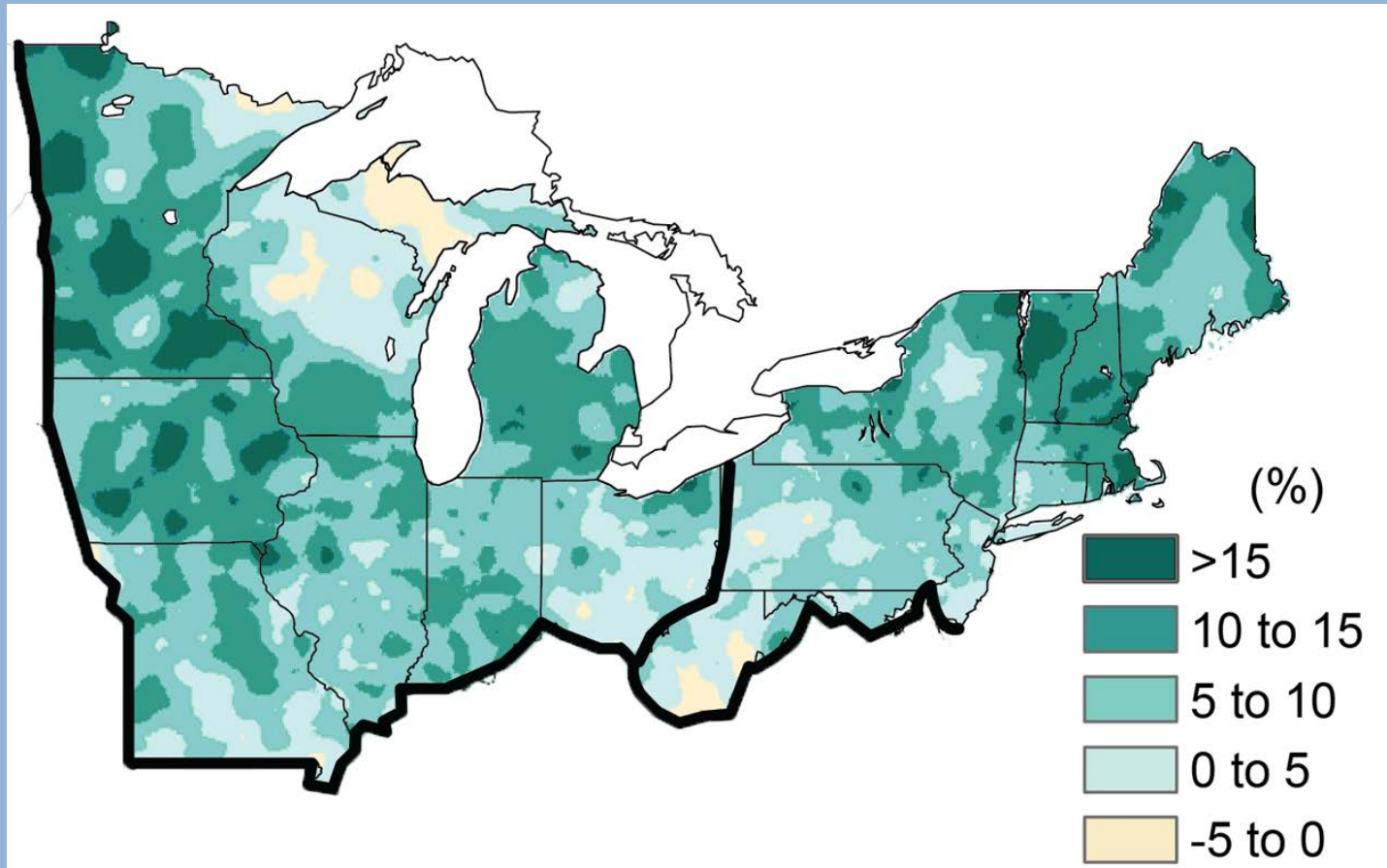
Possible slight increase in number of heat waves

Climate Change in Context



Courtesy GLISA, 2105, modified from Hayhoe et al.

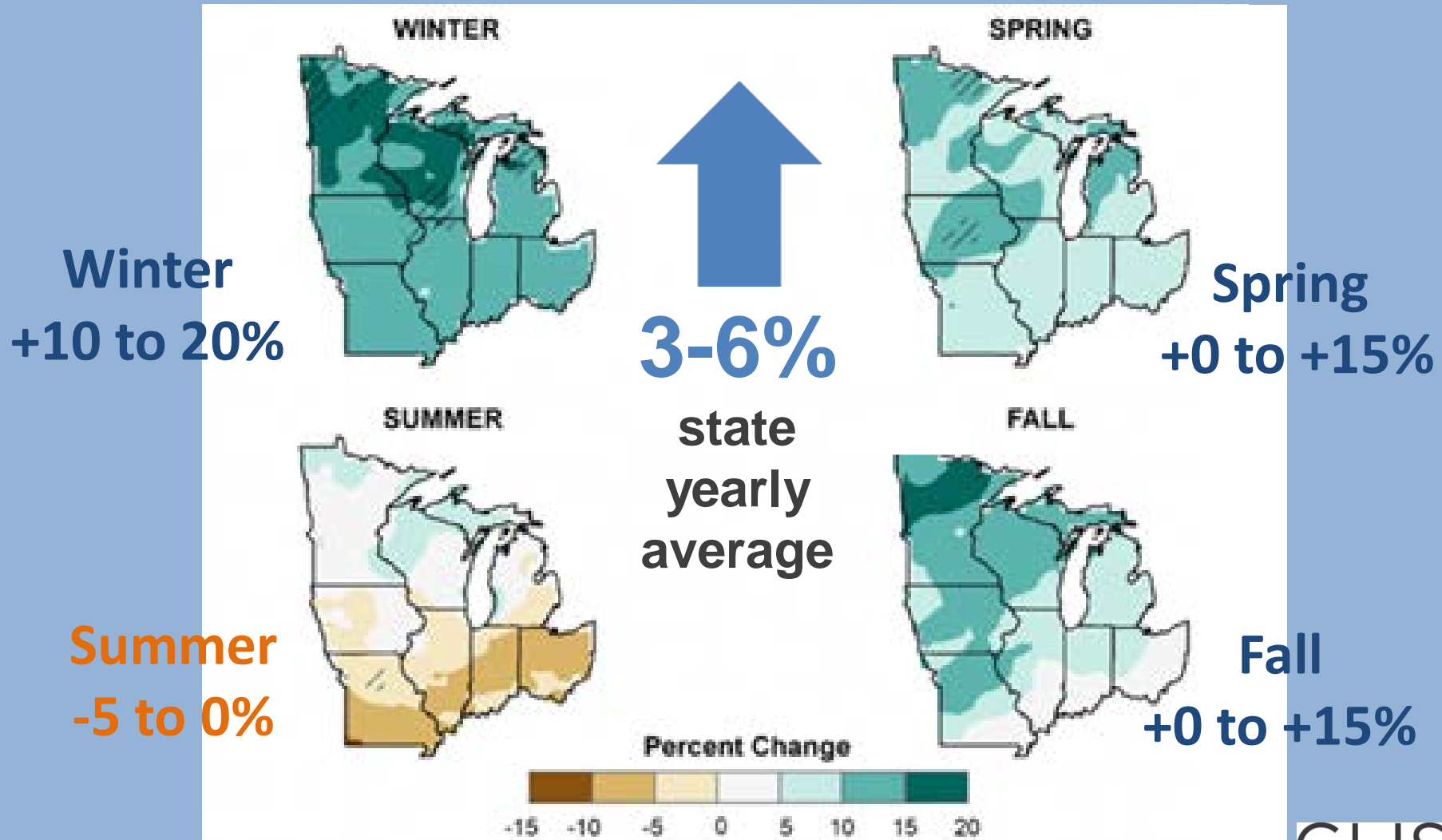
Observed Michigan Precipitation



↑
4.5%
(1.4 in)
1951-2010

Precipitation is variable. Northwestern UP has seen declines while Michigan has seen an overall increase.

Projected Precipitation Change from 1971-2000 to 2041-2070



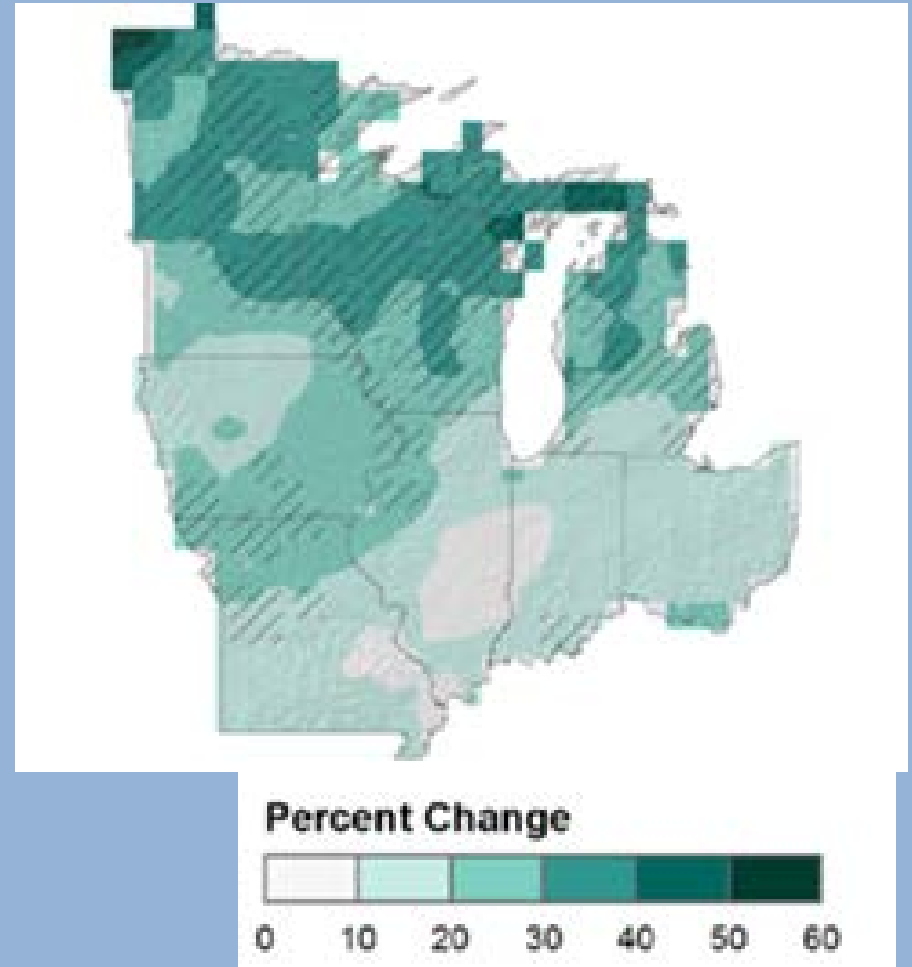
Extreme Precipitation > 1in/day (EP)

Projected change (1971-2070)

- Number of days/yr. with EP



10% south -
30% north



Climate Change is Bad for People



“We need to... convince the world that humanity really is the most important species endangered by climate change.”

*Margaret Chan, MD
Director-General,
World Health Organization*

“Climate change is one of the most serious public health threats facing our nation. Yet few Americans are aware of the very real consequences of climate change on the health of our communities, our families and our children.”

*Georges Benjamin, MD,
Executive Director
American Public Health Association*

Health Impacts from Climate Change

(adapted from Frumkin et al 2008, Luber et al 2014)

- **Extreme Weather Events**

- Heat waves, storms, floods, droughts, wild fires

- **health impacts:**

- Injuries, heat-related illnesses, death
- Worsening of chronic heart & lung conditions
- Anxiety, depression, mental stress
- Social disruption, housing displacement

- **Environmental Disruption**

- Degraded water & air quality; Sewage/septic breakdown
- Habitat changes

- **health impacts:**

- Vector-borne diseases
- Water- and food-borne diseases
- Asthma and allergic conditions



Who is affected by Climate Change?

Everyone is impacted; however, some more likely to be harmed than others.

Vulnerable People:

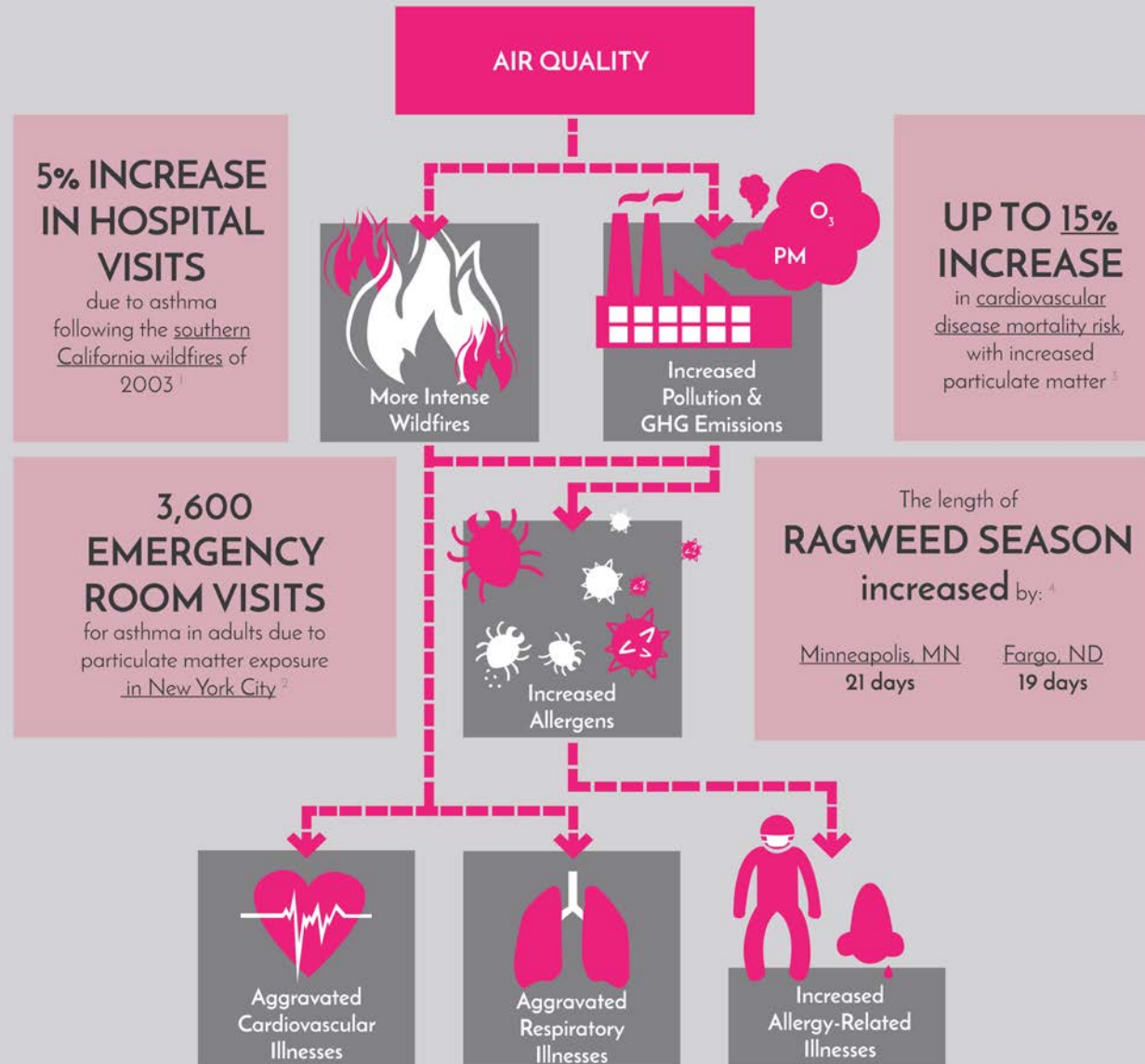
- Elderly and very young children
- Persons with pre-existing conditions
- Persons taking certain medications
- Socially isolated
- Low income

In Vulnerable Places:

- Urban, failing infrastructure, poor housing
- High storm risk, flood plain



HOW CLIMATE CHANGE AFFECTS YOUR HEALTH



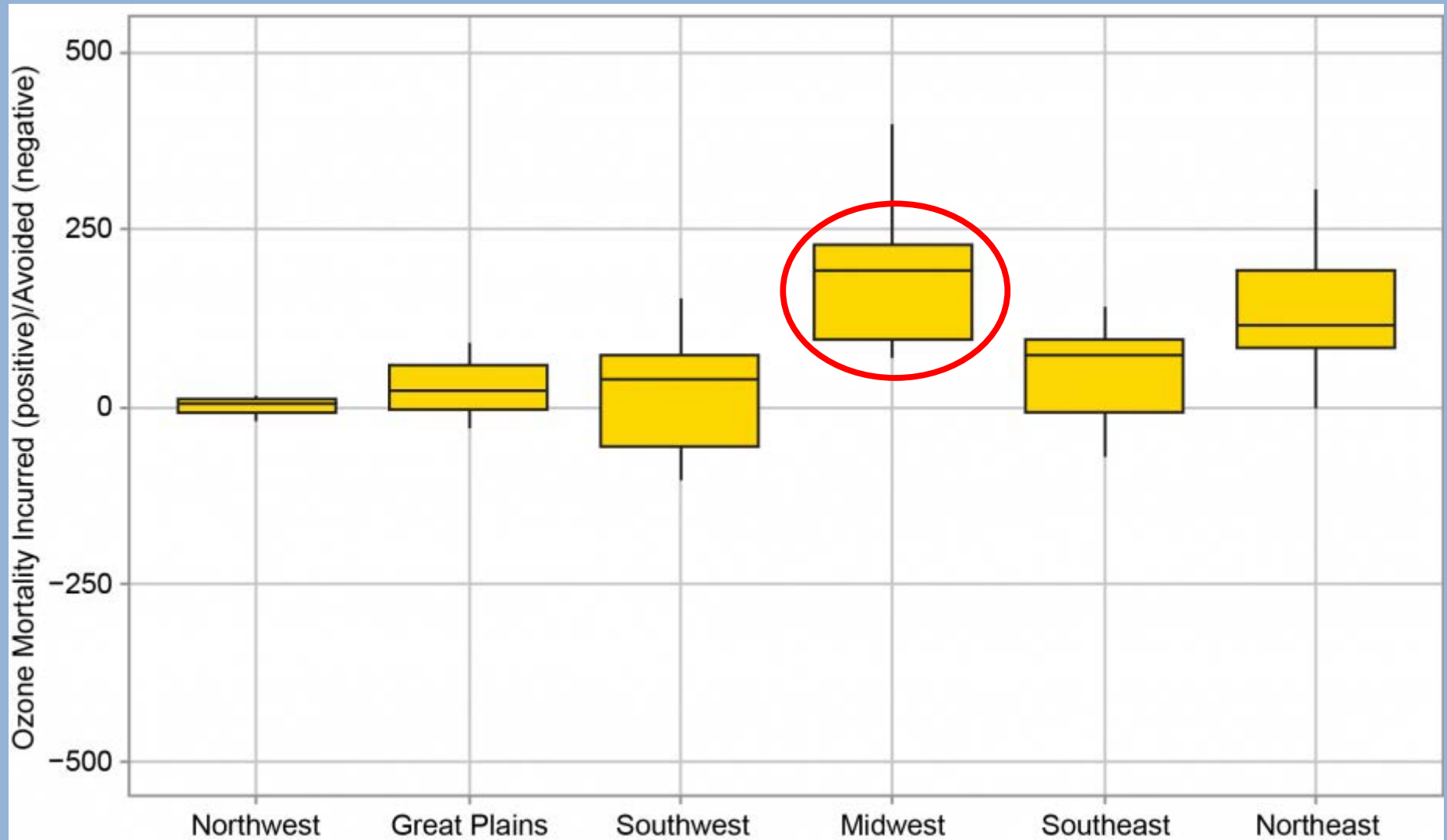
1. <http://www.ncbi.nlm.nih.gov/pubmed/1901694>
2. <http://www.epa.gov/health/docs/060604a/060604a-020101-0101.pdf>
3. <http://www.who.int/news-room/factsheets/detail/air-pollution>
4. <http://www.who.int/news-room/factsheets/detail/air-pollution>

Climate Change Affects Air Pollutants

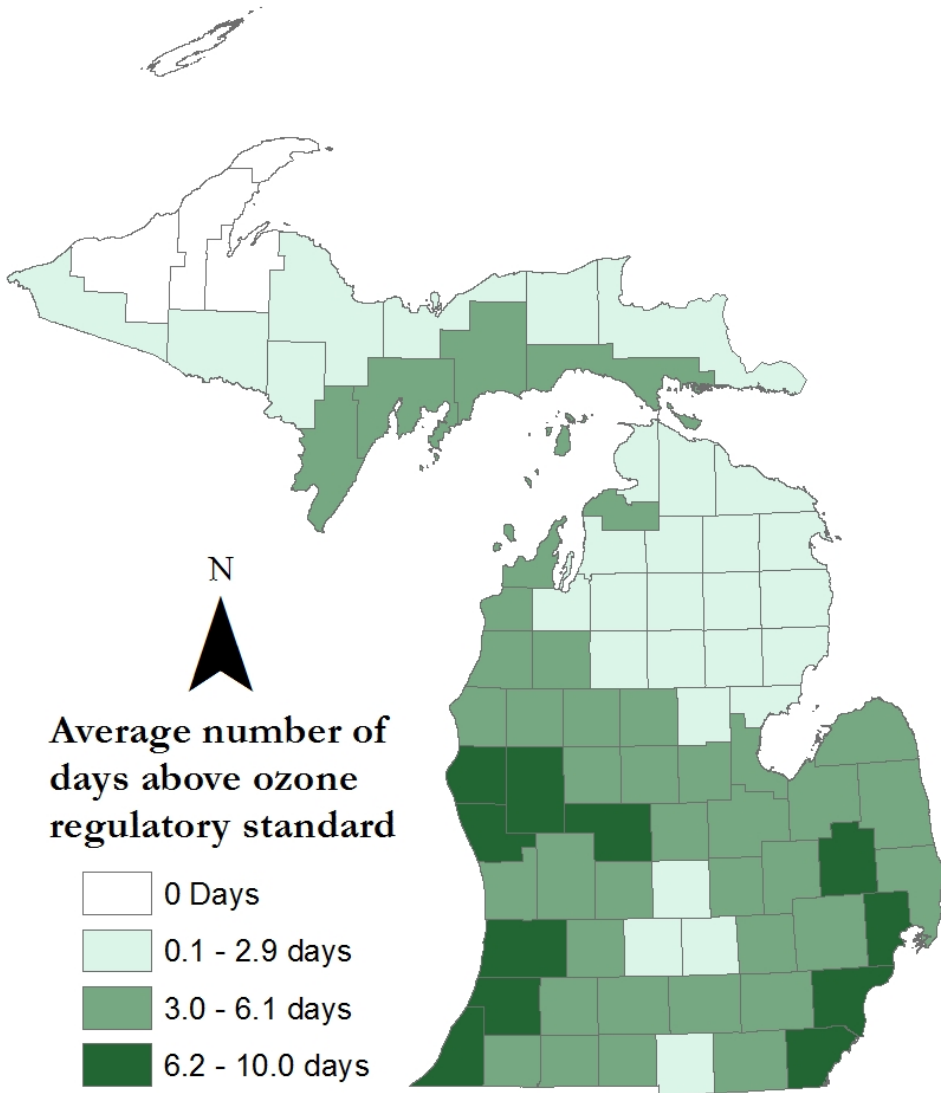


- Directly affects wind patterns, leads to more **air stagnation** events
- Increases temperatures which . . .
 - **Increase pollution** from fossil fuel combustion to meet electricity demand for increased air conditioner use
 - Increase production of natural sources of air pollutant emissions
 - Increase formation of **ozone**
- Lengthens the **allergy** season and fosters growth of allergenic plants (ragweed)
- Increases heavy rainfall and flooding, fostering **mold**, also allergenic

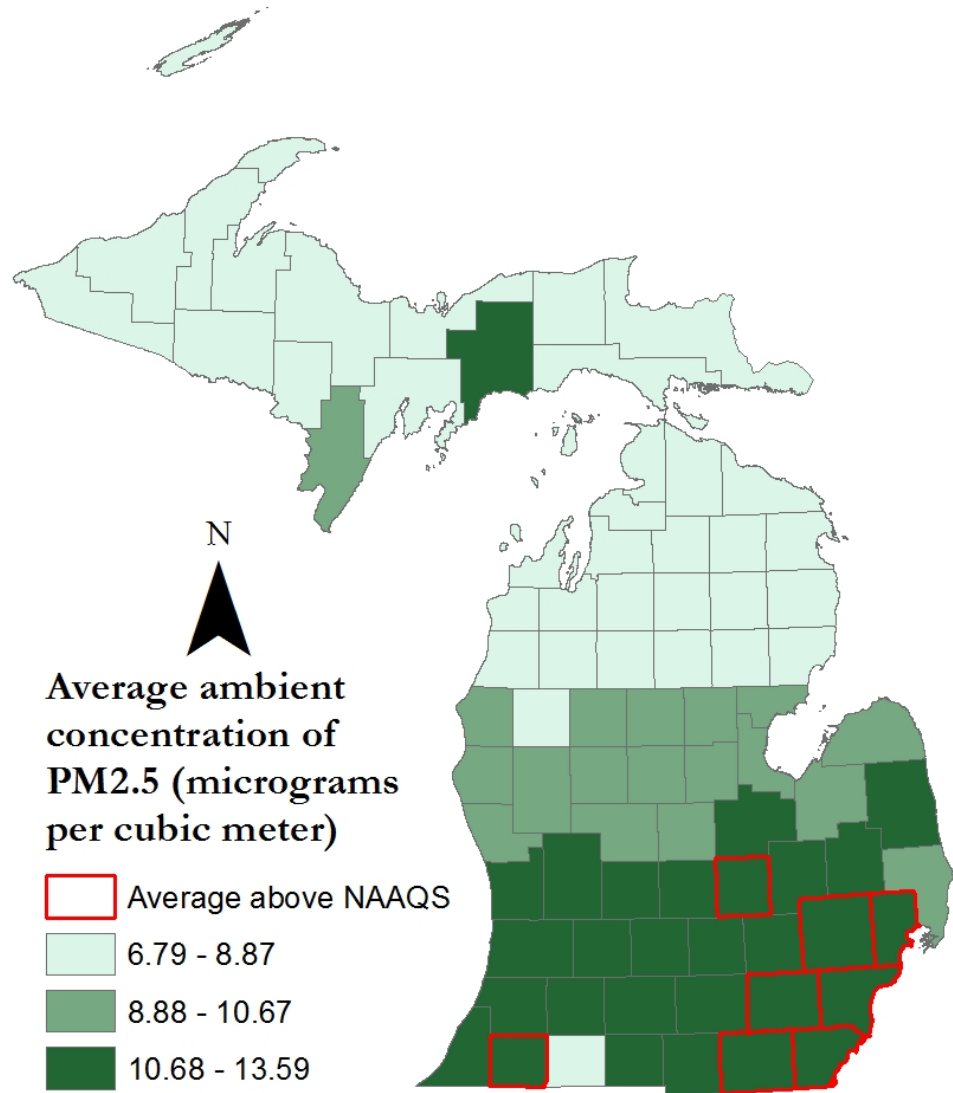
Projected Change in Ozone-related Premature Deaths from 2000-2030



Distribution of Poor Air Quality by County



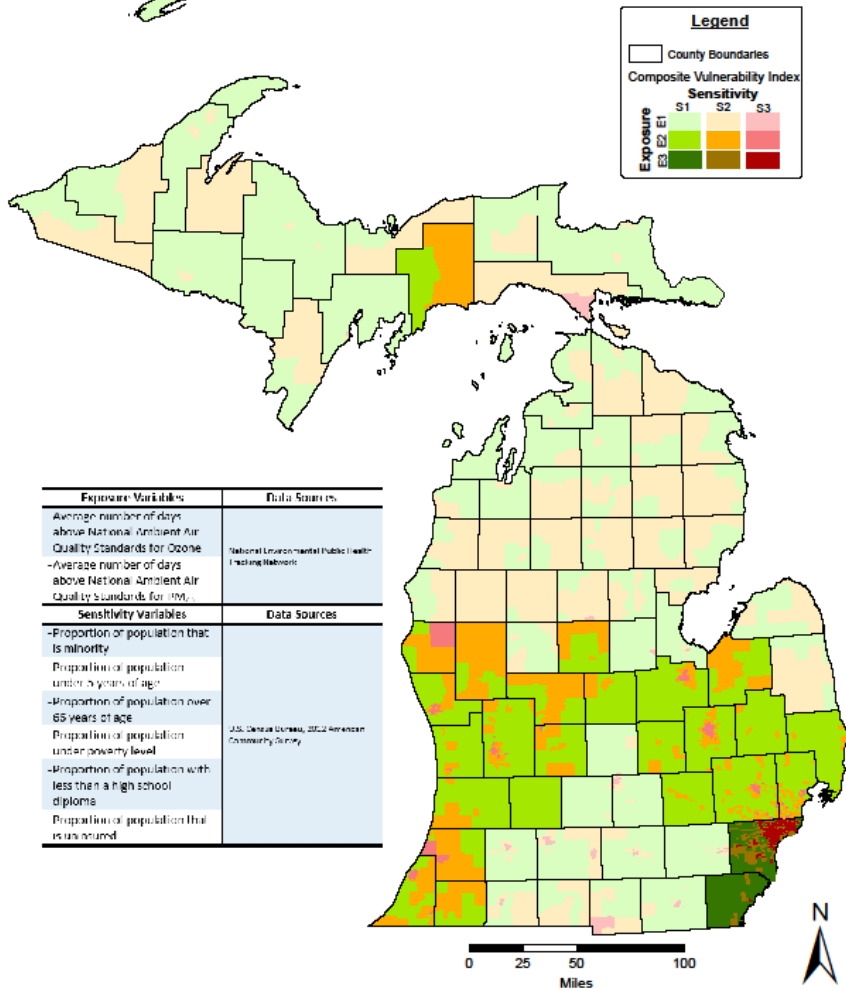
Source: Environmental Health Tracking Network (2005-2011)
 *Includes both counties with monitors and counties which values were mathematically modelled
 *Ozone regulatory standard changed from 80 ppb to 75 ppb in 2008



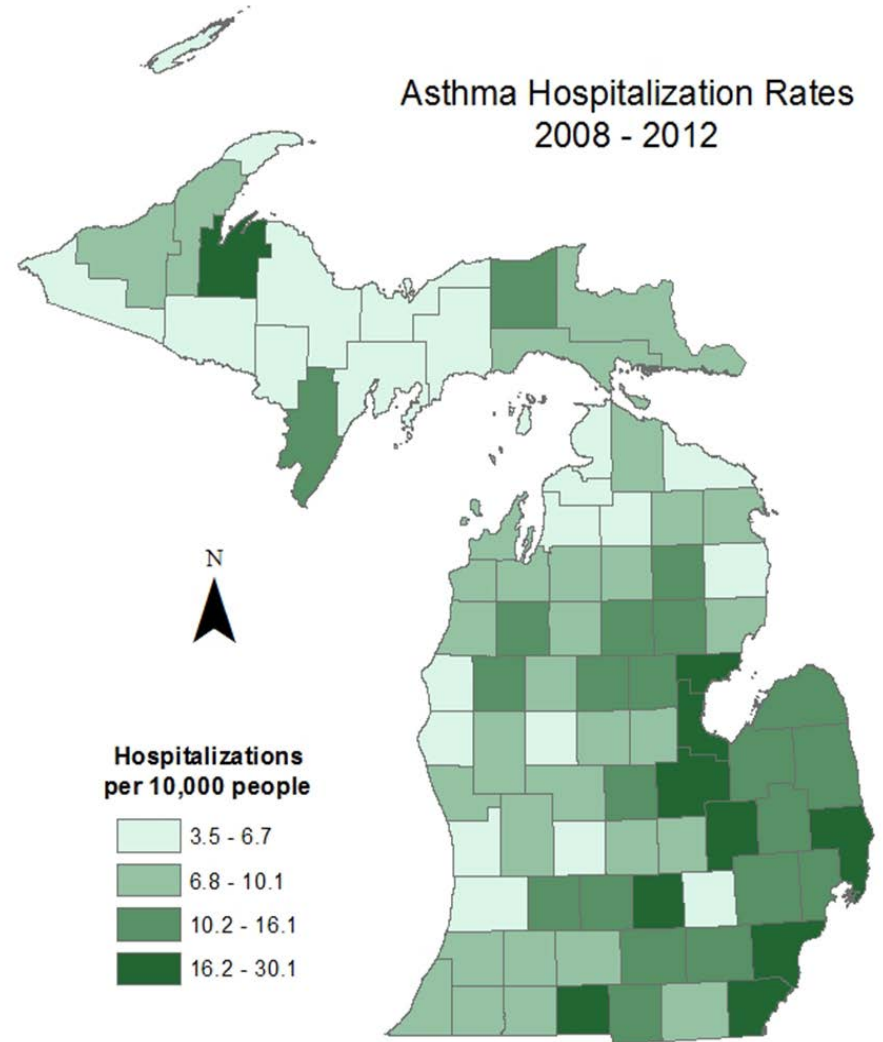
Source: Environmental Health Tracking Network (2005-2011)
 *Includes both counties with monitors and counties which values were mathematically modelled
 National Ambient Air Quality Standard = 12 micrograms PM2.5 per cubic meter

Distribution of Vulnerability by County

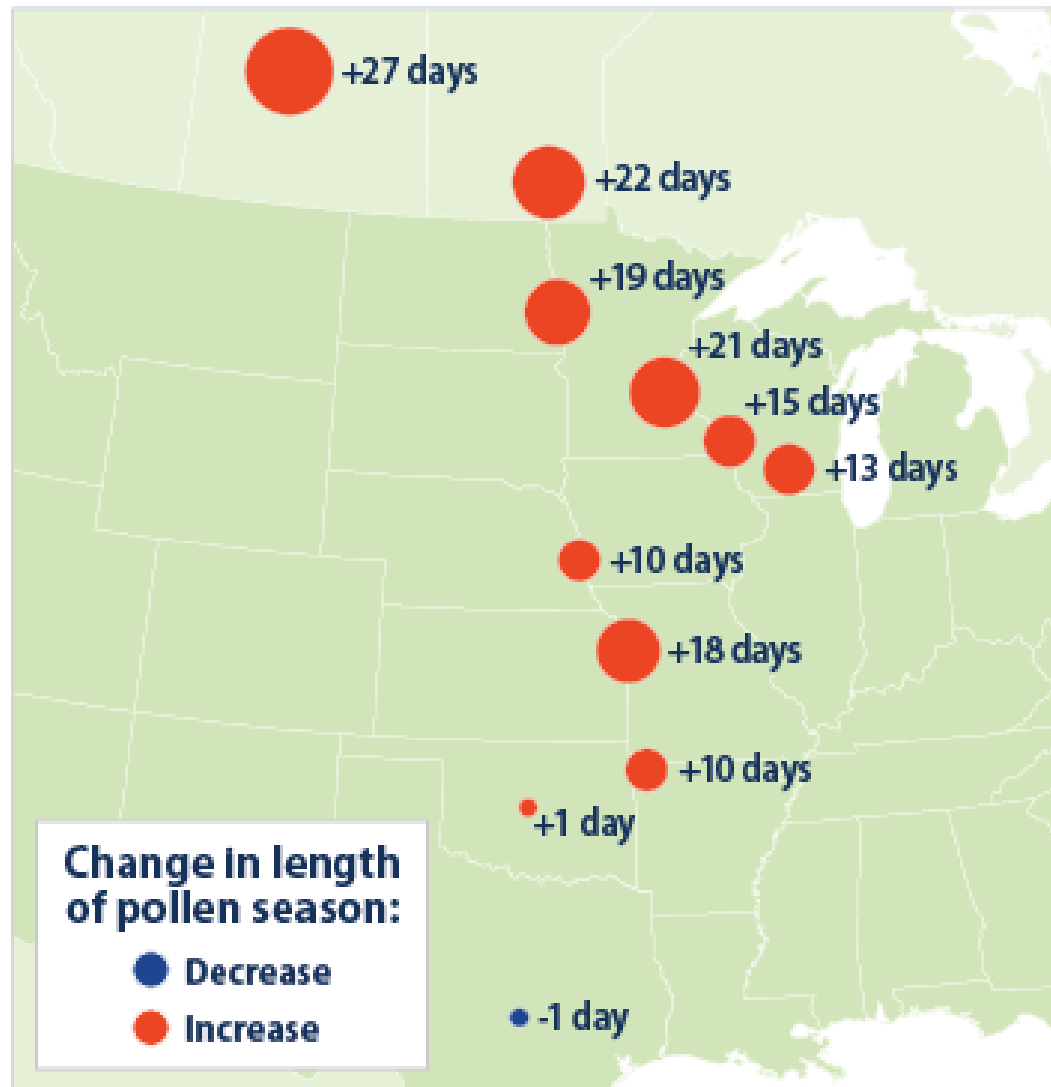
Michigan Climate and Health Vulnerability Assessment Respiratory Diseases



Asthma Hospitalization Rates 2008 - 2012



Change in Length of Ragweed Pollen Season, 1995–2013



Data source: Ziska et al., 2014

Public Health Strategies

Mitigation: Reduce, Prevent GHG Emissions

- Reduce energy consumption
- Use fossil fuel alternatives
- Reduce fossil fuel combustion
- Control emissions

Adaptation: Actions that Moderate Harm

- Monitor conditions, inform the public
- Community, infrastructure planning
- Emergency preparedness



Strategies We Can Do Now

- Encourage monitoring of AQ Alerts, Heat warnings; use AirNow app
- Promote pollen monitoring stations
- Support emission restriction policies on ozone action days
- Incorporate low-allergen plants in public landscaping
- Mow/repurpose vacant lots to reduce ragweed
- Support Clean Power Plant legislation



For further information:

APHA Climate Change

www.apha.org/topics-and-issues/climate-change

CDC Climate and Health Program

www.cdc.gov/climateandhealth/







National Climate & Health Assessment

health2016.globalchange.gov/

Contact Us: CameronL@Michigan.gov

www.Michigan.gov/climateandhealth








Prediction for Michigan

Key Health Outcome	Biophysical Parameter Changes	Predicted Change
Respiratory Diseases	Air Pollutants increase with high temps; Pollen, Mold levels increase with longer growing season & more moisture	
Heat Morbidity, Mortality	More frequent, longer Heat Events; Warmer minimum temperatures	
Injury, CO Poisoning	More frequent Ice Storms, Extreme Rain leading to more Power Outages & Cleanup; changes in other storm types unclear	 
Waterborne Diseases, Toxins	Algal blooms, other Flood-related contaminations more frequent	
Vector borne Diseases	Impact on Mosquito & Tick lifecycle unclear	

Priority Climate-Related Health Impacts

1. Respiratory conditions
2. Heat Illness
3. Storm –related Injury, CO poisoning
4. Water – borne diseases
5. Vector – borne diseases



	Climate Driver	Exposure	Health Outcome	Impact
 Extreme Heat	More frequent, severe, prolonged heat events	Elevated temperatures	Heat-related death and illness	Rising temperatures will lead to an increase in heat-related deaths and illnesses.
 Outdoor Air Quality	Increasing temperatures and changing precipitation patterns	Worsened air quality (ozone, particulate matter, and higher pollen counts)	Premature death, acute and chronic cardiovascular and respiratory illnesses	Rising temperatures and wildfires and decreasing precipitation will lead to increases in ozone and particulate matter, elevating the risks of cardiovascular and respiratory illnesses and death.
 Flooding	Rising sea level and more frequent or intense extreme precipitation, hurricanes, and storm surge events	Contaminated water, debris, and disruptions to essential infrastructure	Drowning, injuries, mental health consequences, gastrointestinal and other illness	Increased coastal and inland flooding exposes populations to a range of negative health impacts before, during, and after events.
 Vector-Borne Infection (Lyme Disease)	Changes in temperature extremes and seasonal weather patterns	Earlier and geographically expanded tick activity	Lyme disease	Ticks will show earlier seasonal activity and a generally northward range expansion, increasing risk of human exposure to Lyme disease-causing bacteria.
 Water-Related Infection (<i>Vibrio vulnificus</i>)	Rising sea surface temperature, changes in precipitation and runoff affecting coastal salinity	Recreational water or shellfish contaminated with <i>Vibrio vulnificus</i>	<i>Vibrio vulnificus</i> induced diarrhea & intestinal illness, wound and blood-stream infections, death	Increases in water temperatures will alter timing and location of <i>Vibrio vulnificus</i> growth, increasing exposure and risk of water-borne illness.
 Food-Related Infection (<i>Salmonella</i>)	Increases in temperature, humidity, and season length	Increased growth of pathogens, seasonal shifts in incidence of <i>Salmonella</i> exposure	<i>Salmonella</i> infection, gastrointestinal outbreaks	Rising temperatures increase <i>Salmonella</i> prevalence in food; longer seasons and warming winters increase risk of exposure and infection.
 Mental Health and Well-Being	Climate change impacts, especially extreme weather	Level of exposure to traumatic events, like disasters	Distress, grief, behavioral health disorders, social impacts, resilience	Changes in exposure to climate- or weather-related disasters cause or exacerbate stress and mental health consequences, with greater risk for certain populations.