

# Surveillance of the Health Effects from a Changing Climate – Use of Environmental Public Health Indicators

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## BACKGROUND

### Climate Change

#### Intergovernmental Panel on Climate Change (IPCC)

Changes in temperature, precipitation, and other weather variables due to climate change “are likely to affect the health status of millions of people.”

- IPCC 2007

#### Evidence of climate change in the Great Lakes Region

- Temperatures are rising, especially in winter.
- Winters have become milder and shorter.
- Duration of ice cover is shorter, leading to more snow in some areas.
- Spring is arriving earlier.
- Extreme rainfall events are becoming more frequent.



#### What might be expected for Michigan?

- Warmer, drier climate => fires, particulate matter air pollution,
- More frequent severe storms => injuries
- More flooding => water contamination, water-borne disease
- Increased insects => insect-borne diseases (e.g. West Nile)
- Heat events => hospitalizations, death
- Ozone, Aeroallergens => asthma

#### Michigan Climate & Health Adaptation Program (MICHAP)

- In 2010 the Michigan Department of Community Health (MDCH) received funds under the CDC Climate Ready States and Cities Initiative.
- Indicator development, calculations, and presentations are a component of this cooperative agreement.

## Surveillance in Michigan of the Effects of Climate Change

### Surveillance

Ongoing surveillance of changes in climatic conditions and health effects from these changes are essential to:

- Quantifying past and current impacts of climate change on human health,
- Predicting future impacts,
- Developing and guiding public health adaptation strategies, and
- Evaluating the effectiveness of these strategies.<sup>1</sup>

## BACKGROUND (continued)

### Climate Change Indicators

#### Indicators are:

- Descriptive summary measures,
- Written to be easy to understand,
- Straightforward to calculate from existing data sources, &
- Can calculate these indicators over multiple years to detect trends.

#### Indicators are used to:

- Assess baseline status and trends,
- Track program goals and objectives, and
- Build core surveillance capacity in state and local agencies.

#### State Environmental Health Indicators Collaborative (SEHIC)

- Established in 2004 by the Council of State and Territorial Epidemiologists (CSTE).
- Identified methods for developing environmental public health (EPH) indicators.
- Following development of EPH indicators, SEHIC developed and piloted indicators for climate change.
- In 2009, English et al.<sup>1</sup> described an approach to climate change indicator development.

## METHODS

### Climate Change Indicators Pilot

- Pilot implemented instructions and gathered feedback on use and utility of indicators
- Participants, including Michigan, provided feedback on
  - Ease of calculation,
  - Time requirements for calculation,
  - Perceived usefulness,
  - Likelihood of adoption, and
  - Overall comments about pilot.

### Climate change indicators – 5 categories

#### Environmental Indicators

1. Greenhouse Gas Emissions
2. Air Mass Stagnation Events
3. Max/Min and Diurnal Temperature
4. Pollen Indicator
5. Number of Fires and Percent of Total Acres Impacted
6. Positive Test Results in Sentinels and Reservoirs (for WNV)

#### Health Outcome Indicators

7. Rate of Heat Deaths, Hospitalizations, and ER Visits During Summer Months
8. Injuries and Deaths Due to Extreme Weather Events
9. Human Cases of Lyme Disease
10. Human Cases of West Nile Virus
11. Human Cases of Hantavirus, Valley and Dengue Fever
12. Allergic Disease

#### Mitigation Indicators

13. Total Energy Consumption Per Capita
14. Renewable Energy Consumption Per Capita
15. Vehicle Miles Traveled

#### Adaptation Indicators

16. Development of a State Adaptation Plan
17. Access to Cooling Centers
18. Heat Island Mitigation Plans
19. Health Surveillance Systems Related to Climate Change
20. Public Health Workforce Trained in Climate Change Research, Surveillance and Adaptation

#### Policy Indicators

21. Development of a State Climate Change Advisory Board
22. Development of a State Climate Change Action Plan
23. Completion of a Greenhouse Gas Inventory
24. Number and Percent of Local Governments Participating inICLEI
25. Percent of Population Living in Cities Participating in the U.S. Conference of Mayors Climate Protection Agreement

## METHODS (continued)

### Indicator How-To Guide

#### Indicator template contains:

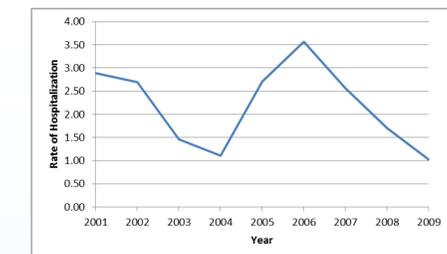
- Step by step directions,
- Measurement units,
- Geographic area,
- Time period,
- Significance and background,
- Rationale,
- Limitations,
- Data Sources,
- Limitations of the data sources,
- Related datasets, and
- Appropriate uses.

## RESULTS (one example)

### Annual Number and Rate of Heat Hospitalizations

Age Groups	2001	2002	2003	2004	2005	2006	2007	2008	2009
<1	<10	<10	<10	<10	<10	<10	<10	<10	<10
1 to17	24	<10	<10	<10	11	11	<10	<10	<10
18-44	47	67	36	33	73	48	68	46	16
45-64	74	72	47	34	68	128	69	51	38
65-84	97	92	38	23	91	127	89	46	39
85+ years	45	27	16	11	30	45	21	17	<10
<b>Gender</b>									
male	175	170	95	77	186	228	186	131	65
female	114	101	52	35	87	131	71	39	37
<b>Total</b>	<b>289</b>	<b>271</b>	<b>147</b>	<b>112</b>	<b>273</b>	<b>359</b>	<b>257</b>	<b>170</b>	<b>102</b>

Number of heat-related hospitalizations for the state of Michigan for the years 2001-2009, by age group and gender.



Rate of heat hospitalization (per 100,000 residents) in the State of Michigan from 2001-2009.

## DISCUSSION

### Next Steps

- Complete MICHAP climate change indicators report.
- Incorporate climate change indicators into MDCH Michigan Climate & Health Adaptation Program (MICHAP) surveillance system.
- Continue to participate with SEHIC to adapt indicators for local areas (i.e. counties, cities, etc.).

## Literature Cited

<sup>1</sup>English PB, Sinclair AH, Ross Z, Anderson H, Boothe V, et al. 2009 Environmental Health Indicators of Climate Change for the United States: Findings from the State Environmental Health Indicator Collaborative. Environ Health Perspect 117(11): doi:10.1289/ehp.0900708

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