

# Health impacts of extreme weather events and climate change Perspectives from Detroit, Michigan, USA



January 2020

This executive summary describes research conducted between January 2018 and August 2019 by University of Vermont researchers to understand the short and long-term health impacts of extreme weather events and climate change in Detroit, Michigan, and possible solutions.

We also offer recommendations for how municipal government entities, non-profit organizations, and citizens can use these findings to guide future dialogue and policies.

## Study motivation

The National Climate Assessment (2018) documented an increase in heavy rainfall events in several regions of the U.S., particularly the Northeast and Midwest U.S., between 1958 and 2016 (Figure 1). Heavy precipitation events are defined as “an episode of abnormally high rain or snow” that “varies depending on location, season, and length of the historical record.” Cities like Detroit that have experienced extreme storms like the 2014 and 2016 floods can use insights gained during these past events to better address and avoid future health threats.

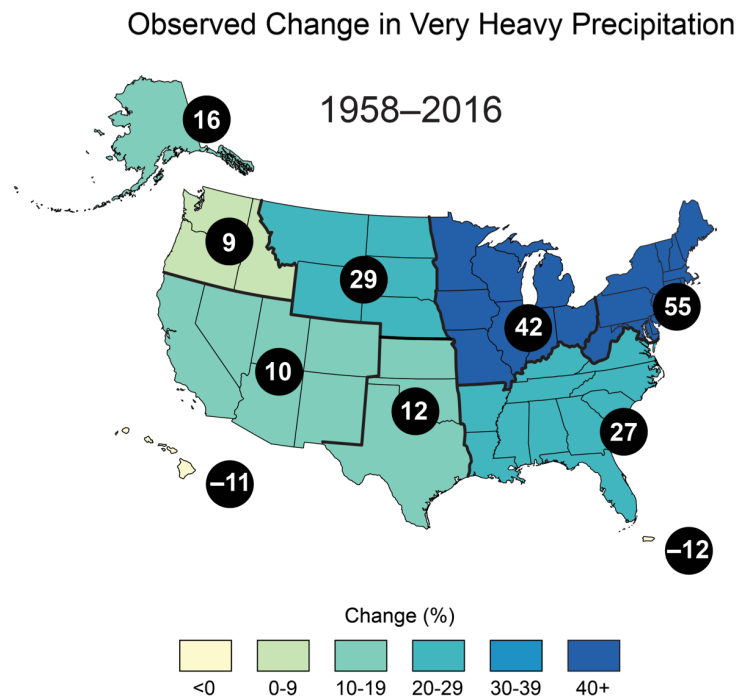
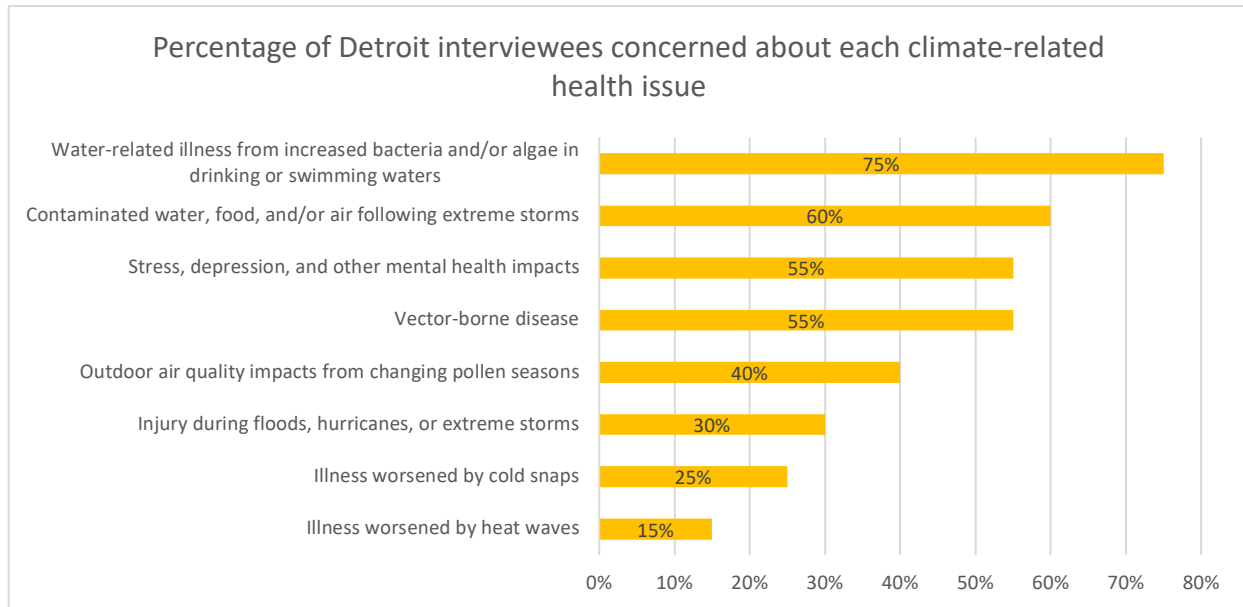


Figure 1. Most regions of the U.S. saw an increase in very heavy precipitation events between 1958-2016. Among these regions, the Midwest experienced the second-greatest increase in heavy precipitation events (42%). Source: <https://nca2018.globalchange.gov/chapter/2/>

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## Results

Residents expressed several health concerns linked to climate change (Figure 2), such as:



**Figure 2.** Twenty residents interviewed indicated whether they were concerned about each of the nine health threats linked to climate change listed in the chart above.

### 1. Water-related illness from increased bacteria or algae in drinking or swimming waters

“I do worry about the algae bloom that keeps cropping up in Lake St. Clair. I understand it's bad in Toledo too. You just need to be sure that they're getting that filtered out.”

“Water...primarily because of what happened in Flint. So people of color, minority people, marginalized communities, either issues, problems, whatever, get pushed down or not really investigated to understand what the causes are to a great extent.”

### 2. Contaminated water, food, and/or air following extreme storms or floods

Water: “So 2014, we had 18 inches of raw sewage in our basements. Then it happened again [in 2016], and that wasn't even a major downpour.”

Food: “E. Coli bacteria and any type of virus or bacteria that's circulating around in the air or the water will contaminate the food in your house, the food in your stores or even any type of-- there's a lot of community gardens around too, and that could affect it as well to use the diseased water, throw it into the produce.”

Air: “Oh, yes. You could feel it in the chest, I wouldn't call it the flu, but it was definitely some type of bronchial illness that resulted afterwards for a few weeks.”

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### 3. Stress, depression, and other mental health impacts of climate change

*Direct:* “It can suck the life out of you in bad weather. Damp and gloomy, or you’re so hot you just can’t think. People get really, really irritable and do a lot of crazy, mean things.”

*Indirect:* “When these young whites come in and they want to plant trees or put these rain gardens in. It’s the perception that you got more concern about putting a tree in this neighborhood than you do about trying to help me get something repaired in my house or whatever. So that’s a stress, that’s creating stress in the neighborhood.”

### 4. Vector-borne disease (such as Lyme disease spread by ticks)

“So far, we haven’t been hit by West Nile or Zika, but it’s just a matter of time. The more rain, the more damp, humid places. Abandoned tires. You’re going to have the potential. We’re a global society. You don’t know who’s hitchhiking—what little bug is hitchhiking where.”

There were four perceived causes of flooding, and several possible solutions proposed

Table 2. Four perceived causes of flooding (column 1) resulted in some solutions **based** on these causes (column 2) and some solutions agreed upon **regardless** of the cause (column 3).

Perceived <b>causes</b> of flooding	Solutions offered <b>based</b> on causes	Solutions offered <b>regardless</b> of causes
1. Government mismanagement of infrastructure and/or land	<ul style="list-style-type: none"> <li>City government investment in infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>Engagement of all groups (citizens, non-profits, government) in “green” solutions, like planting and maintaining trees, rain gardens, and “green alleys”.</li> <li>Improved communication and coordination between government and citizens.</li> </ul>
2. Climate change	<ul style="list-style-type: none"> <li>Decrease greenhouse gas emissions</li> </ul>	
4. Topography	n/a	
5. Nature/God	n/a	

- Some residents blamed climate change for extreme storms and floods: “I truly believe in global warming. That’s because we never used to have storms so drastically severe.”
- Sometimes residents blamed flooding on perceived government mismanagement of land and infrastructure: “Flooding, I have not previously attributed to climate change as much as I have sewer systems and you know that kind of thing.”
- Often, residents blamed more than one factor, and therefore agreed on some solutions, like improved communication and coordination with government to create more green space to absorb excess stormwater.

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### Recommendations:

1. Vulnerability to health impacts from extreme weather events and climate change depends upon three factors:
  - Level of *exposure* to a risk + *sensitivity* to that risk + capacity to *adapt* to the risk<sup>1</sup>

Effective solutions should address all three of these factors. This involves addressing climate and non-climate contributors to vulnerability.

  - In Detroit, non-climate drivers of vulnerability include geographic residence and race (varying **exposure to risk**), pre-existing health conditions and age (**sensitivity to health impacts**) and income level (**capacity to adapt**).
2. Government institutions responsible for managing stormwater infrastructure, including “green infrastructure” (e.g. rain gardens on public easements), should proactively negotiate stewardship responsibilities with neighborhood groups and citizens.
3. Facilitated dialogue and collaborative decision-making between residents and government entities could ease tensions and build consensus on solutions. Dialogue should include both climate change and local environmental management issues.

### If you have any questions about this study, please contact:

Christine Carmichael, Ph.D. Email: [fairforests@gmail.com](mailto:fairforests@gmail.com)

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### Research methods

- Between March and April 2018, University of Vermont researcher Christine Carmichael interviewed 21 Detroit residents affected by the 2014 and 2016 floods to document health impacts experienced from this event, as well as any concerns about how climate change could affect the health of Detroit residents in the future. She also asked residents to share their perspectives on possible solutions to these health threats.
- Residents who lived in Detroit for varying amounts of time, and from below and above median income for the Detroit metropolitan area (\$58,411 in 2016), provided data via audio-recorded interviews.
- Data were also collected through observation of dialogue at community events, including community planning processes, forums co-organized by the city and other organizations, and meetings of neighborhood-based organizations.
- Dr. Carmichael analyzed the transcribed interviews with UVM researchers Dr. Cecilia Danks and Dr. Christine Vatovec to identify themes in responses, which are presented in the Results section. While 21 interviews is too few to analyze statistically, interviewees were carefully chosen to capture a diversity of perspectives.

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<sup>1</sup> Patz, J. A., Gibbs, H. K., Foley, J., Rogers, J., and Smith, K. R. (2007). Climate Change and Global Health: Quantifying a Growing Ethical Crisis. *EcoHealth*, 4(4), 397-405.