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NB-IRDT
New Brunswick Institute for Research, Data and Training

Summary Report

Health Effects During Extreme Heat Events in New Brunswick: Developing an Evidence-Base to Enhance Adaptation Planning

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Project Title

Health effects during extreme heat events in New Brunswick: Developing an evidence-base to enhance adaptation planning

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NB-IRDT

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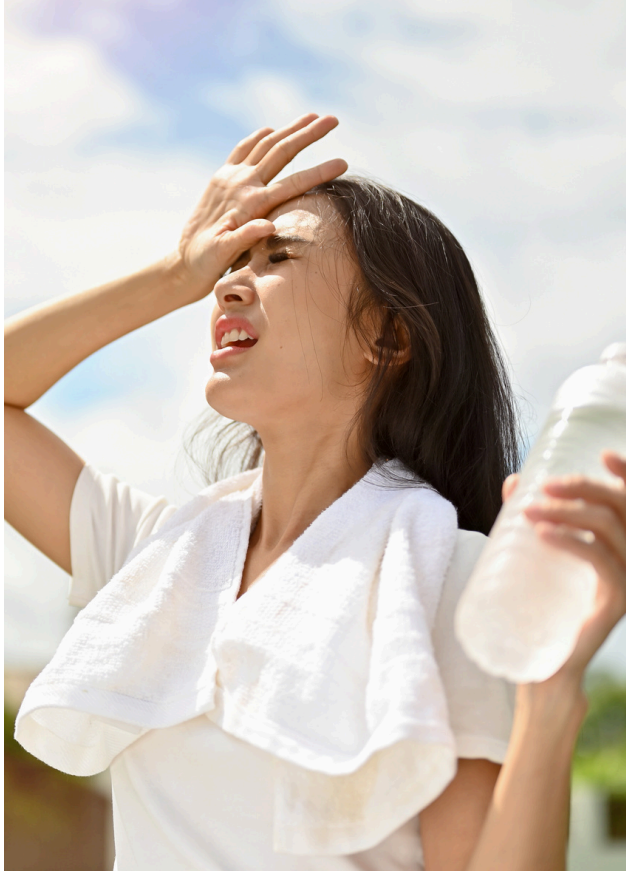
Why is This Study Important?



Extreme heat isn't just uncomfortable -- it's dangerous. Exposure to high temperatures can lead to heat exhaustion or heat stroke, and it can aggravate existing health issues, like respiratory or cardiovascular conditions.[1] In extreme cases, heat may contribute to higher numbers of hospital visits, emergency department (ED) visits[2] and even death. The longer a heatwave lasts, the greater the risk.

Climate change is accelerating, and research suggests the number of extremely hot days will more than double in the near future.[3] This is an important concern for the province of New Brunswick (NB), whose aging population is not well-adapted to extreme heat. Many New Brunswickers also have chronic health conditions, which places them at higher risk of experiencing health problems during extreme heat.

Because heat events are expected to get worse, it's important to study how extreme heat has impacted New Brunswickers' health in the past to help plan for a safer future.

This research study looks at how temperature, humidity and heatwaves impacted 3 types of health outcomes in New Brunswick between 2007 and 2021:

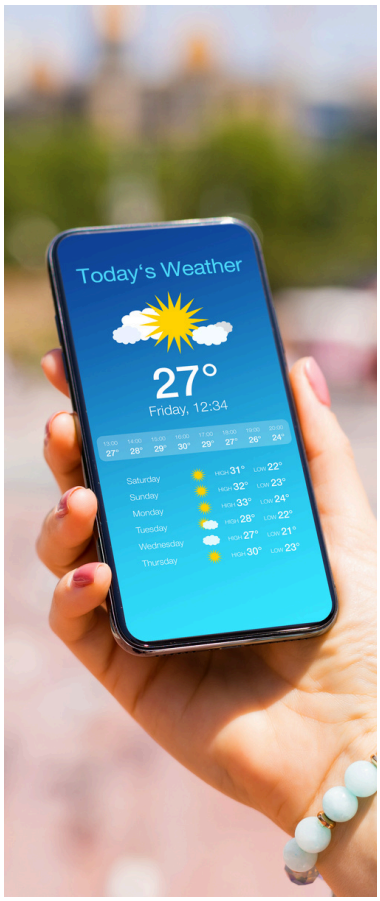
- Mortality (death)
- Hospitalizations
- Emergency department (ED) visits

By doing so, this study aims to identify heat thresholds (like certain temperatures or humidity levels) that pose the greatest risk. This information could be used to inform updates and improvements to the province's Heat Alert and Response System (HARS). Overall, this research has the important goal of supporting provincial efforts to become more prepared for and resilient to future heatwaves.

How Was This Study Completed?

To undertake this study, our research team at NB-IRDT used weather data provided by Environment and Climate Change Canada, taken from 13 weather stations located near hospitals. Information on health outcomes was obtained from linked administrative data sets at NB-IRDT, including the Citizen Data (death counts), the Discharge Abstract Data (hospitalizations) and the Horizon and Vitalité Emergency Department Data (ED admissions). We also used open-source data from the Canadian Urban Environmental Health Research Consortium (CANUE) to measure residential proximity to green (vegetation) and blue (water) spaces. Populations were defined as 'heat vulnerable' based on demographic factors from the Citizen Data, socioeconomic factors from the Canadian Index of Multiple Deprivation (CIMD) and health factors from the Canadian Chronic Disease Surveillance System (CCDSS).

Several different heatwave definitions were used to look at how heatwave duration and intensity influenced health outcomes. The definitions differed according to length (2+ vs. 3+ days), daily and nightly maximum temperatures and daily maximum humidex (i.e., 'hot *and* humid' days vs. 'hot *or* humid' days).



Limitations

While reading the results on the next pages, it's important to remember that there are certain limitations to this study. For instance, ED data were only available for the last 5 years of the study period. Due to potential limitations in data coding, it was not feasible to define 'cause-specific' (i.e., heat-specific) health outcomes, so this study examines all-cause outcomes for associations between heat and health. Cause-specific outcomes will, however, be part of future research.

Additionally, because temperature data came from weather stations and are 'area-level,' they may not reflect individual heat exposure. They also do not account for population movement or indoor temperature, where people spend much of their time during heatwaves. This could lead to an underestimation of the impact of heat on health outcomes.

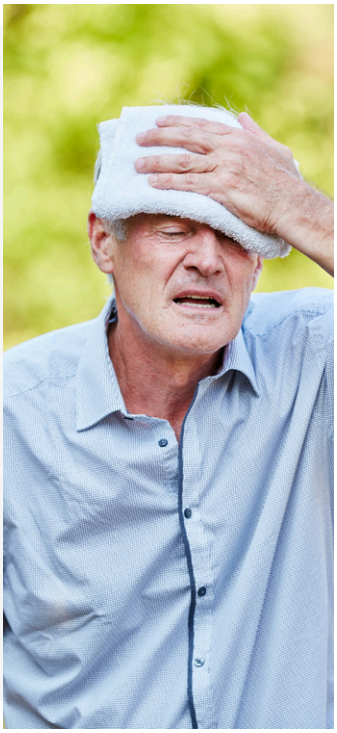
Extreme Heat in NB: Definitions and Measures

What is considered extreme heat?

- **Temperature** - when maximum daytime temperatures exceed 30° Celsius and nighttime temperatures do not fall below 18°
- **Humidex** - when maximum daytime humidex exceeds 36

What is considered a heatwave?

- **Duration** - when extreme heat (temperature and/or humidity) lasts 2 days or longer



How does extreme heat impact New Brunswickers' health?

In the week following a day with a humidex of 36 or higher:

Cumulative risk of death increases by 5%.

Cumulative risk of hospitalization increases by 2%.

Cumulative risk of ED visits increases by 2%.

↳ *However, at a humidex at or above 40, cumulative risk of death increases by 10%.*

What is cumulative risk?

Cumulative risk is the total risk associated with a hot day over a period of time. For example, it may be hot today, but the impacts of today's heat will impact the population's health over the next week.

Which Heatwaves Have the Greatest Impact?

The greatest impacts on mortality, hospitalizations and ED admissions took place during longer heatwaves and those with high temperatures **and** humidity, rather than during heatwaves that had only high temperatures or only high humidity.

In the days following heatwaves that were **both hot and humid**, there was a

24% increase in cumulative risk of death
6% increase in cumulative risk of ED visits

In comparison, for heatwaves that were **either hot or humid**, there was a

14% increase in cumulative risk of death
4% increase in cumulative risk of ED visits

The 'Urban Heat Island' Effect

Results also suggest that the impacts of extreme heat are greater in urban areas.

In NB, for instance, we see this in the cities of Fredericton, Moncton and Saint John, which have higher population density and greater social and economic vulnerability.

Cities also have more heat-absorbing surfaces, like asphalt, concrete and buildings, that retain heat. In comparison, rural areas with more open spaces and vegetation cool down faster.

Risk of Death During Extreme Heat

4% increase — Overall, across the province

11% increase — In the 3 main urban areas of NB

14% increase — In core urban areas of NB

Do Green Spaces Provide Protection from Heat?

At extreme temperatures, risk of death increases:

2%
in areas with higher vegetation

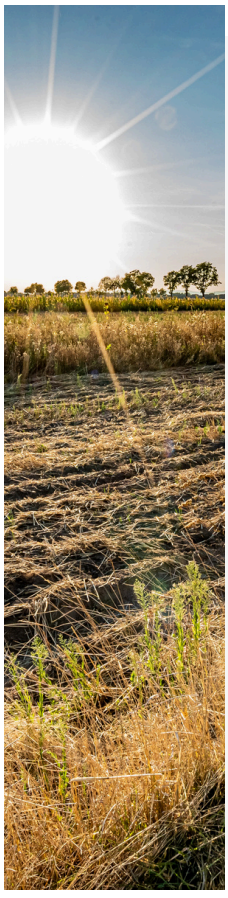
8%
in areas with lower vegetation

This suggests that living close to green spaces (like parks, gardens or forests) offers some protection from the impacts of extreme heat.

How long do risks from extreme heat last?

The most heat vulnerable people tend to face immediate risk -- meaning they are most likely to suffer a health issue on the day of extreme heat. However, many risks (like for death and ED visits) emerge a few days later and can last for an entire week after heat subsides.

Who is considered heat vulnerable in this study?



Age

Children aged 0-5 and older adults aged 65+

Socioeconomic vulnerability

People living in neighbourhoods with the highest levels of residential instability, ethnocultural composition, economic dependency and situational vulnerability: the 4 measures of the Canadian Index of Multiple Deprivation

Chronic health conditions

People with cardiovascular diseases, respiratory diseases, diabetes, neurological conditions and mental illnesses (i.e., schizophrenia, psychotic disorders, mood/anxiety disorders, personality disorders or other mental health diagnoses)

Conclusions

In a time of growing concern over climate change, this study plays an important role by providing the first extensive look into the impacts of extreme heat in New Brunswick. It's also the first study of its kind in Atlantic Canada.

The results show that extreme heat contributes to all three health outcomes this study considers: mortality (death), hospitalization and visits to the ED. This, of course, places more strain on the province's healthcare system.

Not all 'hot days' are created equal, however. Some days are considered extremely hot because they have a high temperature, while other days are considered extremely hot because they have high humidity. Sometimes extreme heat only lasts for a day, and sometimes it goes on for extended periods of time.

This study finds that heat events of longer durations (2+ days) and higher intensity (high temperature and high humidity) pose the greatest health risks.

Some places and people are likely to be more impacted by extreme heat than others. For instance, the health risks from extreme heat are greater in NB's three largest cities. This is likely due to the more crowded spaces, the structures that may 'trap' the heat and the social and financial challenges that exist in urban areas. Meanwhile, across the entire province, those who are considered 'heat vulnerable' based on age (children and older adults), health or socioeconomic conditions were the primary individuals impacted during times of extreme heat.

However, even when heat subsides, it is crucial to remain on alert, as negative effects on health continue during the 7 days following extreme heat. Knowing what heat thresholds are most dangerous, and for how long, is key when taking steps to protect health in a changing climate.

Questions?
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