

HEAT ISLANDS

What are heat islands?

The world is getting warmer, and Canada is warming faster than the rest. Current climate modelling shows that Canadian urban centres will experience at least four times as many +30 °C days per year and longer extreme heat events by 2051–2080.

But not all cities and neighbourhoods will experience a warming environment in the same way. The layout and design of our communities can affect and amplify the health risks presented by climate change. Some areas in urban centres can experience higher temperatures for longer periods because they lack trees and vegetation to cool them and are built with heat-absorbing materials. This is the urban heat island effect.

How does it affect health?

The World Health Organization has identified climate change as one of the greatest health threats of the 21st century. Some features that are unique to cities, such as fewer trees and plants, building materials that store heat, and buildings and vehicles that create heat through energy use, can exacerbate and amplify some effects of climate change. As a result, cities are at the front lines of adapting to climate change. For example, sea-level rise, extreme heat, reduced rainfall, and increased frequency of extreme weather events are expected to be felt more by urban populations.² All of these effects have important impacts on health.

The frequency and intensity of heat waves have increased significantly over the last few decades,³ already leading to adverse health outcomes.

In addition to causing heat-related illnesses such as swelling, fainting, heat rash and heat stroke, extreme heat can also exacerbate pre-existing health conditions, especially heart disease, kidney disease and lung diseases such as asthma and COPD.⁴ Illustrating how severe the impact of extreme heat can be, in an August 2003 heat wave in France, 15,000 more people died than would have been expected given mortality rates.⁵

The urban heat island effect magnifies the risks of warmer temperatures⁶ by making cities hotter than rural areas during the day and at night, limiting the body's ability to cool down and get relief from the heat. Prolonged exposure to extreme temperatures without sufficient time to cool down can lead to critical health hazards. For example, it has been estimated⁷ that a 2-3°C increase in temperatures translates to a 4-7% increase in mortality due to heat.

Trees significantly relieve heat stress at the street level and within neighbourhoods scale, particularly during heat waves and hot times of day. In Toronto, neighbourhoods with less than 5% tree cover make five times as many heat-related ambulance calls than neighbourhoods with more than 5% cover. Marginally increasing tree cover in neighbourhoods that have less than 5% coverage could reduce heat-related ambulance calls by 80%.⁸

Who is affected?

Most of the impacts of climate change will amplify existing health hazards found in populations. How susceptible a population is to the effects of climate change will depend on their existing vulnerabilities. For example, young children, older people, and people with pre-existing health conditions such as respiratory or heart conditions, are physiologically more sensitive⁹ to the harmful impacts of heat waves.

Still others are at greater risk from climate impacts because they lack the resources to protect themselves or to recover from them. In addition, people who work outside such as construction workers, and homeless or precariously housed individuals are also at heightened risk from heat.

People with lower incomes in cities may be harder hit by heat waves because they also tend to live in neighbourhoods that lack green space, have no access to pools, and be in homes that are not air-conditioned. People without access to adequate housing, air-conditioning or who can't get drinking water whenever they need it will have greater challenges in getting relief from extreme heat. Social isolation and mobility issues can also pose barriers to people who need to get to places with air conditioning. If someone has difficulty understanding public health warnings around heat they may be at increased risk of negative health effects of extreme heat.¹⁰

HEAT ISLANDS (CONT'D)

References

- 1 Climate Atlas of Canada. Prairie Climate Centre. <https://climateatlas.ca/>
- 2 Hobbie SE, Grimm NB. 2020 Nature-based approaches to managing climate change impacts in cities. Trans. R. Soc. B 375: 20190124. <http://dx.doi.org/10.1098/rstb.2019.0124>
- 3 Government of Canada. "Canada's Changing Climate," 2019. https://healthydesign.city/wp-content/uploads/2021/06/CCCR_FULLREPORT-EN-FINAL.pdf
- 4 Health Canada "Extreme Heat Events Guidelines: Technical Guide for Health Care Workers," 2011. <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/climate-change-health/extreme-heat-events-guidelines-technical-guide-health-care-workers.html>
- 5 Fouillet, A., Rey, G., Laurent, F., Pavillon, G., Bellec, S., Guihenneuc-Jouyaux, C., Clavel, J., Jouglu, E., & Hémon, D. (2006). Excess mortality related to the August 2003 heat wave in France. International archives of occupational and environmental health, 80(1), 16–24. <https://doi.org/10.1007/s00420-006-0089-4>
- 6 Health Canada "Reducing Urban Heat Islands To Protect Health In Canada An Introduction For Public Health Professionals," March 2020. <https://www.canada.ca/content/dam/hc-sc/documents/services/health/publications/healthy-living/reducing-urban-heat-islands-protect-health-canada/Reducing-Urban-Heat-EN.pdf>
- 7 Yupeng Wang, Umberto Berardi, Hashem Akbari, Comparing the effects of urban heat island mitigation strategies for Toronto, Canada, Energy and Buildings, Volume 114, 2016, Pages 2-19, ISSN 0378-7788, <https://doi.org/10.1016/j.enbuild.2015.06.046>
- 8 Drew A. Graham, Jennifer K. Vanos, Natasha A. Kenny, Robert D. Brown, The relationship between neighbourhood tree canopy cover and heat-related ambulance calls during extreme heat events in Toronto, Canada, Urban Forestry & Urban Greening, Volume 20, 2016, Pages 180-186, ISSN 1618-8667, <https://doi.org/10.1016/j.ufug.2016.08.005>
- 9 Health Canada "Health Impacts of Air Pollution in Canada: Estimates of premature deaths and nonfatal outcomes," March, 2021. <https://www.canada.ca/en/health-canada/services/publications/healthy-living/2021-health-effects-indoor-air-pollution.html>
- 10 Prairie Climate Centre. University of Winnipeg "Heat Waves and Health: A Special Report on Climate Change in Canada," 2019.
- 11 <https://healthydesign.city/wp-content/uploads/2021/06/heat-health-report.pdf>

