

Beach day or deadly heat wave? What you need to know to beat the heat safely

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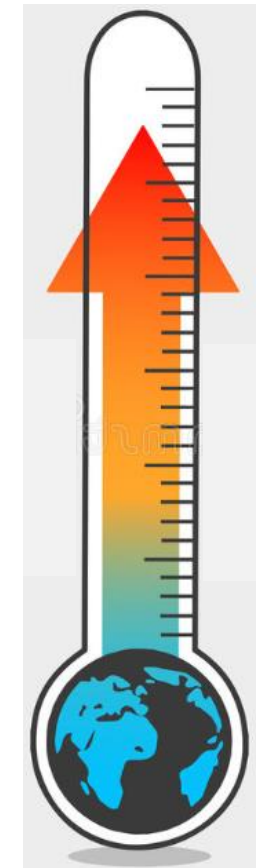
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We are faced with the critical task of understanding how we can adapt and prepare in the face of rising global temperatures.

Record-setting heat engulfed Western Canada (peak outdoor temperatures of 49.6°C (Lytton, British Columbia), humidex of ~60°C) and the Northwest Territories in late June through mid-July 2021, claiming the lives of an estimated 619 older Canadians (primarily in British Columbia) and straining provincial health services to a near breaking point.

This catastrophic EHE comes on the heels of record-breaking temperatures in 2020, which capped the hottest decade ever recorded in Canada and the planet.





Are Canadians prepared for the next heat event?



Laboratory-based heat wave simulations are needed to assess the efficacy of personal cooling interventions. These are limiting our ability to provide guidance that will protect the most vulnerable.

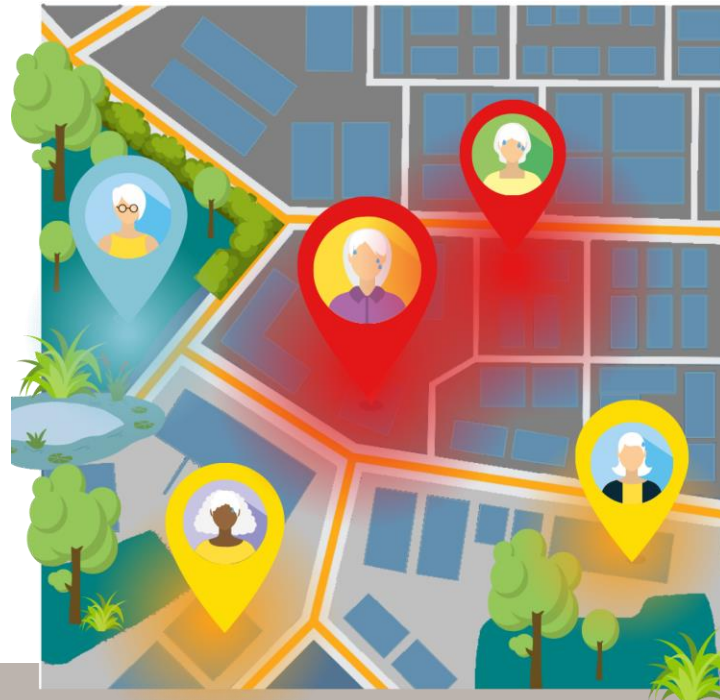
In partnership with Health Canada and the great support of members of the NAFR, we have made great progress in defining heat-mitigation solutions and guidance to protect Canadians.





Temperature variation between two homes based on the application of exterior cooling strategies (left).

Location of home impacts indoor overheating. Homes in densely packed neighbourhoods with limited green space are at greatest risk for overheating (red). Homes with more spacing and adjacency to green space are at a lower risk for overheating (yellow) (left).



How cool should I keep my home?

Emerging research suggests that keeping indoor temperature below 26°C is effective for staying cool and healthy!



Mobilizing Public Health Action on Climate Change in Canada

“An upper limit of 26°C indoors has been proposed as sufficient to protect most occupants from heat-related injury and death, including those more susceptible due to age or health conditions.”

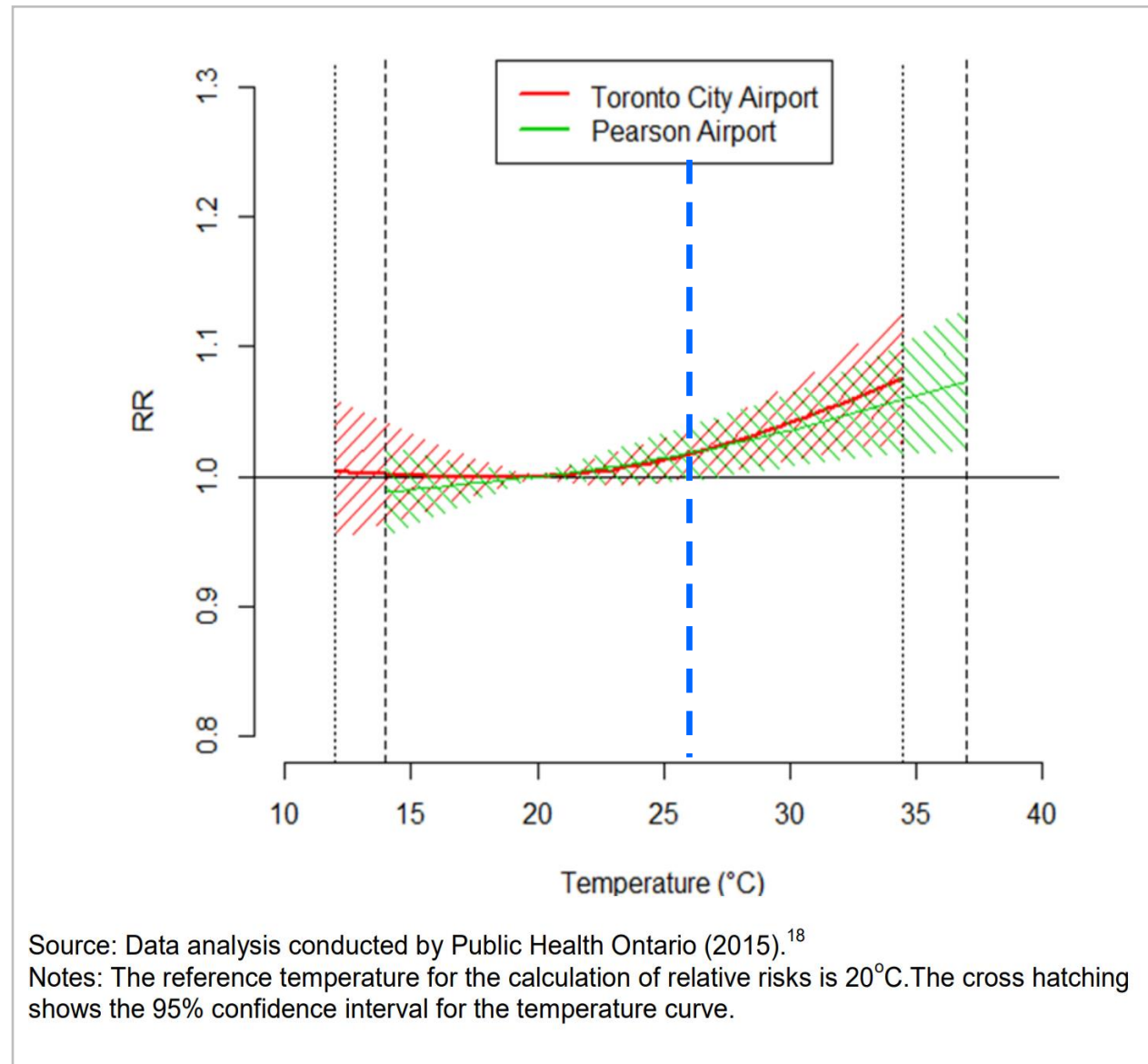
“Metro Vancouver has already changed its Building By-law to require that all new multi-unit residential buildings have mechanical cooling capable of maintaining an indoor temperature of less than 26°C by 2025.”

Dr. Theresa Tam



Indoor temperature and health

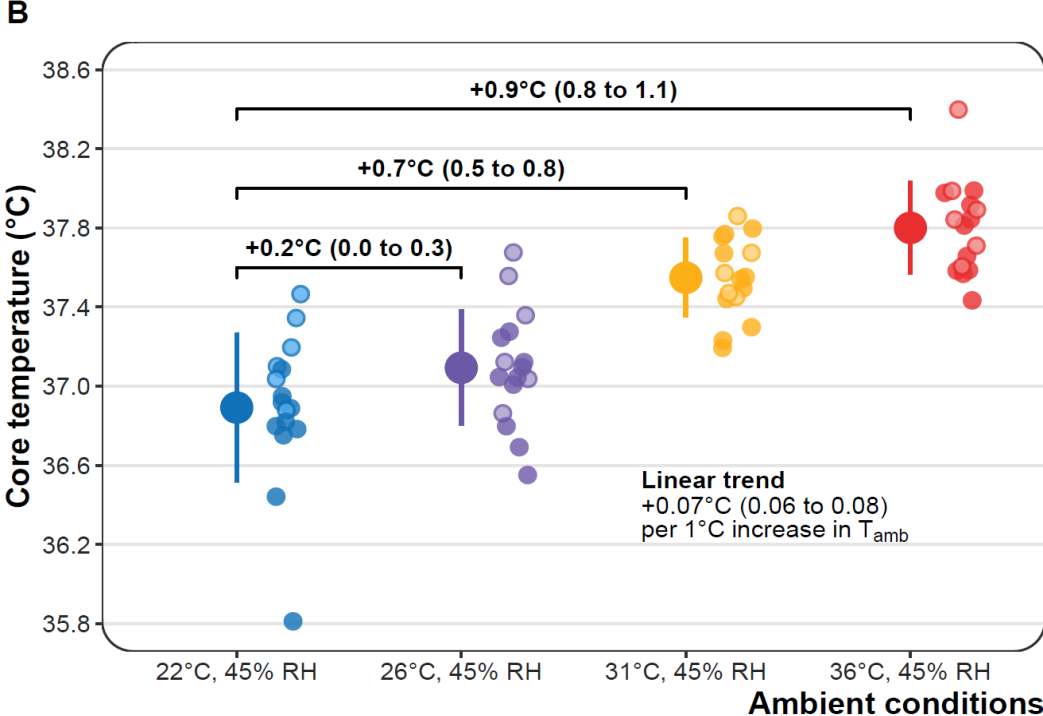
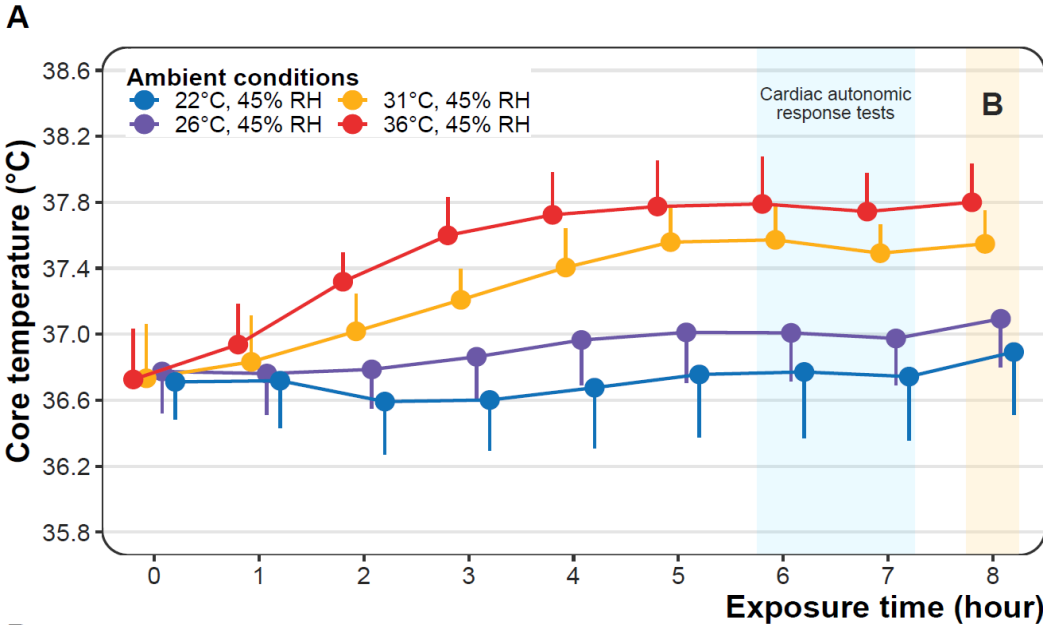
Outdoor temperatures exceeding 26°C are associated with increased mortality and emergency service calls in Ontario.



The effect of indoor temperatures on body temperature and cardiovascular autonomic function in older adults

When ambient temperature was maintained below 26°C...

- Body temperature was maintained within safe limits for 8 hours.
- No substantial changes in heart rate, rate pressure product, or blood pressure.
- No substantial changes in the autonomic regulation of blood pressure during activities of daily living.



$\leq 26^{\circ}\text{C}$



A single-day exposure to temperatures $\leq 26^{\circ}\text{C}$ will likely not create an undue physiological strain in older adults.

$26-31^{\circ}\text{C}$



Sustained exposure to temperatures greater than 26°C but less than 31°C may pose a risk to health in some older adults.

$\geq 31^{\circ}\text{C}$



Sustained exposure to temperatures $\geq 31^{\circ}\text{C}$ should be avoided for heat-susceptible populations whenever possible.

What if I can't keep my home cool?

Visiting a cooling center or other air-conditioned location is a great way to beat the heat and stay safe!



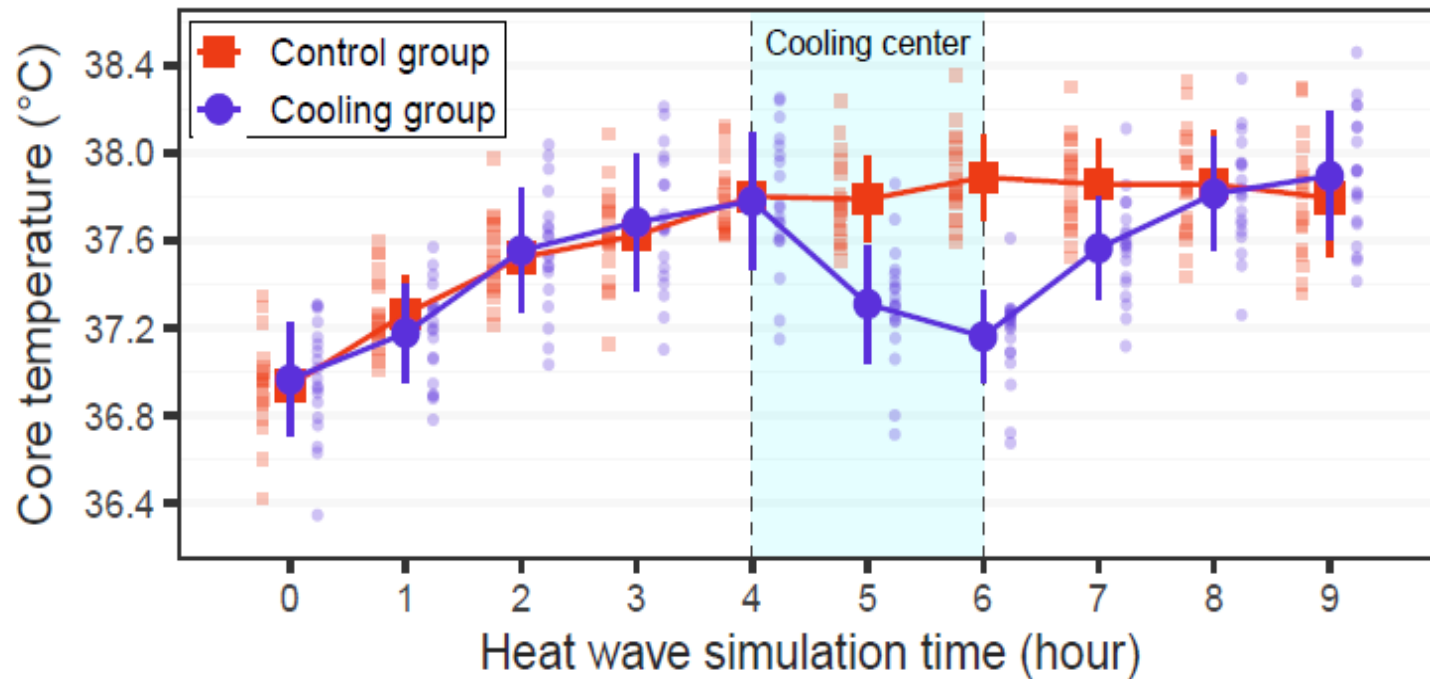
Cooling centres

- An air-conditioned public or private space to provide reprieve from extreme heat.
- Health agencies recommend visiting a cooling center or other air-conditioned location (e.g., shopping mall, movie theater) during heat waves if air conditioning is unavailable.
- Reduce the risk of dying during a heat wave by up to 66%.

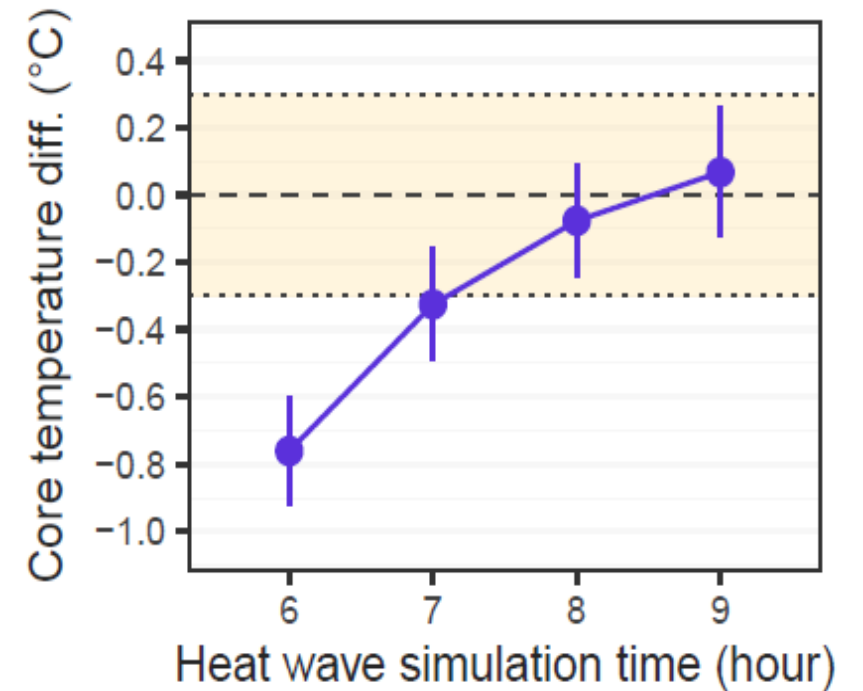


Efficacy of a cooling-centres for limiting physiological strain during a 9-hour simulated extreme heat event

A. Body core temperature during the simulated heat wave



B. Core temperature cooling effect





What if I can't make it to a cooling centre? Are there ways I can keep cool at home?

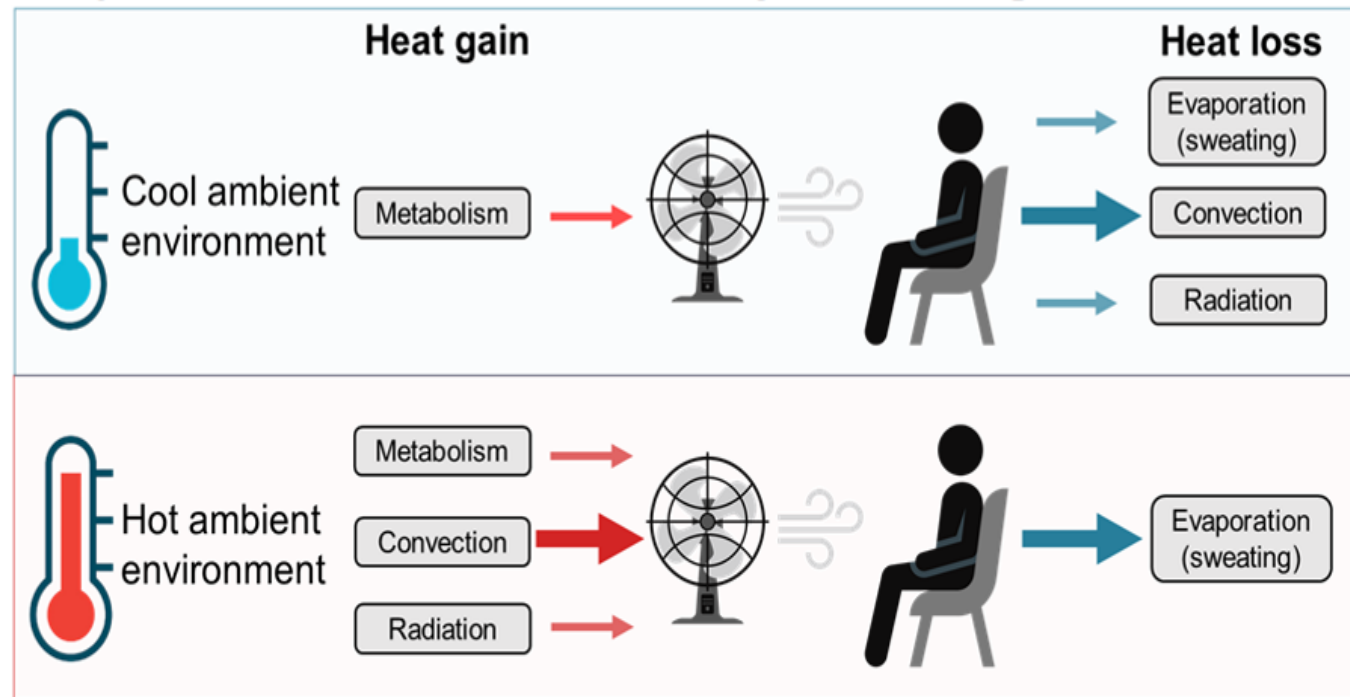
While simple home-based cooling strategies may improve thermal comfort, there is limited evidence to support their use during extremely hot weather.



Electric fans as a personal cooling strategy

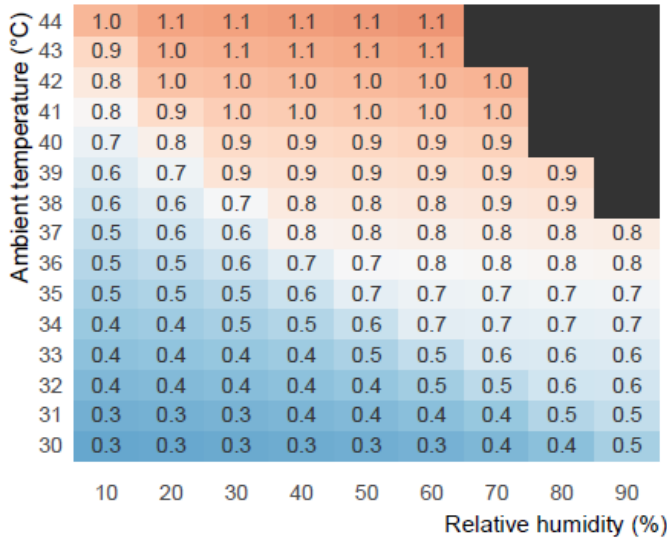


A. Impact of electric fan use on whole-body heat exchange

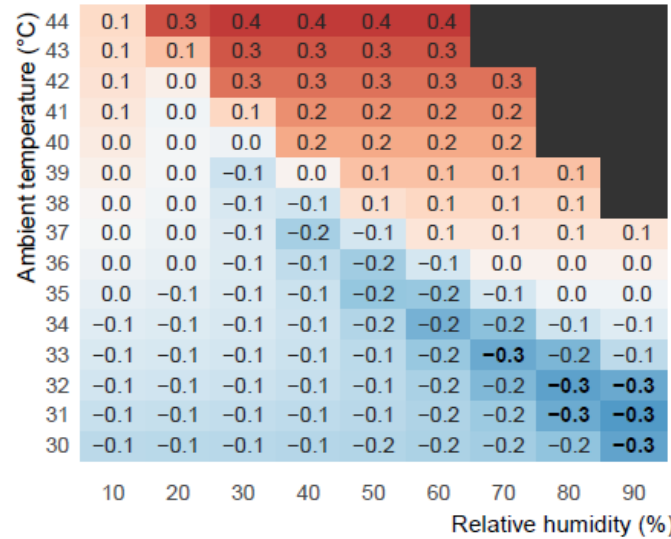




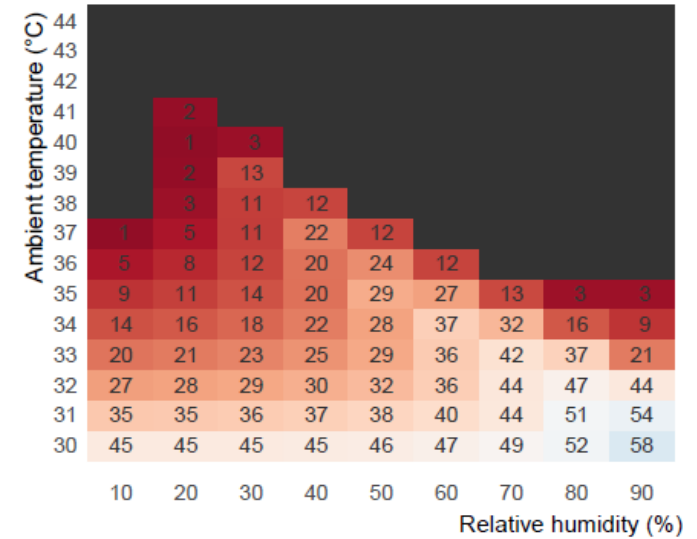
A. Core temperature increase without fan use
Simplified heat balance model for a young adult (18–40 years)



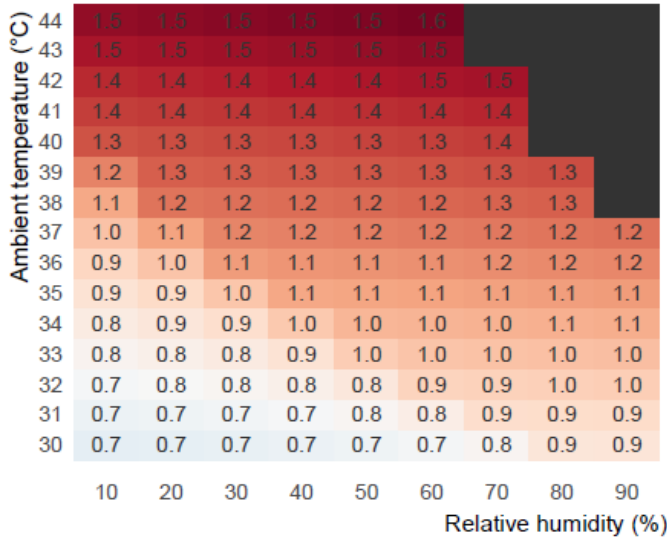
B. Core temperature difference with fan use
Simplified heat balance model for a young adult (18–40 years)



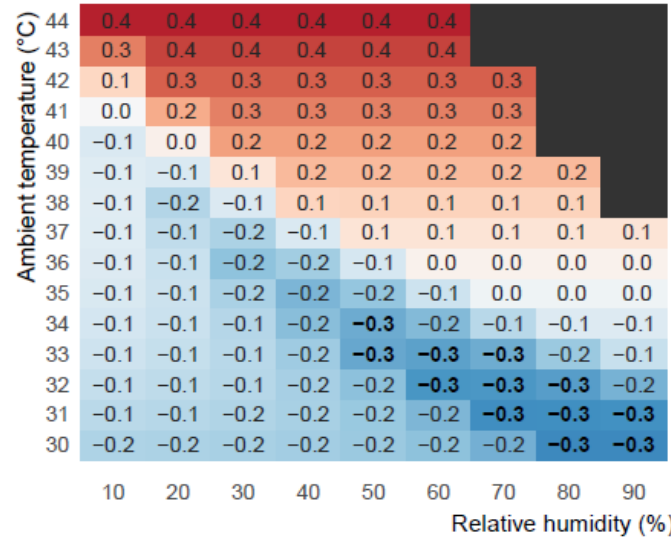
C. Fan effectiveness vs. air conditioning
Simplified heat balance model for a young adult (18–40 years)



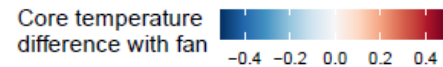
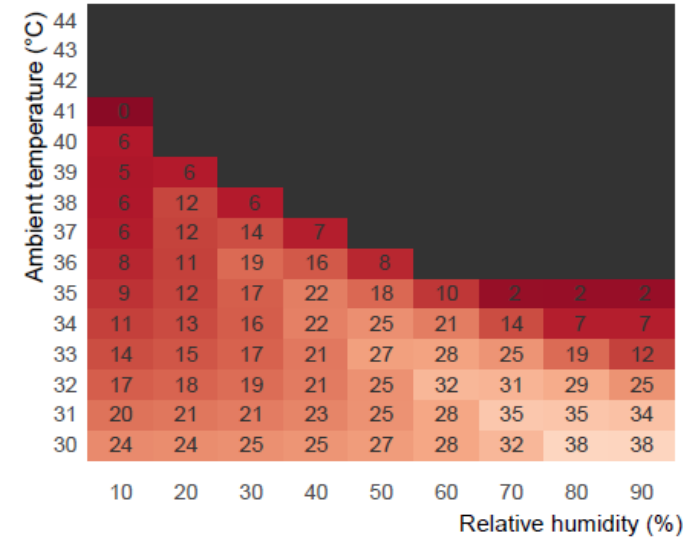
D. Core temperature increase without fan use
Simplified heat balance model for an older adult (65+ years)



E. Core temperature difference with fan use
Simplified heat balance model for an older adult (65+ years)



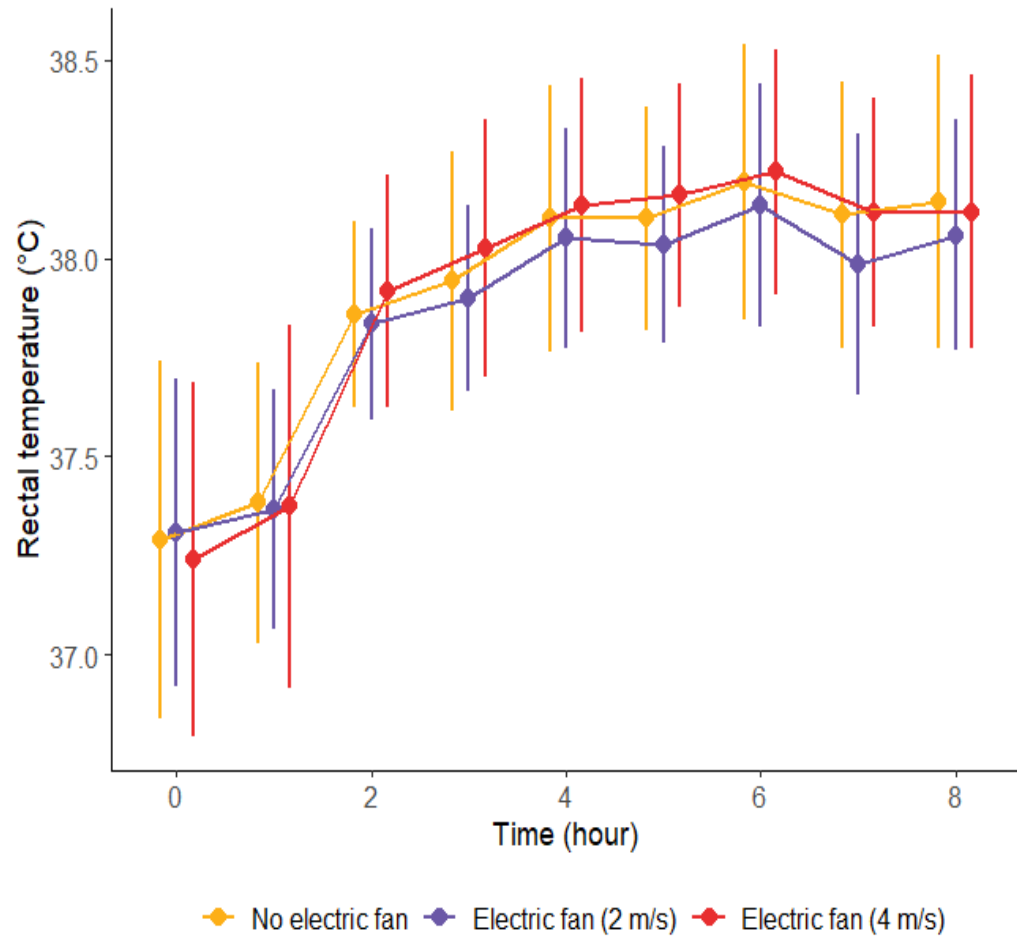
F. Fan effectiveness vs. air conditioning
Simplified heat balance model for an older adult (65+ years)



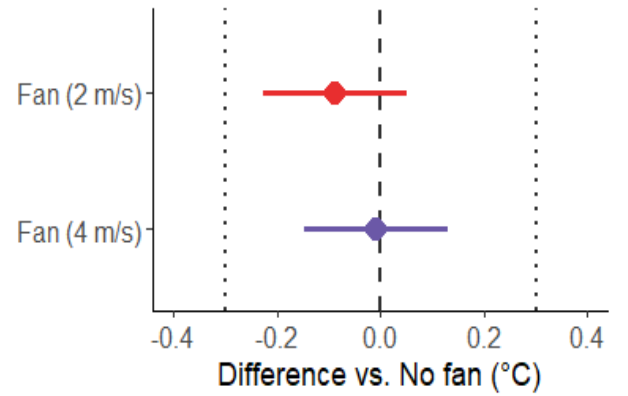
Laboratory data on fan use to keep you cool

Simulated Canadian heatwave: 36°C, 45% relative humidity

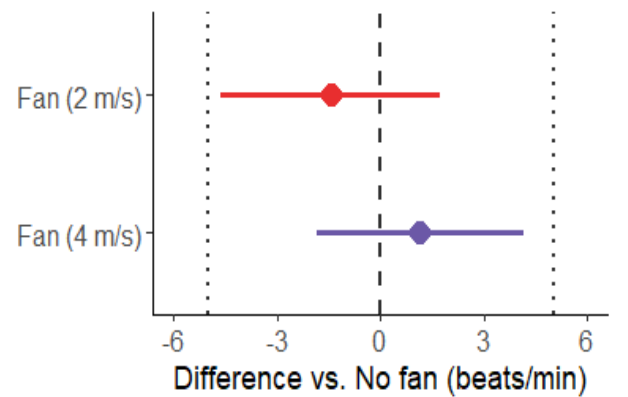
A. Core temperature response (hourly)



B. End-exposure core temperature difference



C. End-exposure heart rate difference

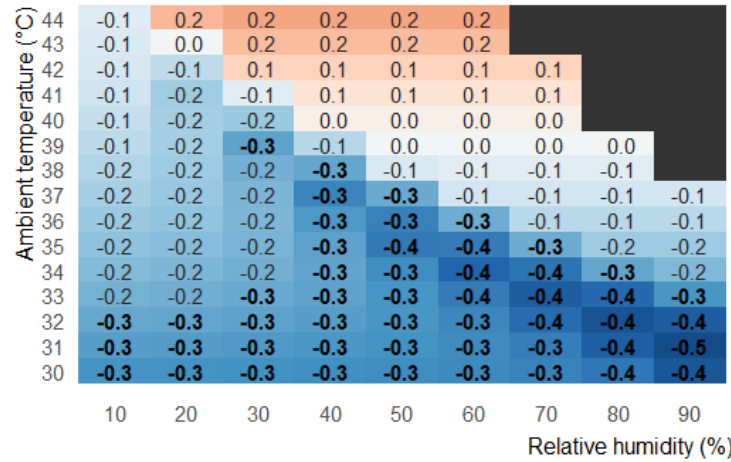


Combining fan use with supplemental skin wetting *



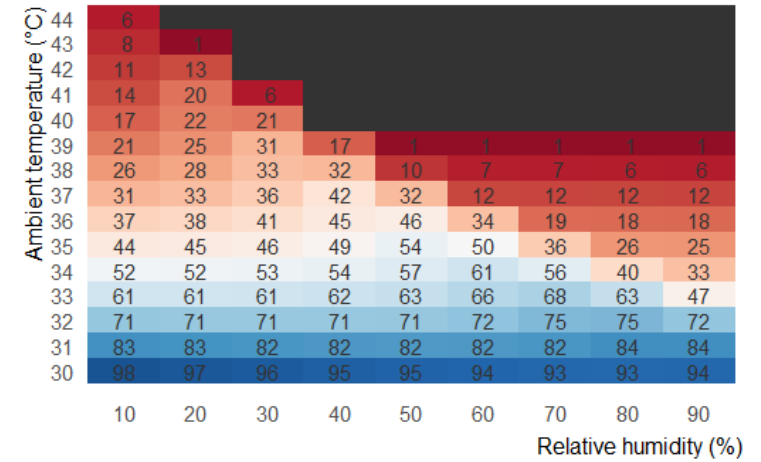
A. Core temperature difference with fan and skin wetting

Simplified heat balance model for a young adult (18-40 years)



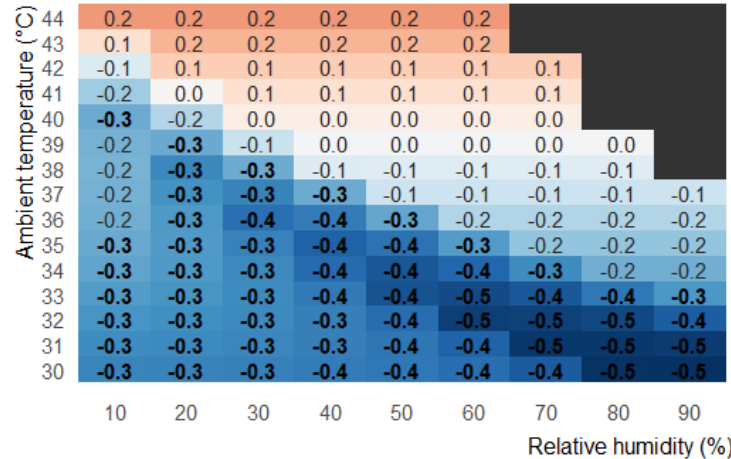
B. Fan and wetting effectiveness vs. air conditioning

Simplified heat balance model for a young adult (18-40 years)



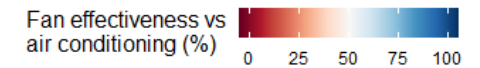
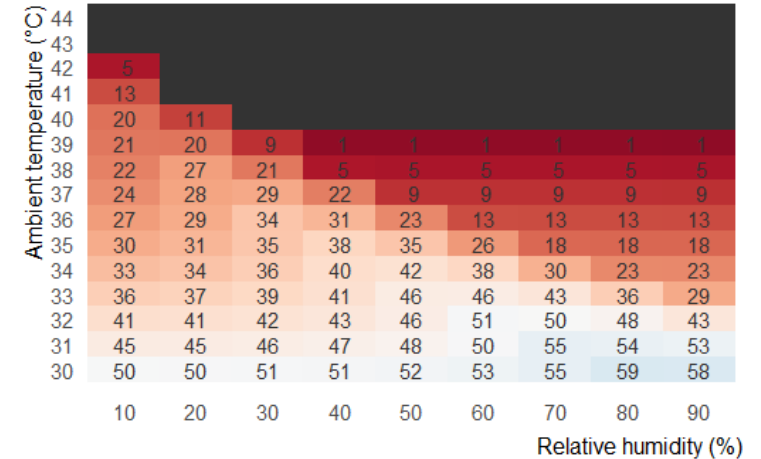
C. Core temperature difference with fan and skin wetting

Simplified heat balance model for an older adult (65+ years)



D. Fan and wetting effectiveness vs. air conditioning

Simplified heat balance model for an older adult (65+ years)



* Empirical support for this strategy is needed.

Lower leg water immersion

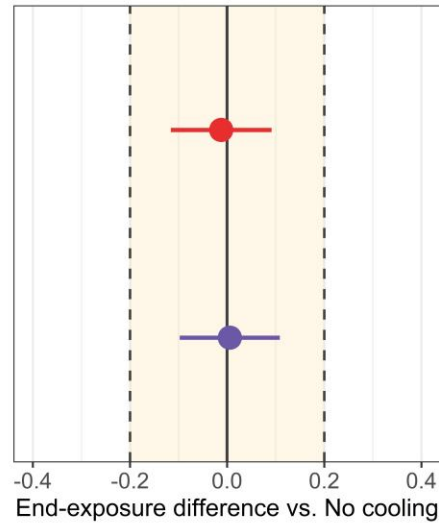
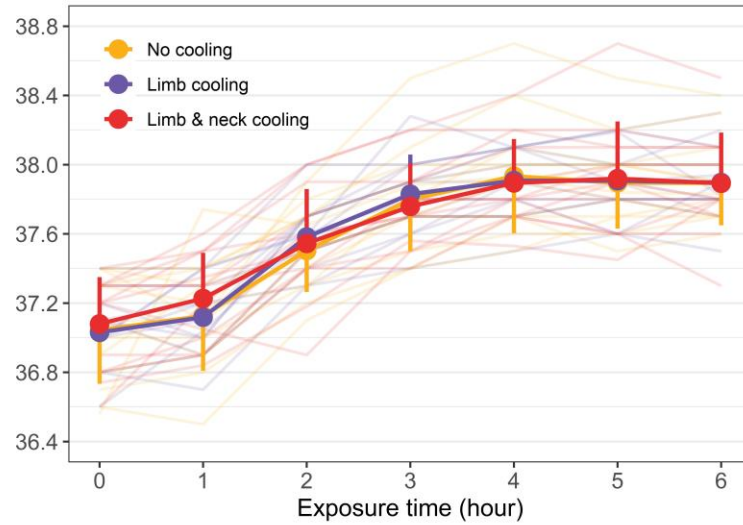
- Cool water extracts excessive heat from the body, reducing both thermal and cardiovascular strain.
- Lower limb immersion is a practical, readily accessible strategy to use even during power outages.
- This method offers additional benefits as it cools a larger surface area of the body.



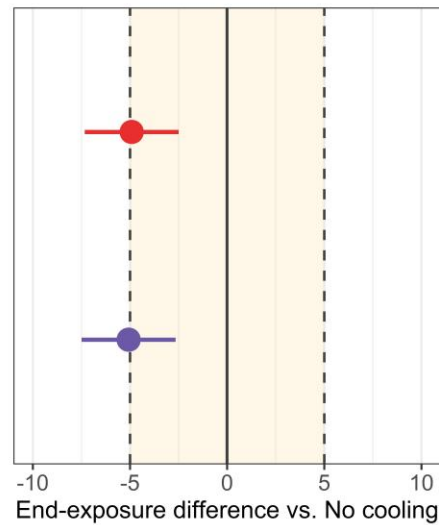
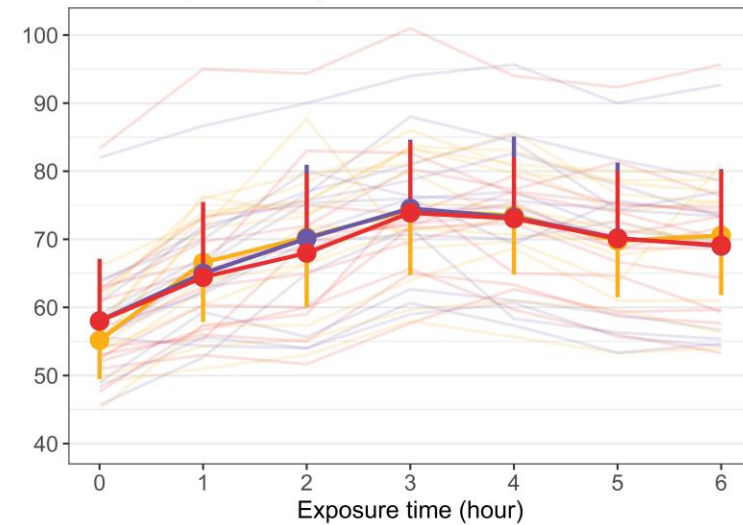
Laboratory data on leg and neck cooling

Simulated Canadian heatwave: 38°C, 35% RH

A. Rectal temperature (°C)



B. Heart rate (beats/min)





Tips for active days in the heat:

- ① Limit activity to cool times of the day
- ② Avoid direct sunlight
- ③ Get enough sleep
- ④ Fuel your body
- ⑤ Listen to your body
- ⑥ Take breaks
- ⑦ Buddy up



Recognizing and responding to heat-related illness

Heat-related illness is caused by the body overheating. The signs and symptoms of heat-related illness can range from mild to severe and can progress rapidly. **If you are unsure, treat it like a life-threatening emergency and start cooling measures.**

Severe heat-related illness

Severe heat-related illness is a life-threatening emergency. Act immediately to get help and start emergency cooling measures.

Signs and Symptoms

Any of the following signs and symptoms indicates **severe** heat-related illness.

- Fainting or loss of consciousness
- Unusual confusion or disorientation
- Severe nausea and vomiting
- Difficulty speaking
- Unusual coordination problems
- Hot, flushed skin or very pale skin
- Not sweating
- Rapid breathing and faint, rapid heart rate
- Body temperature $>39^{\circ}\text{C}$ (102°F)
- Very low, dark urine output

Moderate heat-related illness

Moderate heat-related illness can rapidly become severe heat-related illness. Immediate cooling action is important to prevent progression.

Signs and Symptoms

Any of the following can be signs of **moderate** heat-related illness.

- Nausea
- Light-headedness
- Weakness
- Extreme fatigue, malaise
- Very thirsty or dry mouth
- Difficulty swallowing
- Heat rash, unusual swelling, or cramps
- Rapid heart rate
- Body temperature $>38^{\circ}\text{C}$ (100°F)
- Reduced, dark urine output

Mild heat-related illness

Mild heat-related illness can rapidly become severe heat-related illness. Immediate cooling action is important to prevent progression.

Signs and Symptoms

Any of the following can be signs of **mild** heat-related illness.

- Feeling unwell
- Dizziness
- Headache
- Irritability
- Fatigue
- Thirst
- Skin feels very warm and sweaty
- Increase in resting heart rate
- Reduced urine output



Emergency measures

If someone is experiencing severe heat-related illness, **take all the following actions:**

- Call 911 immediately
- Stay with the individual until emergency services arrive
- Move to a cooler area, if possible
- Remove excess clothing
- Have the individual rest comfortably flat on their back facing up or in a semi-upright position
- Apply cool, wet towels or ice packs around the body, especially to the neck, armpits, and groin, until emergency services arrive

Immediate measures for mild to moderate heat-related illness



If someone is mild to moderate heat-related illness, **take as many of the following cooling actions as possible:**

- Relocate individual to a cooler room
- Remove excess clothing and provide low-level fanning
- Activate air conditioning or open windows in different areas of the house to create a cross-breeze
- Keep the individual resting comfortably flat on their back facing up or in a semi-upright position.
- Encourage sitting upright and drinking water
- Apply cool, wet towels or ice packs around the body, especially to the neck, armpits, and groin
- Call 911 if symptoms persist or get worse

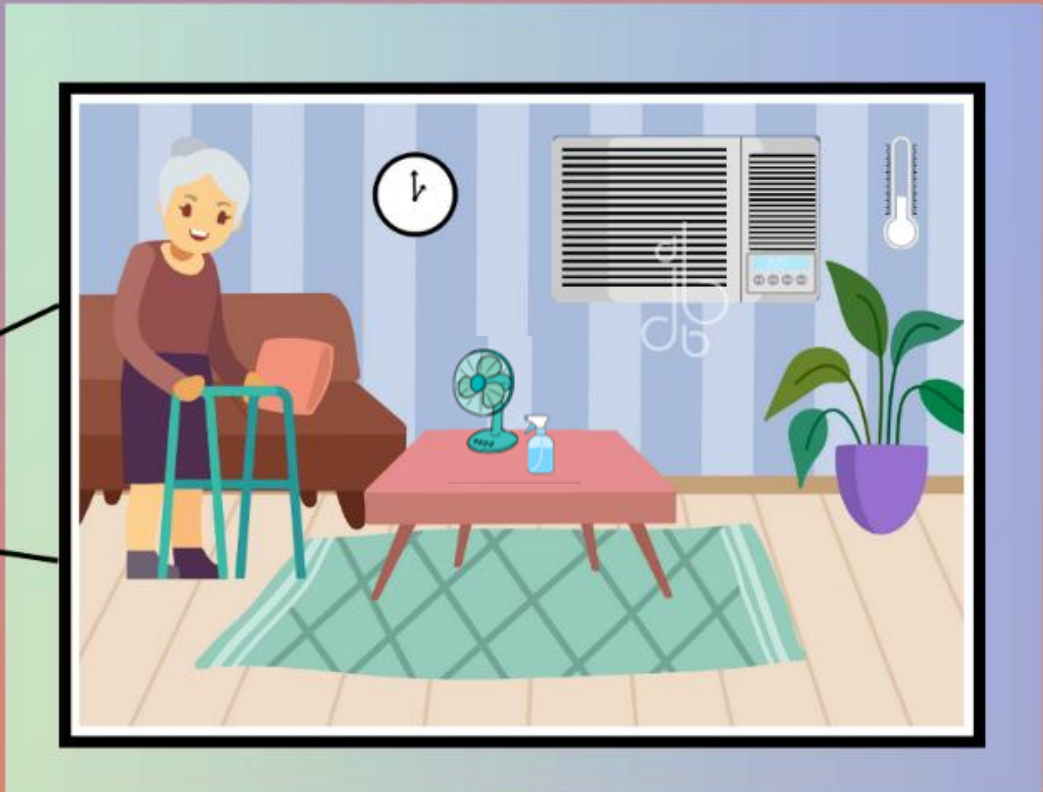
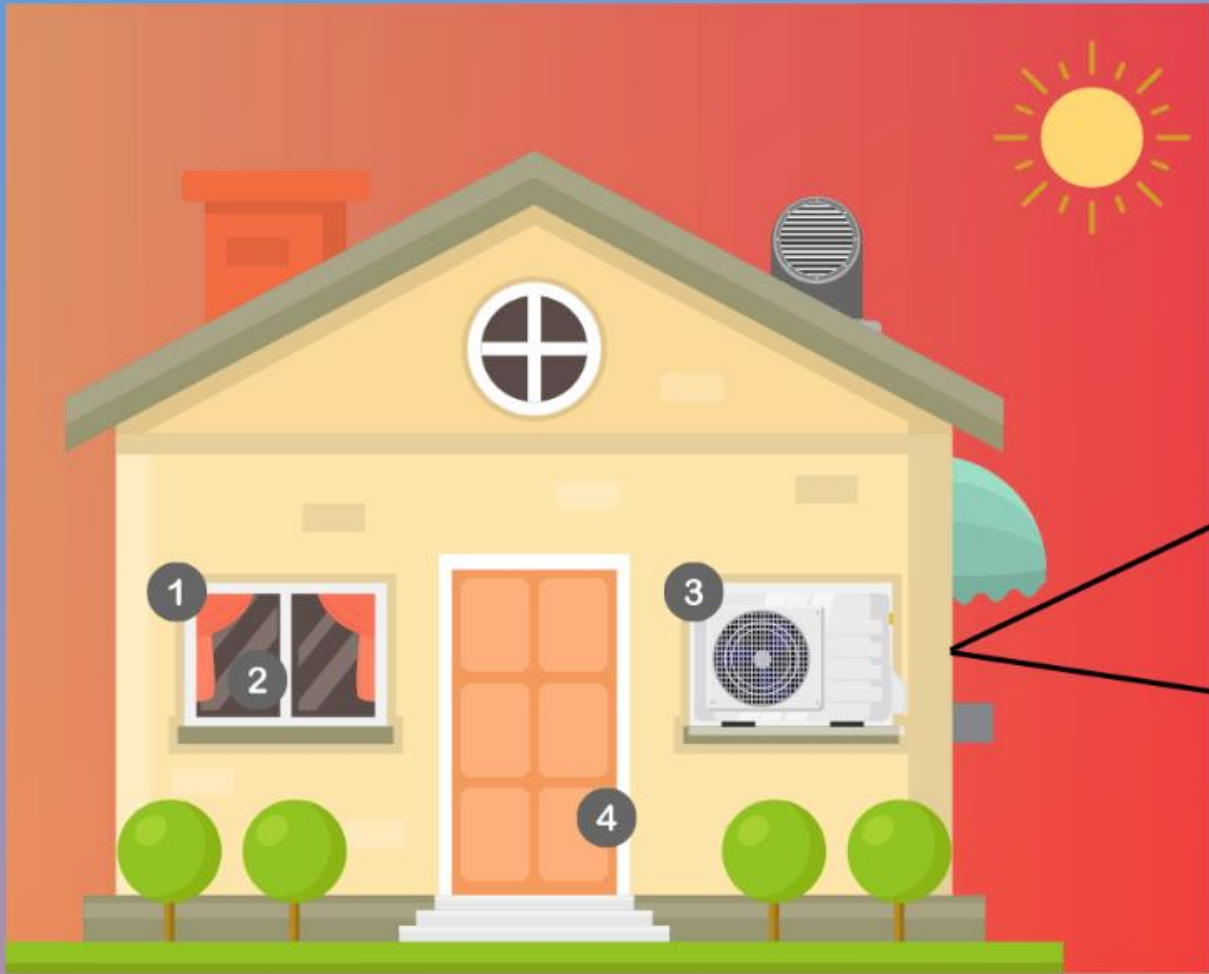
What you should have for an IN-PERSON HEALTH CHECK

- This 4-page document, either printed or digital
- Fully charged cell phone for emergency calls
- Information about others to contact if the individual is at risk
- Ear or mouth thermometer for taking body temperature
- Environmental thermometer for taking room temperature
- Wash cloths or towels for soaking in cool water
- Spray bottle
- Bottled water
- Ice packs

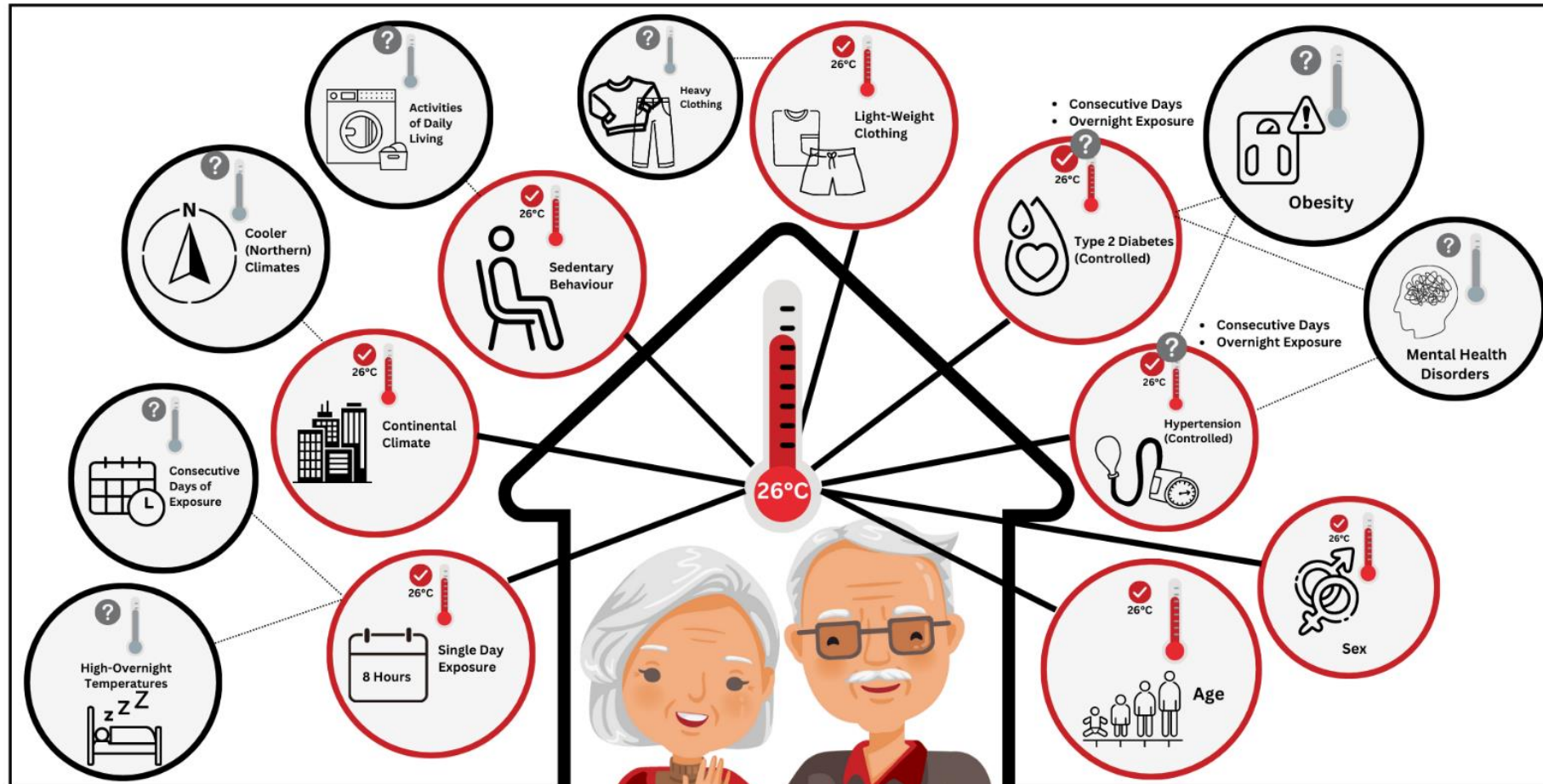
What you should have for an REMOTE HEALTH CHECK

- This 4-page document, either printed or digital
- Residential address of the individual in case you need to call 911
- Information about others to contact if the individual is at risk
- Some personal information about the individual such as age and general health

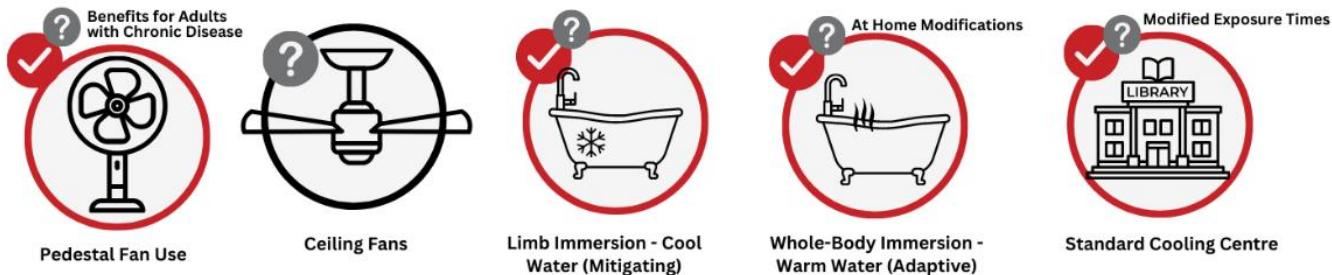
Take action, be part of the solution. You can play an important role in how hot your home gets during hot weather.



Do we have the full story?



Alternative Heat Mitigating Strategies



Defining Workplace Safe Exposure Times

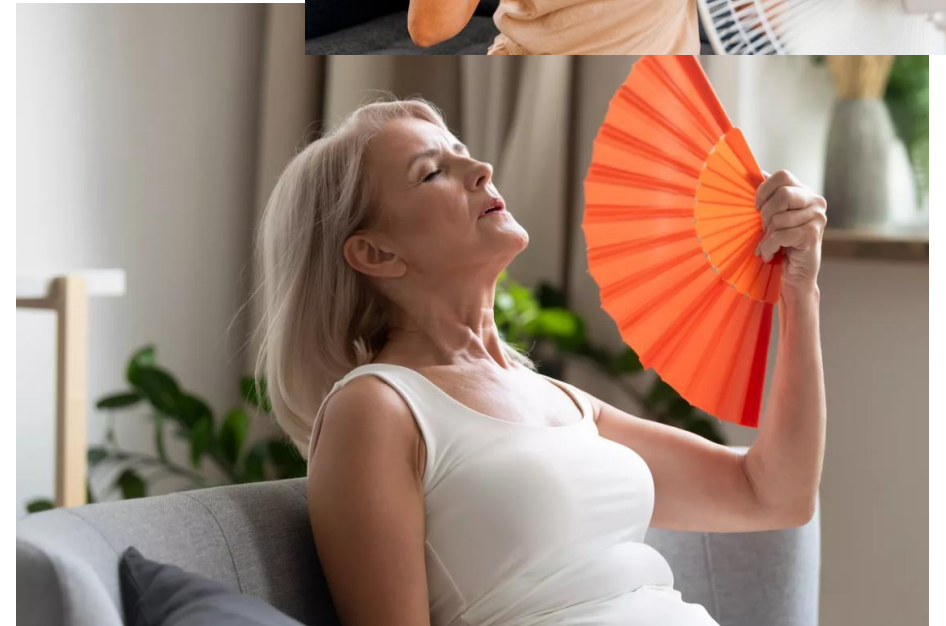


Does menopause affect the ability to cool down?

Our team has launched a series of studies aimed at understanding the effects of menopause on skin blood-flow.

We are seeking healthy post-menopausal women under the age of 65 who meet any of the following criteria:

- Women with current severe hot flashes
- Women with no history of hot flashes
- Women with type II diabetes
- Women currently on hormone replacement therapy



HOW DO CHRONIC CONDITIONS IMPACT MECHANISMS OF CELLULAR PROTECTION DURING EXERCISE AND HEAT STRESS?

Investigating if the presence of **common chronic health conditions** alter cellular protection during exercise or heat exposure

**Men & Women
between 65-80 years old**

hypertension (high blood pressure) or
diabetes (type II)



Dr. Jeremy McCormick
jmccorm3@uottawa.ca

Together....Creating Heat-Resilient Communities



Health
Canada

Santé
Canada

We would like to thank the many volunteers from the National Association of Federal Retirees who have participated in our studies.



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Any
Questions



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