

Heat and Heart Health

What do we know and where do we go?

Georgia Chaseling (PhD)

Sydney Nursing School, Faculty of Medicine and Health

SOLVE-CHD Research Team

Heat and Health Research Centre

Georgia.chaseling@sydney.edu.au








SOLVE-CHD & Heat and Health Research Centre



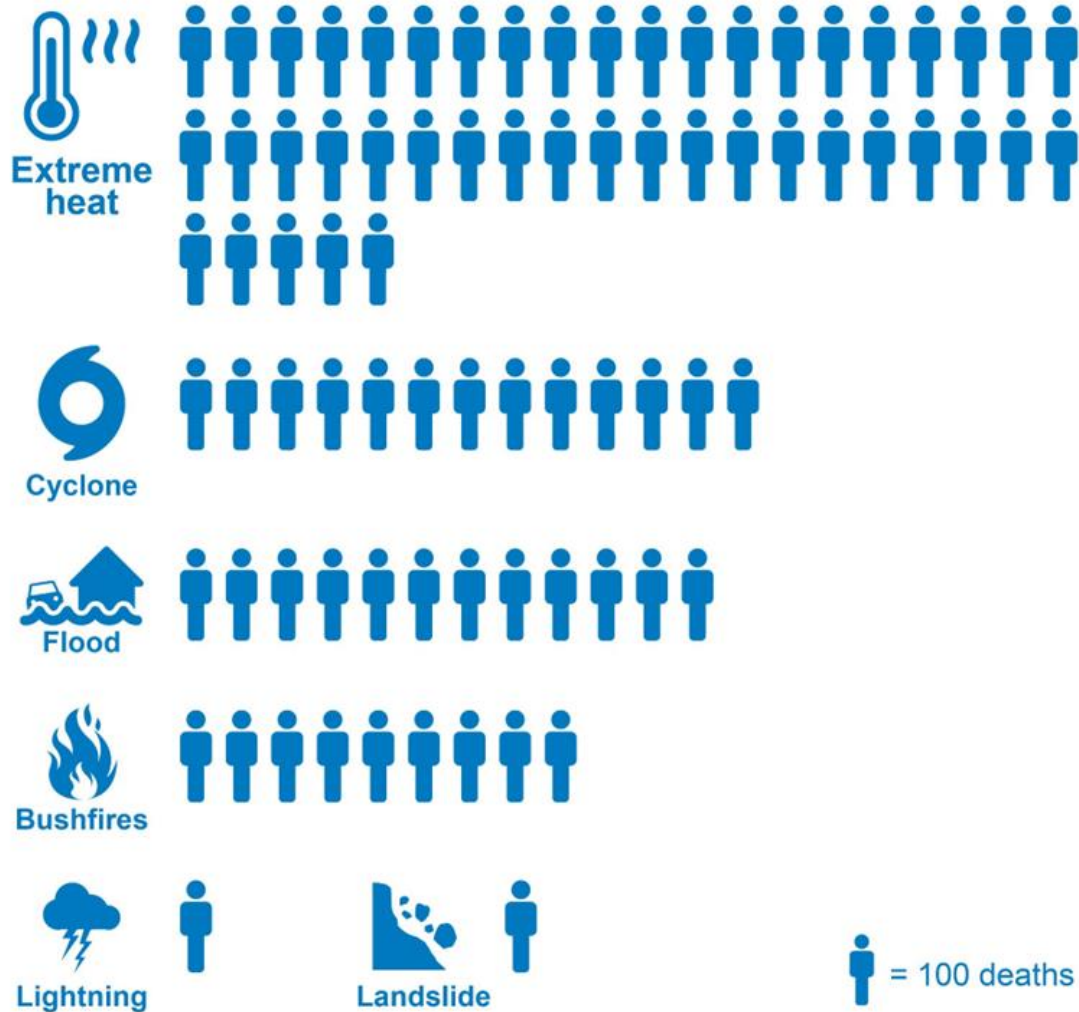
Heat and Health Research Incubator

Priority research themes

 Maternal & Child Health	 Physical Activity, Sport & Occupational Health	 Ageing & Chronic Diseases	 Landscapes & the Built Environment	 Humanitarian Settings
<ul style="list-style-type: none">• Negative heat-related pregnancy outcomes• Infant thermal management methods• Heat in schools• Playground safety	<ul style="list-style-type: none">• Sport extreme heat policy development• Equitable cooling in RMG industry• Occupational heat stress risk management• Active commuting	<ul style="list-style-type: none">• Heat action plans• Personal heat resilience• Medications• Cardiovascular health• Mental health• Aged-care homes• Future survivability limits	<ul style="list-style-type: none">• White/green roofing• Urban greening• Shading initiatives• "Fan-first" cooling• Modifications to built environment• Future sustainable cooling• Low-income housing	<ul style="list-style-type: none">• Refugee camps• Slums• Heat & mosquito-borne diseases• Heat & water-borne diseases

Extreme Heat Events

Deaths from natural hazards 1900-2011

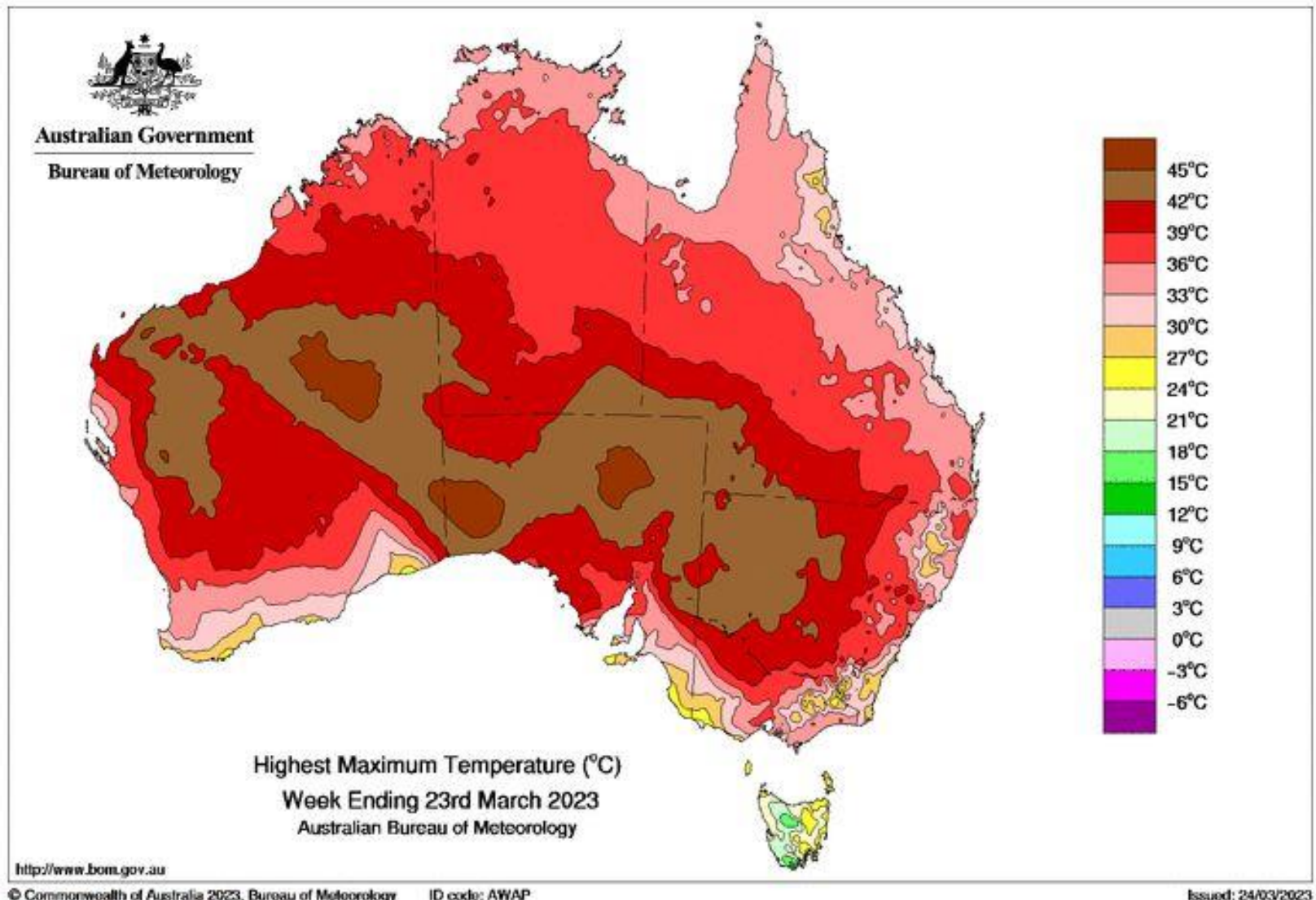


Extreme Heat Events

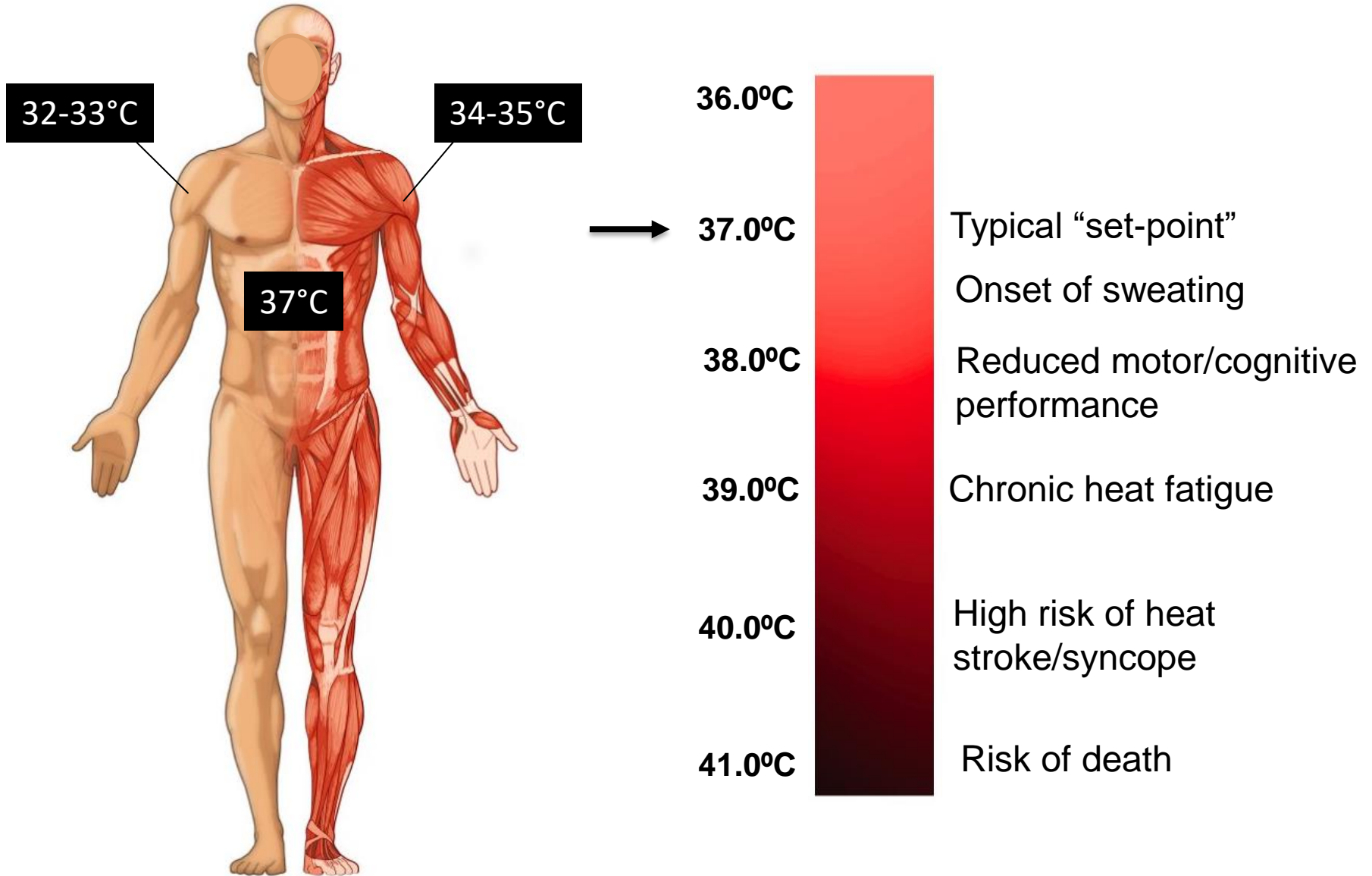
EXCESS DEATHS

Chicago, 1995 3 days	40°C, 50% RH	739 total 246 per day
France, 2003 4 weeks	39°C, 26% RH	14,800 total 528 per day
Russia, 2010 4 weeks	38°C, 40% RH	55,000 total 1964 per day
India, 2015 5 weeks	42°C, 49% RH	2,500 deaths 71 per day
Europe, 2022 3 months	49°C, 13% RH	61,672 deaths 734 per day

Hot weather and heatwaves



Human Body



SYMPTOMS OF HEATSTROKE



The signs and symptoms of heatstroke include:



Troublespeaking, slurred speech



Problems concentrating or coordinating movements



Rapid pulse and fast, shallow breathing



Dizziness, confusion, seizures or loss of consciousness



Sudden rise in body temperature



Aggressive or strange behaviour



Dry, swollen tongue



Headache, nausea or vomiting



Hot and dry and possibly red skin, possibly with no sweat

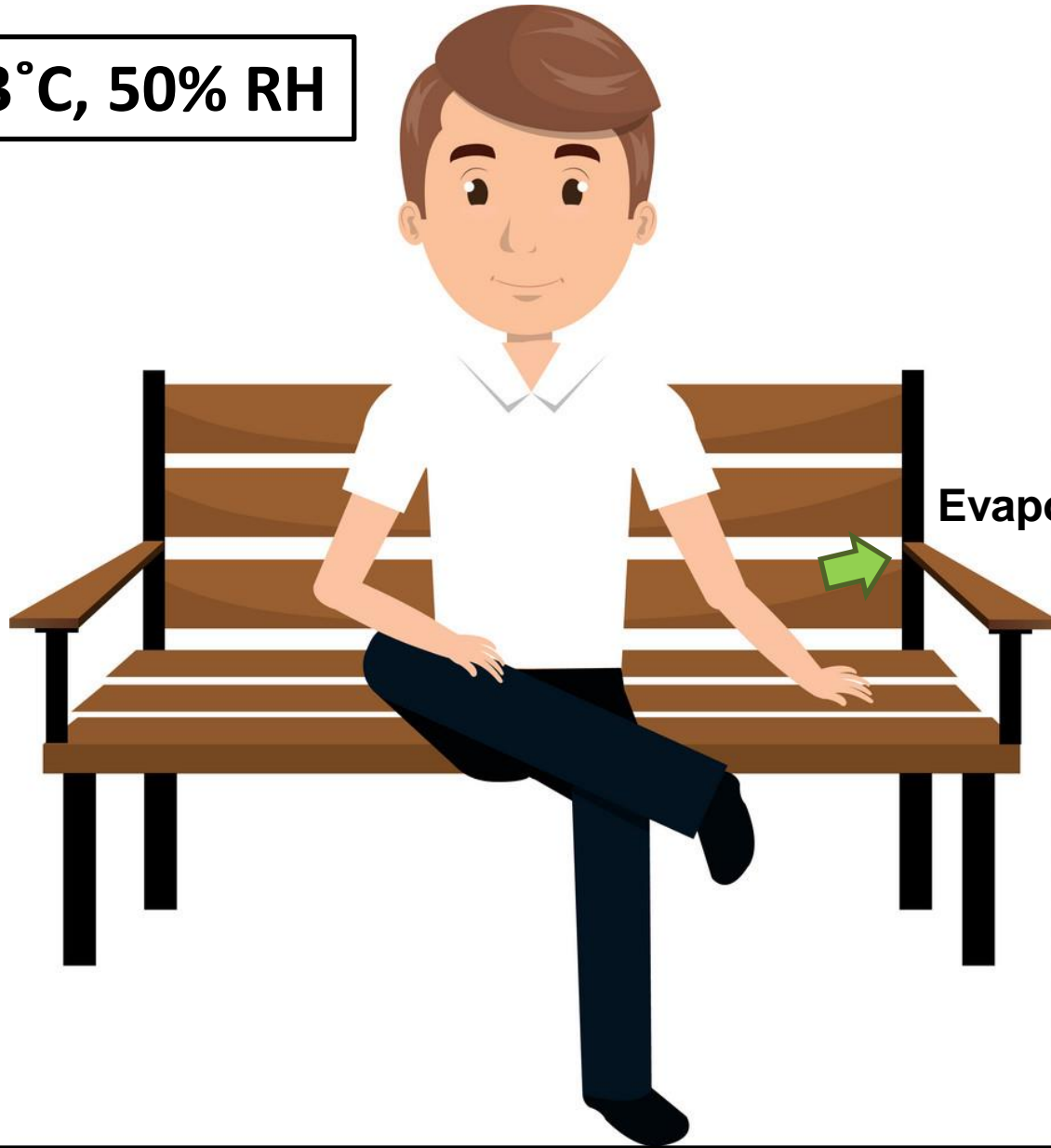


Intense thirst



The casualty may also fall unconscious

23°C, 50% RH

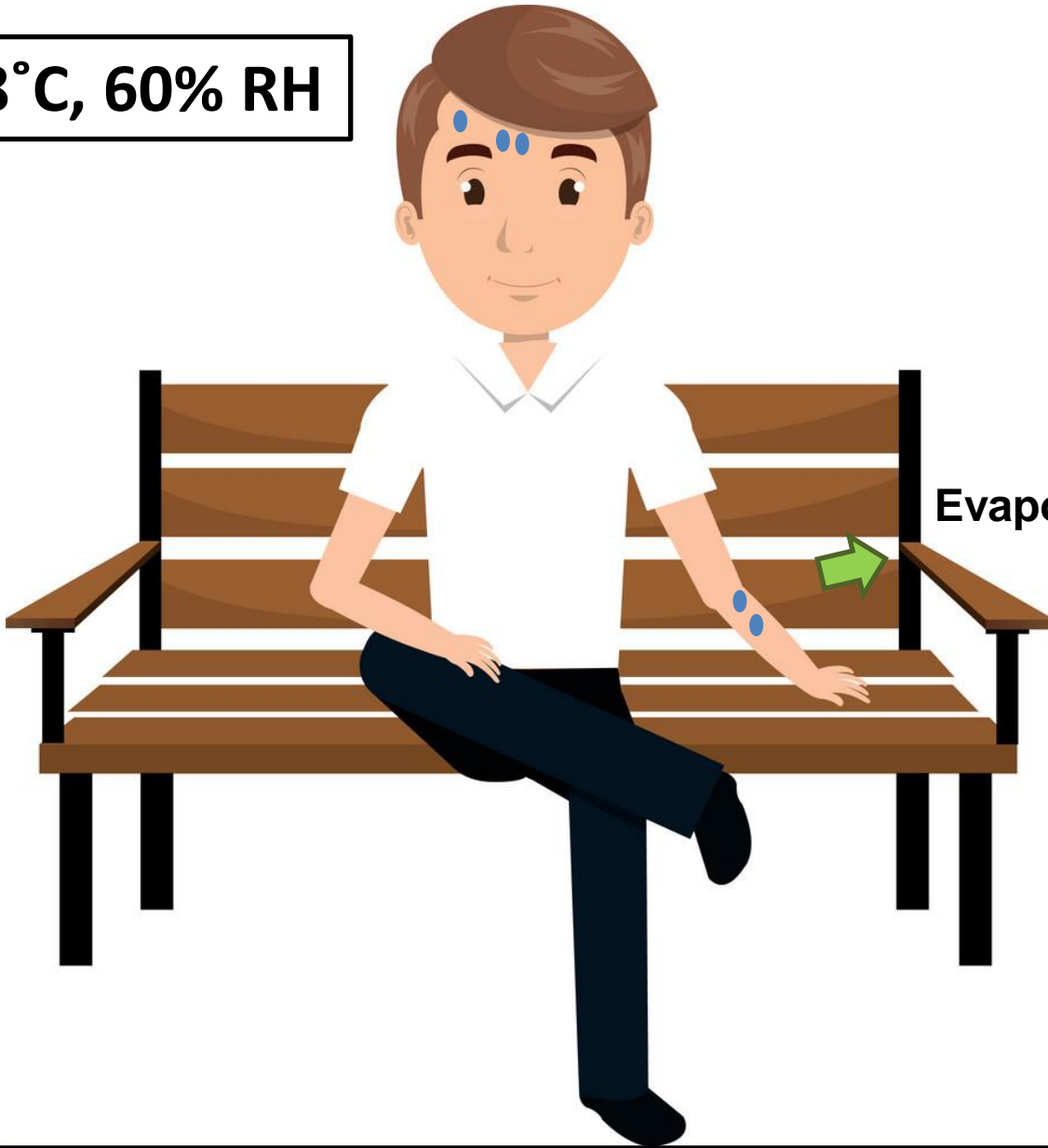


Evaporation

Core temperature: ~ 37.0°C

Skin Temperature: ~ 33.0°C

38°C, 60% RH

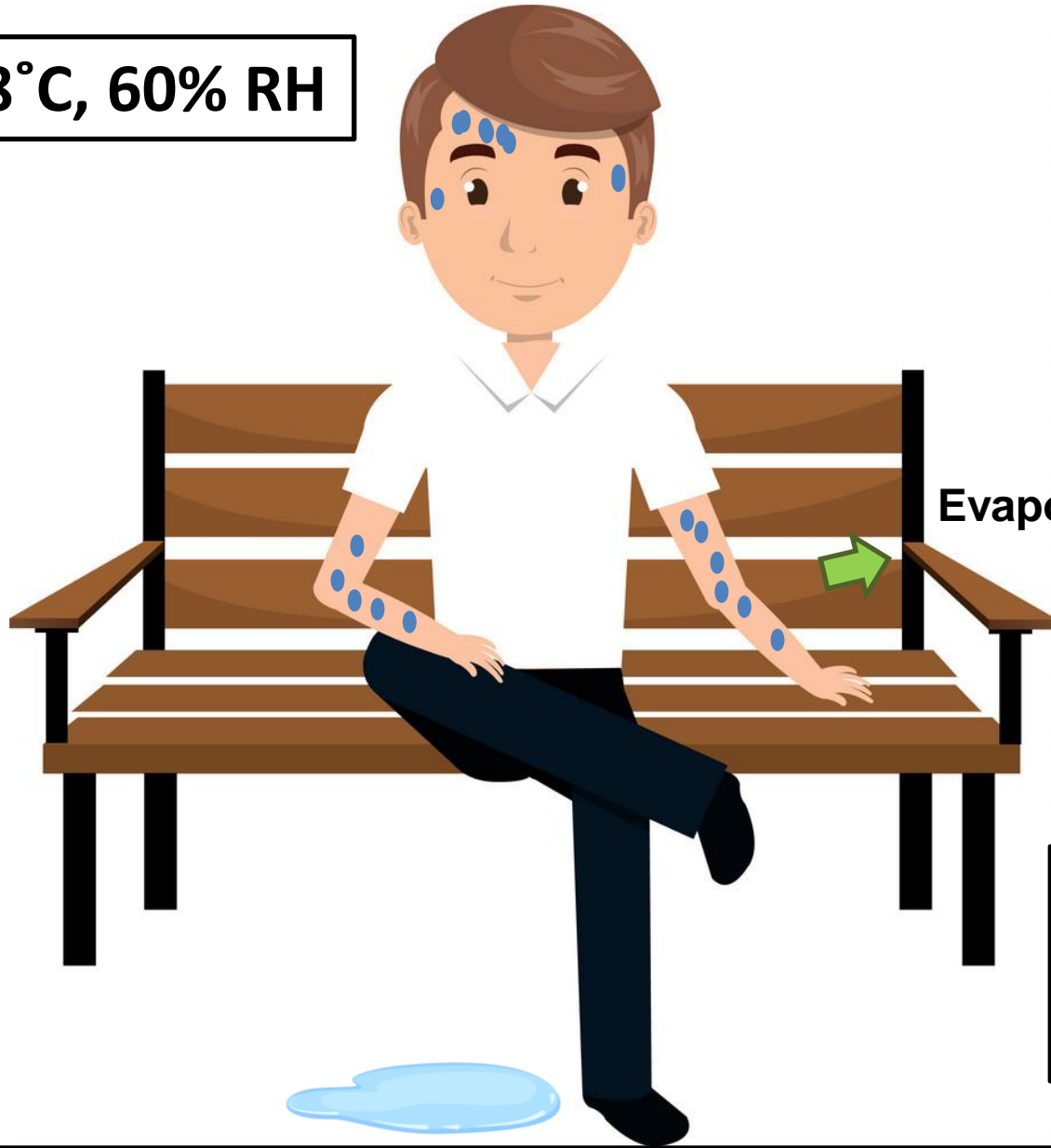


Evaporation

Core temperature: ~ 37.0°C

Skin Temperature: ~ 33.0°C

38°C, 60% RH

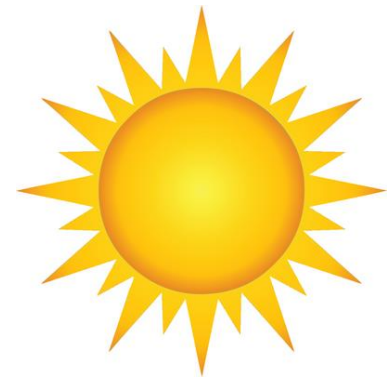
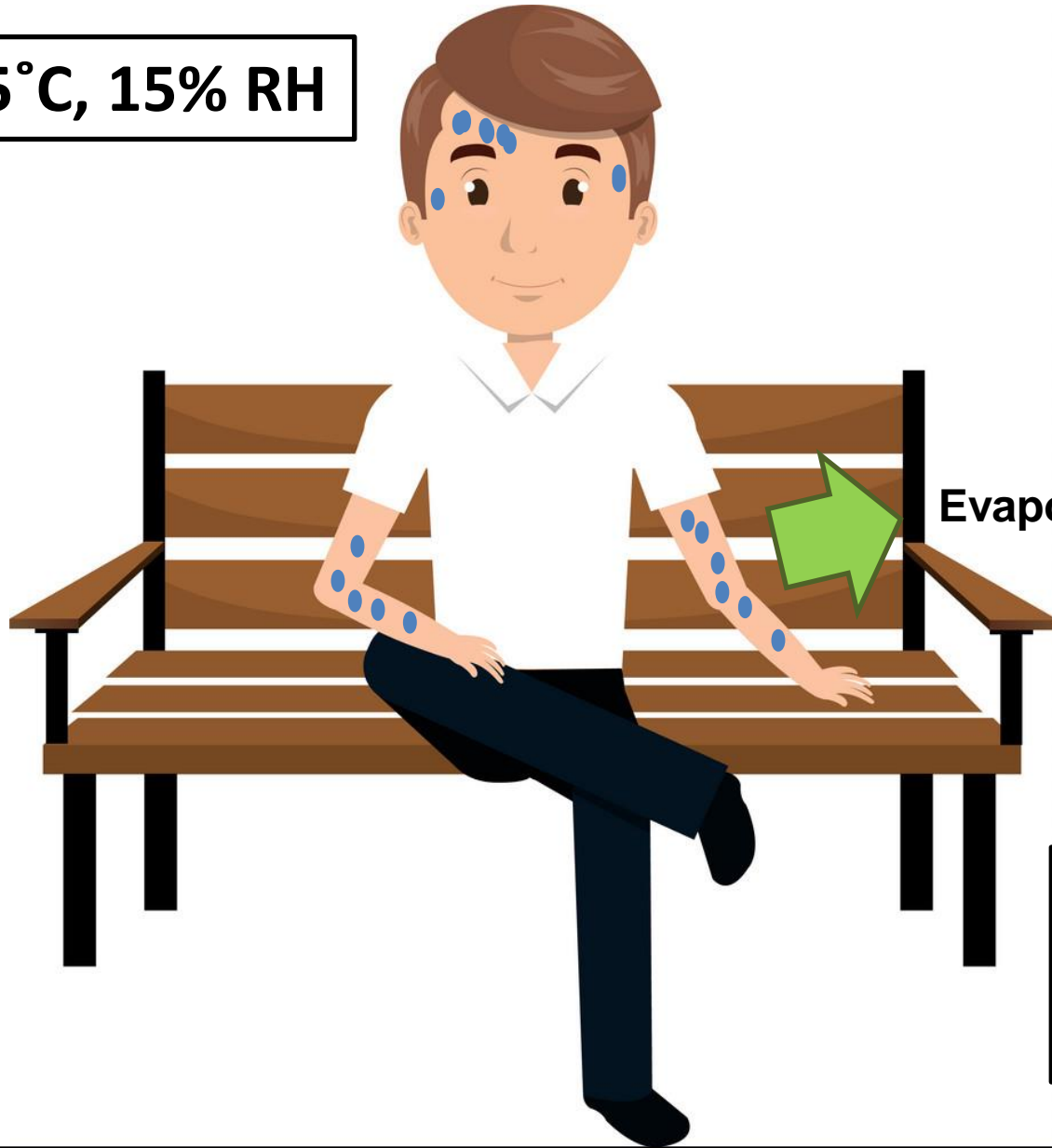


Evaporation

Hot and Humid Environments

Total body surface area that is covered in sweat

45°C, 15% RH



Evaporation

Hot and Dry Environments

Physiological ability to secrete sweat onto the skin surface

Populations 'at risk'



Adults over 60 years old

Pregnant or breastfeeding women

Children

People with chronic diseases

- Heart disease
- Diabetes
- Kidney disease

Populations 'at risk'



People who live in their own

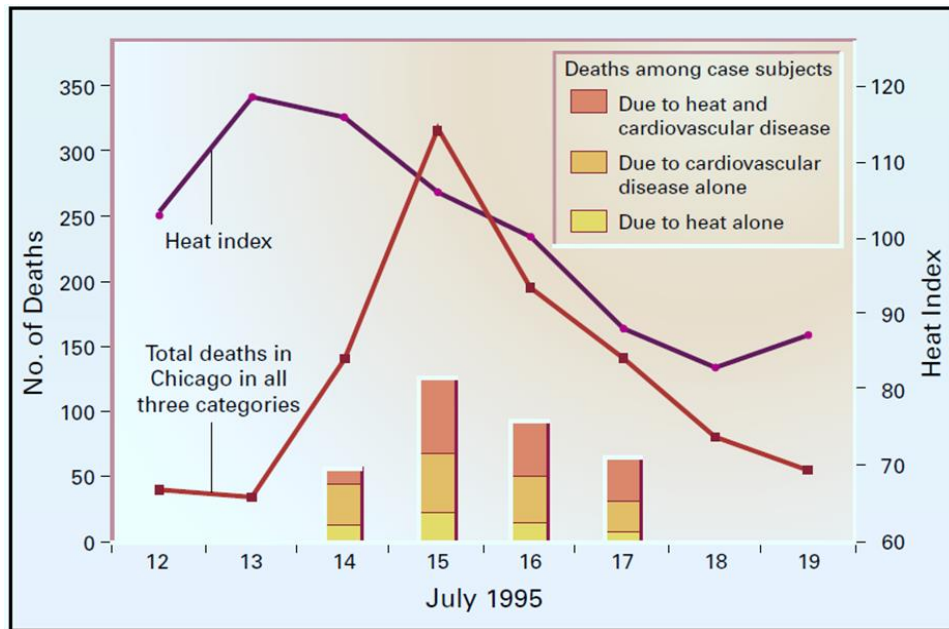
People who do not have contact
with friends or family

People on certain medications

No access to an air-conditioned
environment

Heat and CVD outcomes

Chicago, 1995 40°C, 50% RH 739 deaths



Semenza *et al.*, 1996. N Engl J Med

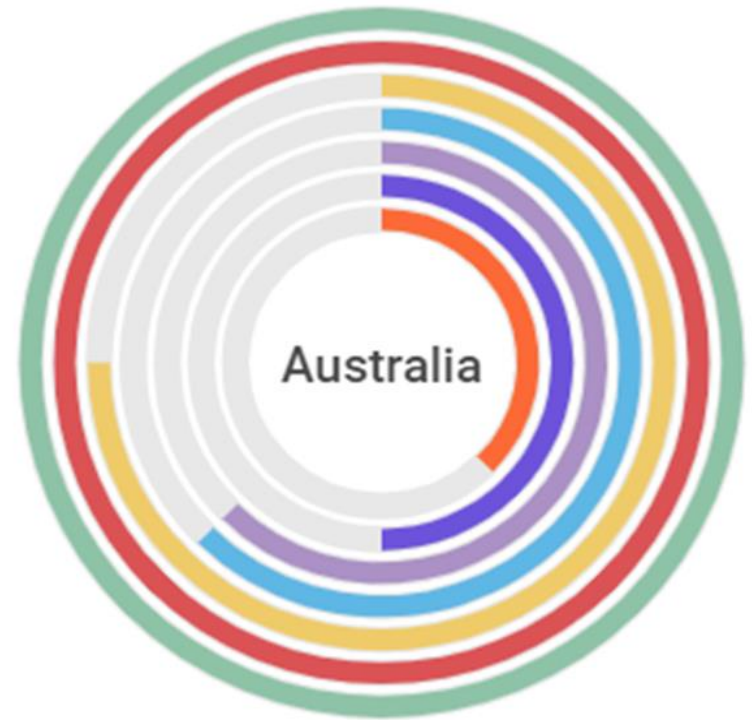
- 82% of deaths due to negative CVD outcomes
- Hospital admissions increased for patients with coronary artery disease, heart failure and dysrhythmias
- People with heart disease have an increased risk

Heat and CVD outcomes

31 Government Websites

- 100% - Adults over 60 years old
- 100% - Infants and young children
- 75% - Pregnant or breastfeeding women

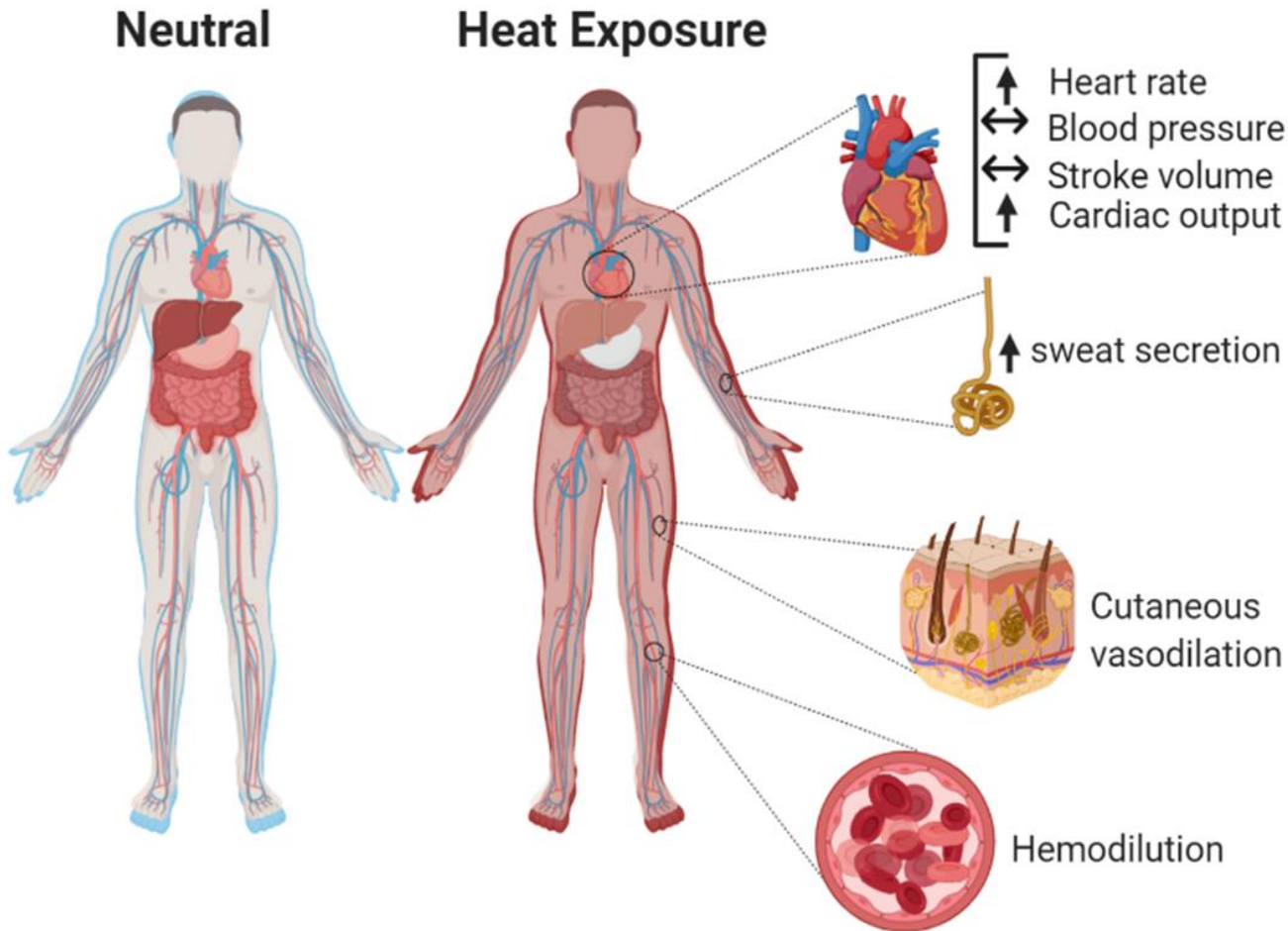
25% - People with heart disease



Unpublished data
Vargas N, Chaseling G, et al

- Older adults
- Infants and young children
- Pregnant or breastfeeding women
- Obese and overweight
- People on certain medications
- Live alone, socially isolated or homeless
- Heart disease

Lack of evidence

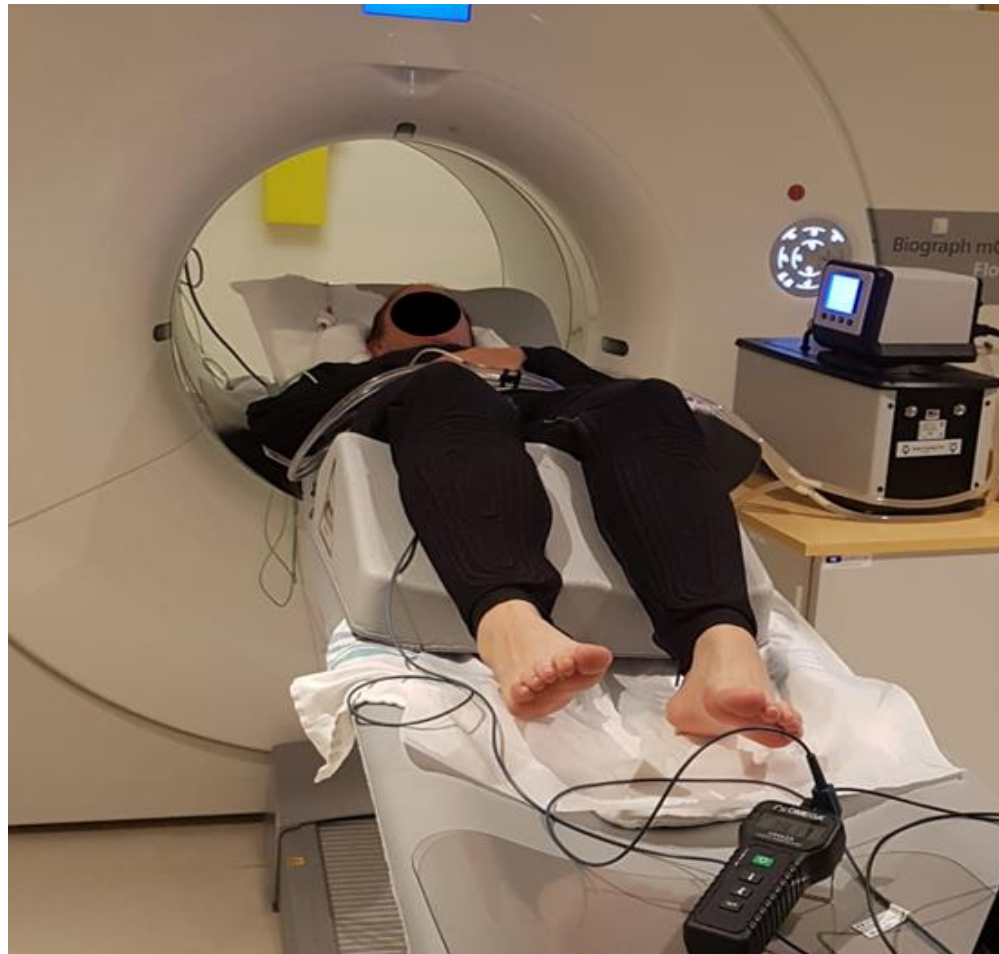


Chaseling GK et al
2021, *Can J Cardiol*



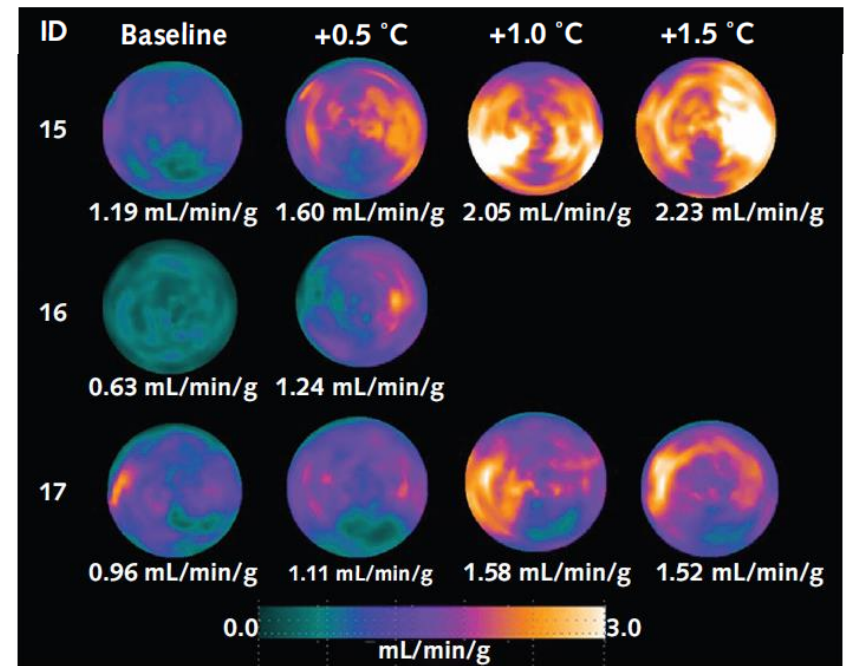
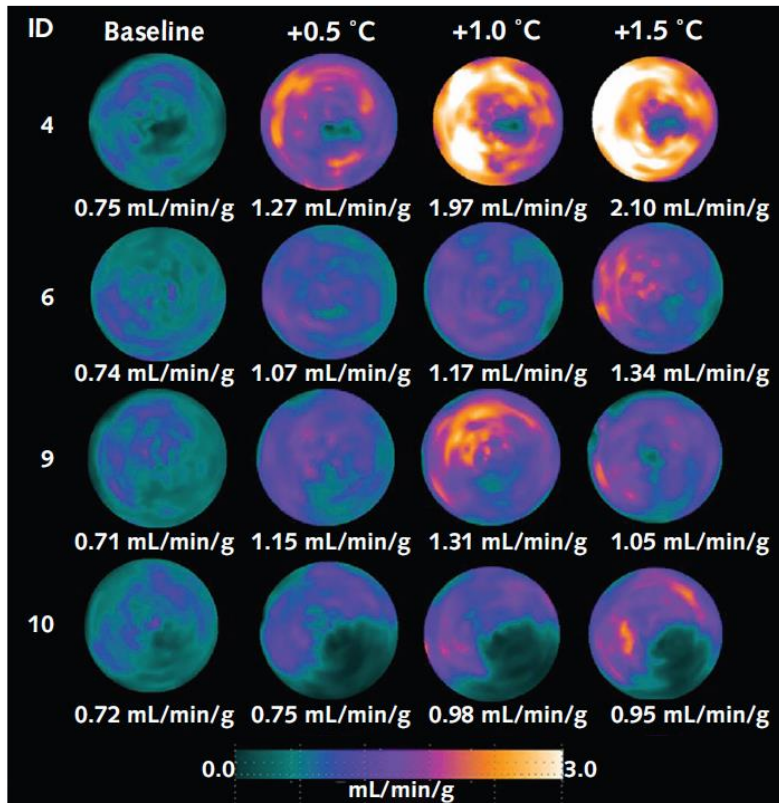
The Effect of Heat Exposure on Myocardial Blood Flow and Cardiovascular Function

Hadiatou Barry, MSc; Josep Iglesias-Grau, MD; Georgia K. Chaseling, PhD; Jade Paul, BSc; Camila Gosselin, BSc; Caroline D'Oliviera-Sousa, NMT; Martin Juneau, MD; Francois Harel, MD, PhD; David Kaiser, MD; Matthieu Pelletier-Galarneau, MD, MSc; and Daniel Gagnon, PhD



The Effect of Heat Exposure on Myocardial Blood Flow and Cardiovascular Function

Hadiatou Barry, MSc; Josep Iglesias-Grau, MD; Georgia K. Chaseling, PhD; Jade Paul, BSc; Camila Gosselin, BSc; Caroline D'Oliviera-Sousa, NMT; Martin Juneau, MD; Francois Harel, MD, PhD; David Kaiser, MD; Matthieu Pelletier-Galarneau, MD, MSc; and Daniel Gagnon, PhD

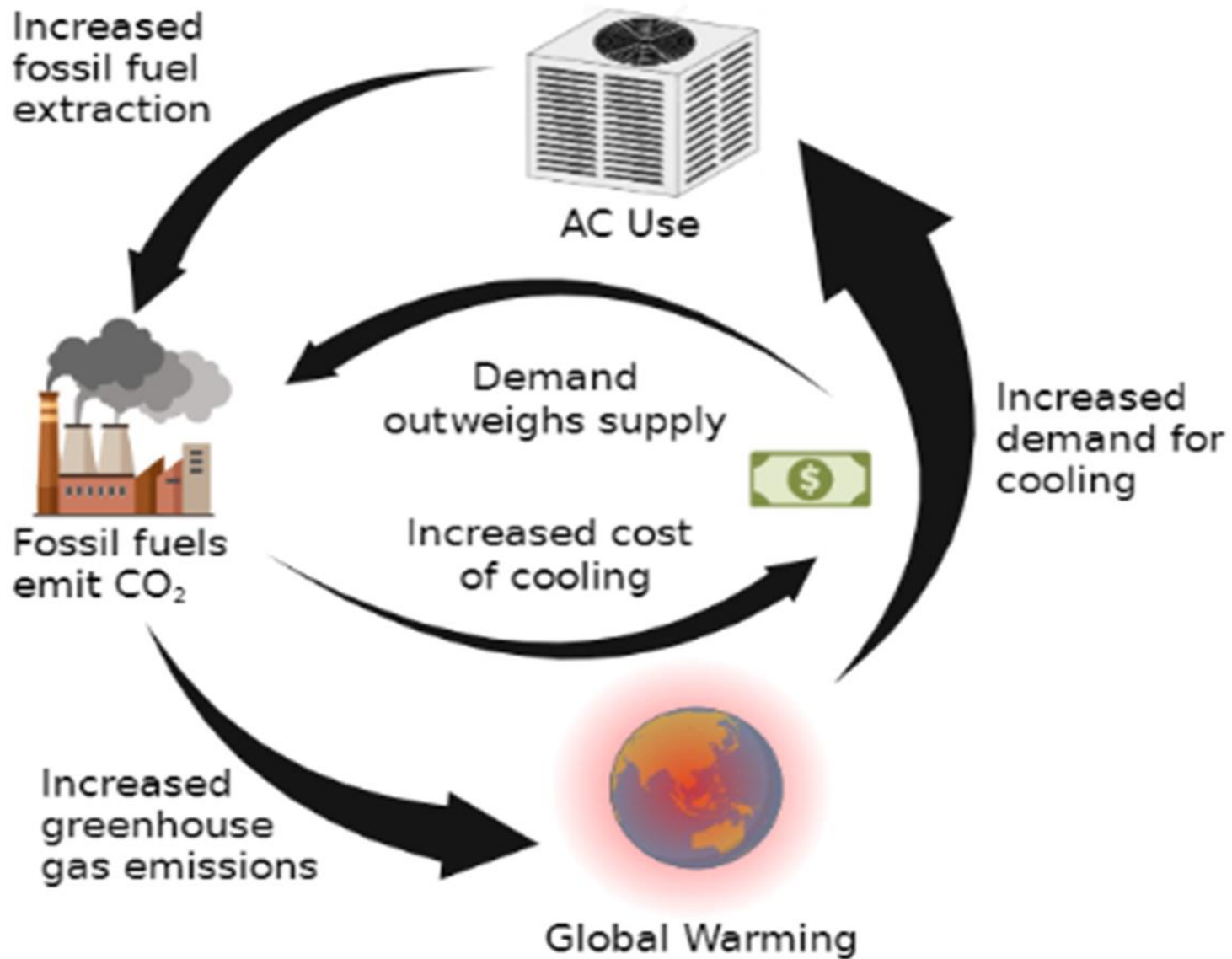


Heat-health guidelines

Top 20 Advice

- 1 Drink plenty of water
- 2 Wear light-coloured, loose clothing, made from natural fibres
- 3 Stay inside with air conditioning if you have it.
- 4 Wear sunscreen, a wide-brimmed hat, sunglasses
- 5 Seek shade where possible, stay out of the sun and minimise the time you spend in the sun between 10 am and 3 pm or 11-5.
- 6 Cool your house by closing windows and shutting curtains and blinds during the day.
- 7 Avoid alcoholic, hot, or sugary drinks including tea and coffee and caffeine.
- 8 Limit physical activity especially during hottest part of the day
- 9 Take cool showers or baths or put your feet in cool water
- 10 Take care of others, particularly elderly friends, neighbours, and relatives
- 11 Use fans if you have don't have air conditioning
- 12 Don't leave pets or children in parked vehicles - even with the windows open
- 13 Drink cold drinks and eat smaller cold meals such as salads and fruits/ avoid hot or spicy food/meals
- 14 Drink water even if you do not feel thirsty
- 15 If you don't have air-conditioning spend the day somewhere that does - e.g. a shopping centre, cinema or library
- 16 If you go outside, carry a bottle of water with you
- 17 Keep yourself cool
- 18 Talk to your GP about how much water you should drink in hot weather, especially if they normally limit your fluids
- 19 If safe, open windows at night to let cool air in
- 20 Put wet packs or cool packs or cool wet towels on your arms or neck

Accessible and sustainable cooling strategies



Electric fan use

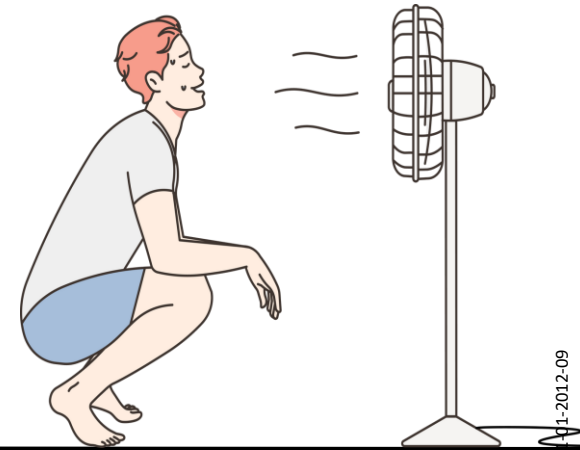
Uses less than
5% of energy
compared to AC



Could reduce
greenhouse gas
emissions by 76%
compared to AC



Could lower heat
and heart strain



Skin wetting

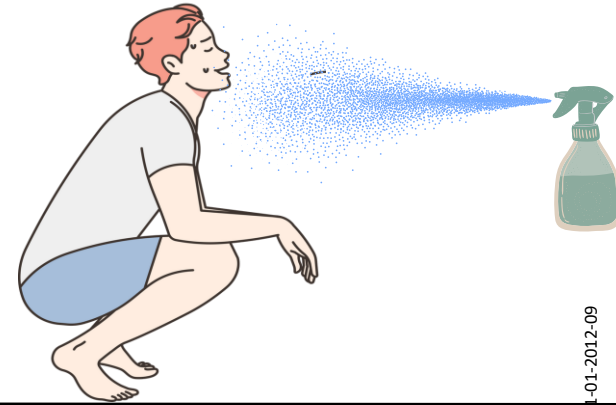
Can provide evaporation in dry environments



Reduces the temperature of the skin and prevents dehydration



Could lower heat and heart strain



Accessible and sustainable cooling strategies



Sustainable and accessible ways to keep cool

Mitigating climate change is vital, but inevitable rising temperatures means that identifying sustainable cooling strategies is also important. Strategies at the individual scale that focus on cooling the person instead of the surrounding air can be effectively adopted, even in low-resource settings.



- + Can provide effective cooling for young healthy adults up to 42°C in 50% humidity
- Effectiveness is reduced with low humidity, and in older adults (>65 years), unless accompanied by self-dousing
- Increases dehydration, but can be offset by drinking an extra glass of water per h



- + Can reduce heat strain and dehydration up to 47°C if dousing is sufficient to keep the skin wet
- + Can be used during power outages
- Low compatibility with high clothing coverage



- + Can reduce dehydration and thermal discomfort in hot and humid conditions
- + Can be used during power outages
- Risk of slips and falls

** Feet immersed above the ankles in 20°C water*



- + Provides high evaporative heat loss without needing to sweat
- + Can be used during power outages
- Clothing must be re-soaked roughly every 60 min



Electric fans can be used below these temperatures irrespective of humidity:

39°C

Healthy young adults (aged 18 to 40 years)

38°C

Healthy adults (aged over 65)

37°C

Over 65s taking anti-cholinergic medication

Evaporative coolers



- + Can cool air temperatures in dry conditions
- Minimal effect in high humidity
- Risks creating mosquito breeding sites without proper maintenance

Misting fans



- + Lowers air temperatures in hot and dry conditions
- Must be used in well ventilated or outdoor areas otherwise humidity increases offset any benefit
- Risk of slips and falls

Ice towels*



- + Can reduce core temperature and cardiovascular strain in conditions up to 45°C
- Requires access to ice
- Labour-intensive to prepare

* Crushed ice wrapped in a damp towel applied to the neck and chest

Cold water ingestion



- + Can provide internal cooling
- + Water should be ingested at a temperature that is most palatable (~10°C) to ensure optimal hydration
- If person has already started sweating, not effective at lowering core temperature

Read the full paper: Jay O, Capon A, Berry P, et al. Reducing the health effects of hot weather and heat extremes: from personal cooling strategies to green cities. *The Lancet* 2021. Published online August 19

Can Heat be Protective?

**Improve resilience
to the heat**

**Reduce the risk of
cardiovascular disease**



**Reduce the risk of
a heart attack**

**Improve overall
cardiovascular health**

Exercise in the heat – How hot is too Hot?



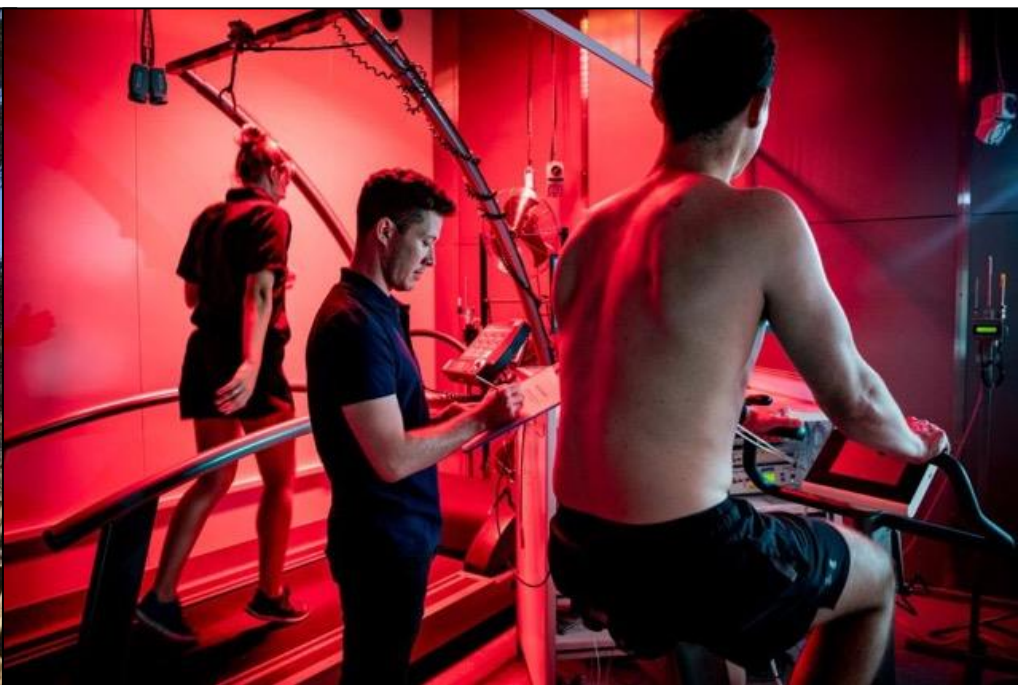
- Early in the morning or late in the evening
- Reduce the amount of time or the exercise intensity
- Plan not to exercise on very hot days
- If possible, use an air-conditioner or have a cold shower

What about medication?



**Some medications may
make your symptoms in
the heat more noticeable**

What's Next?



Acknowledgements

Montreal Heart Institute



Heat and Health Research Incubator



SOLVE CHD

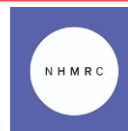


SOLVE – CHD



@GeorgiaKatec
@SolveChd

Fonds de recherche
Santé



SOLVE CHD



INSTITUT DE
CARDIOLOGIE
DE MONTRÉAL

AFILIÉ À
Université
de Montréal