Health Canada Santé Canada

Canada

Health Impacts and Vulnerabilities from Extreme Heat

Peter Berry Ph.D.
Climate Change and Innovation Bureau
Safe Environments Directorate
Health Canada

Making the Links
Climate Change and Health Symposium
Nov 5-6, 2018

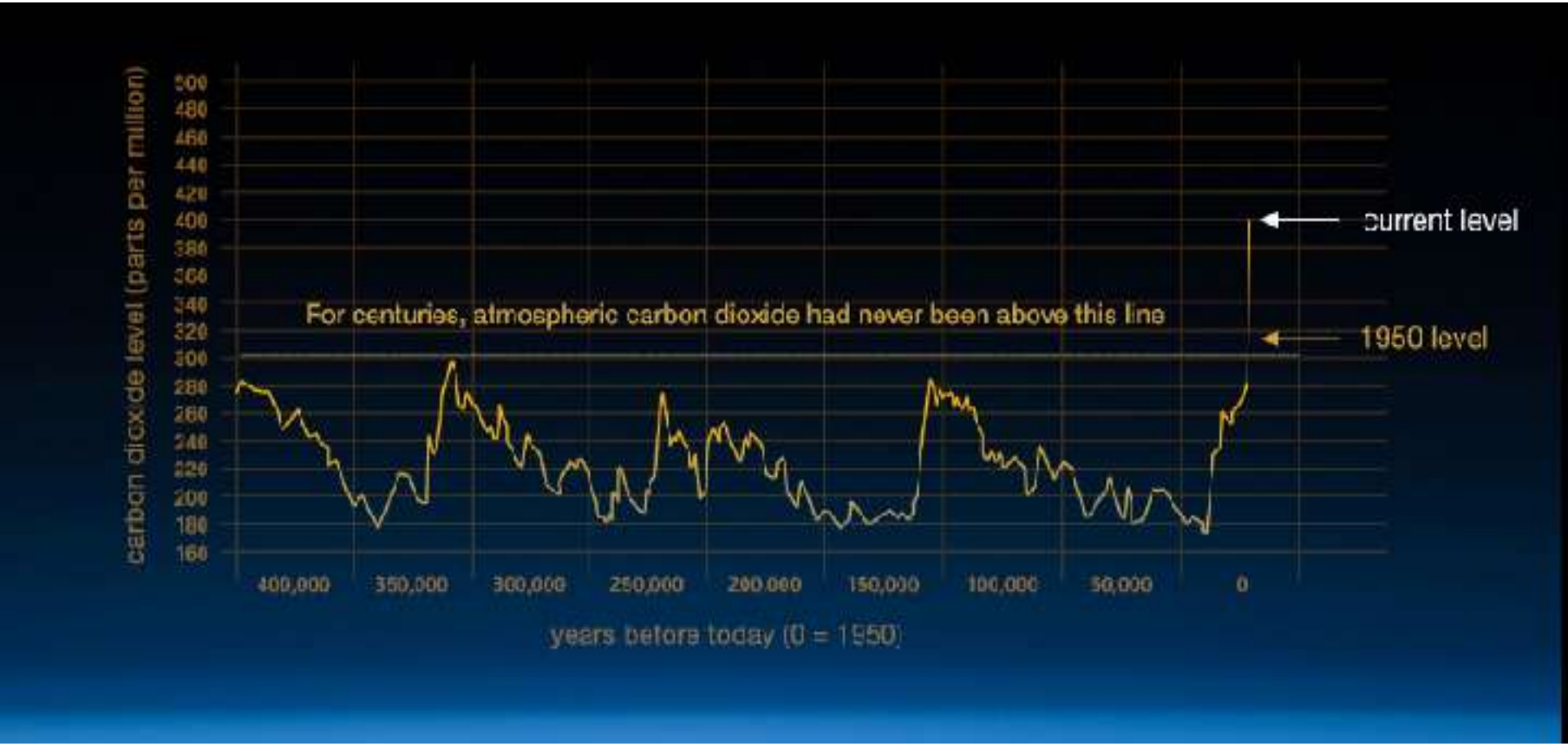
YOUR HEALTH AND SAFETY... OUR PRIORITY.

Presentation Overview

- Canada's Warming Climate
- Heat as a Health Concern to Canadians
- Vulnerability Factors and Implications for Adaptation

OUR WARMING CLIMATE

Rapid Increases in Atmospheric CO_2 Since the Industrial Revolution



NASA, 2018 https://climate.nasa.gov/evidence/

UN: Three-Year Hot Streak "Existential Threat to Planet"

"Confirmation today that we have now had a three-year streak of record hot years, each above 1 degree Celsius, combined with record-breaking economic losses from disasters in 2017 should tell us all that we are facing an ***existential threat to the planet*** *which requires a drastic response. We are getting dangerously close to the limit of the two-degree Celsius temperature rise set out in the Paris Agreement and the desired goal of 1.5 degrees will be even more difficult to maintain under present levels of greenhouse gas emissions."*

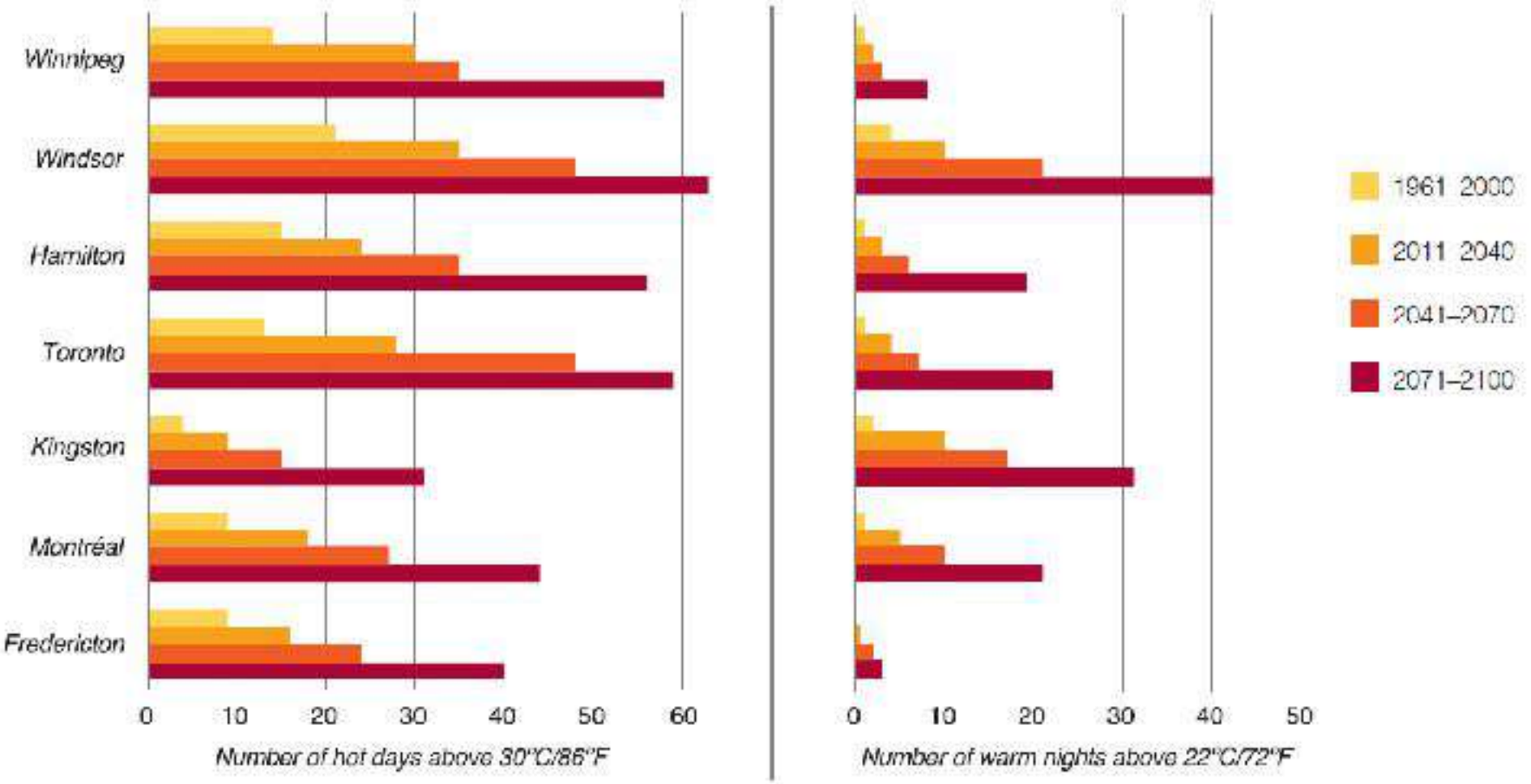
Mr. Robert Glasser, Special Representative of the UN Secretary-General for Disaster Risk Reduction

https://reliefweb.int/report/world/un-three-year-hot-streak-existential-threat-planet

"Temperatures we used to record in June and July are now being recorded in March," Pakistan's weather agency says

http://www.dailyclimate.org/pakistans-shocking-spring-heat-drives-up-water-use-2573890392.html?utm_source=EHN&utm_campaign=e559c98ed4-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_8573f35474-e559c98ed4-99011013

Heat Events will Increase in Canada



Adapted from Casati and Yagouti, 2010

Some Regions will Get Hotter Quicker

Jeong et al., 2014

Extreme hot spell events will increase implying considerable heat related environmental and health risks

HEAT IS A HEALTH CONCERN FOR CANADIANS

Extreme Heat in Canadian Communities

A 2009 extreme heat event in British Columbia contributed to 156 excess deaths in the province's lower mainland area. (Kosatsky, 2010)

An extreme heat event in 2010 in Quebec resulted in an estimated excess of 280 deaths (Bustinza et al., 2013)

Extreme heat event in Quebec in 2018 resulted in over 90 deaths

Heat-Health Vulnerability

Heat-health vulnerability – is the degree to which an individual or community is susceptible to, or unable to cope with, extreme heat conditions

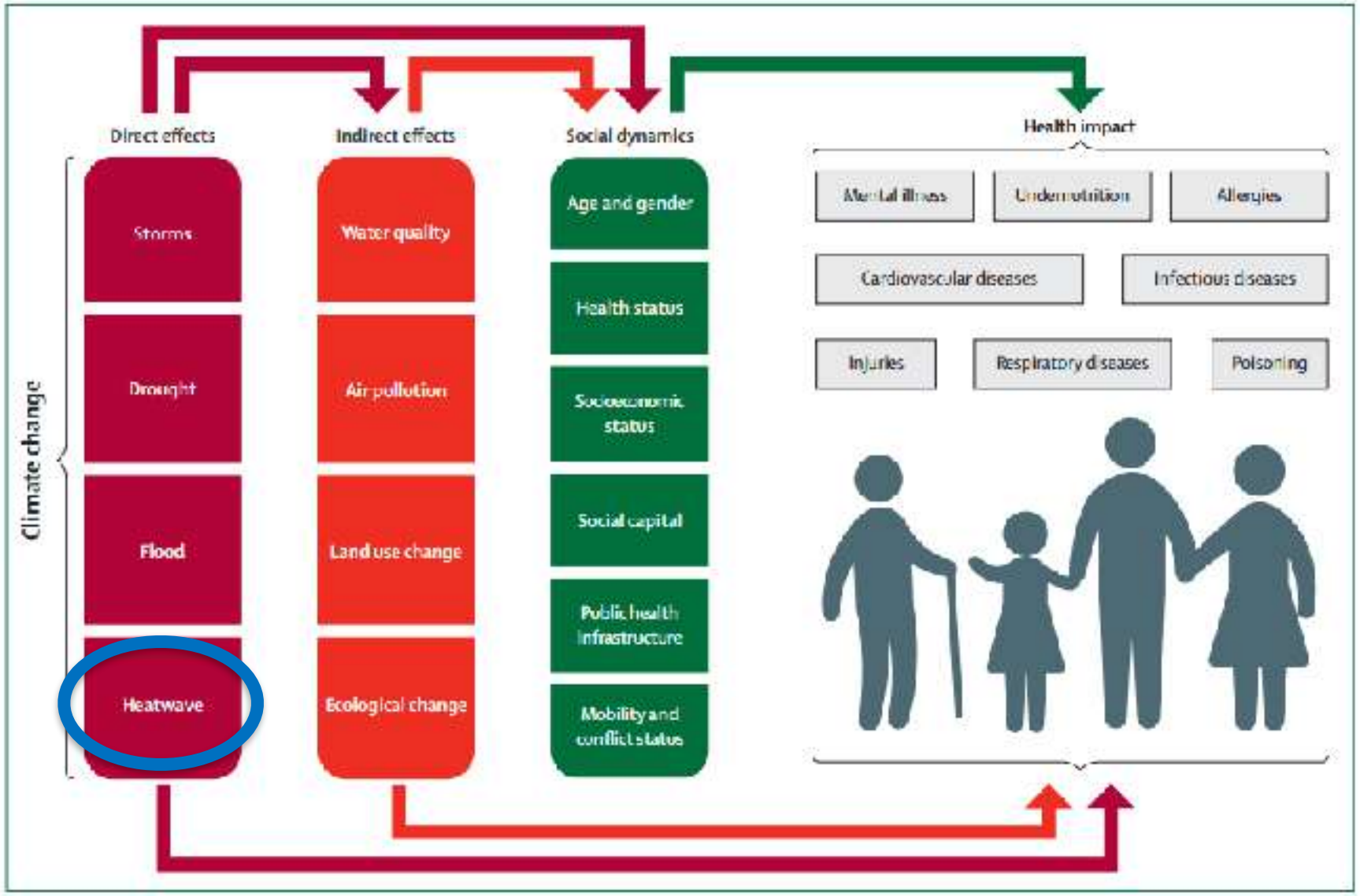
- Exposure
- Sensitivity
- Adaptive capacity

Risks to Health from Heat Will Increase

- Climate change has contributed to increased heat-related mortality
- Even if climate change is below 2°C there could be a substantial increase in the occurrence of deadly heatwaves in cities

IPCC Special Report on Global Warming of 1.5°C
http://www.ipcc.ch/report/sr15/

Heat is a Key Climate Change Health Risk



Source: Lancet Commission report on health and climate change (2015)

Heat Health Risks Affect Many Canadians and Society

Vulnerable Populations

Occupational Health and Productivity

Impacts on Health Facilities and Health Systems

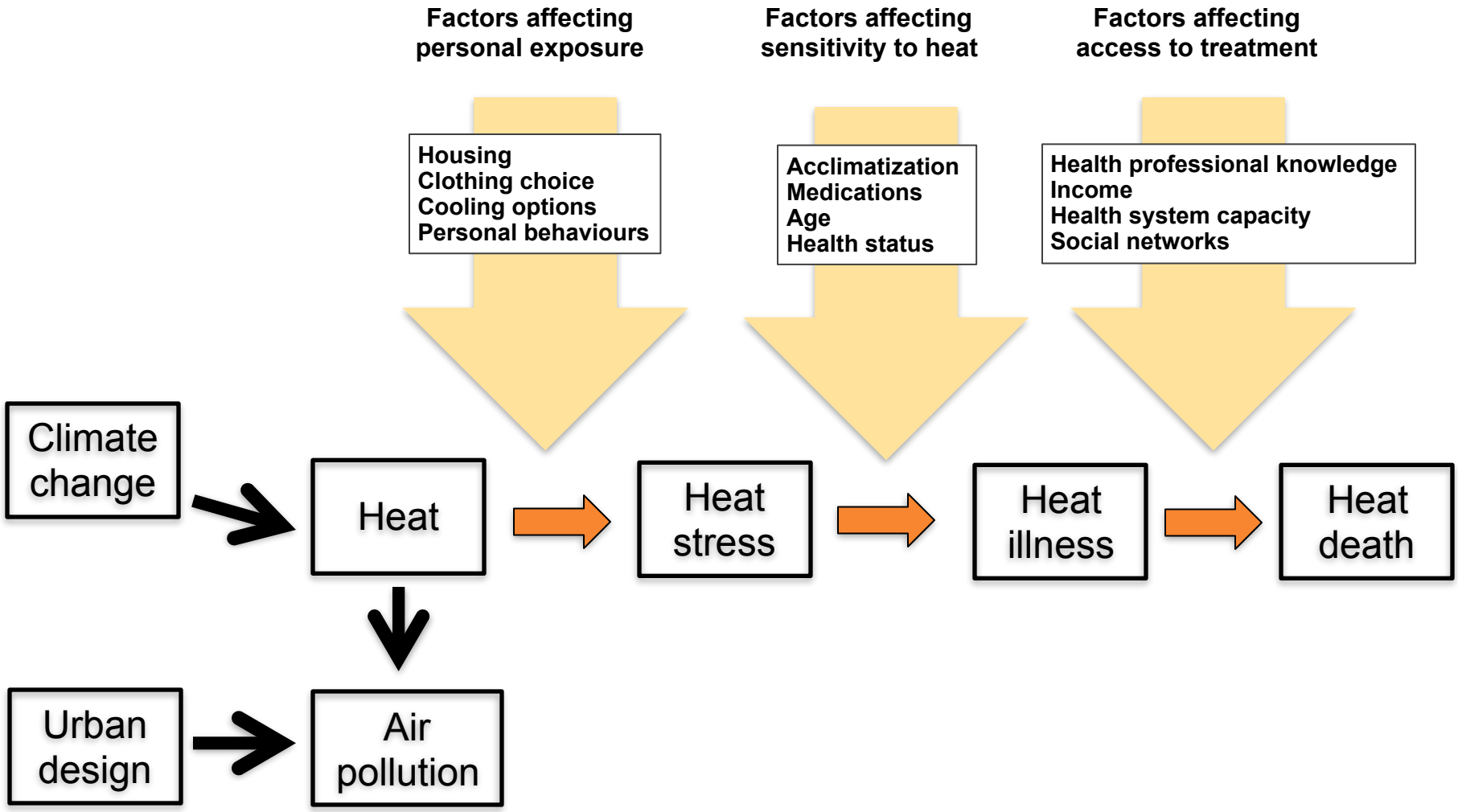
Heat / Air Pollution Synergistic Impacts

Heat-Health Vulnerability Assessments

Factors increasing vulnerability

- Physical characteristics (e.g. reduced thirst sensation, sweating ability)
- Behavioural characteristics
- Environmental exposure
- Chronic conditions
- Taking certain medications
- Social isolation
- Dependence on caregiver
- Language & literacy barriers
- Increased physical strain

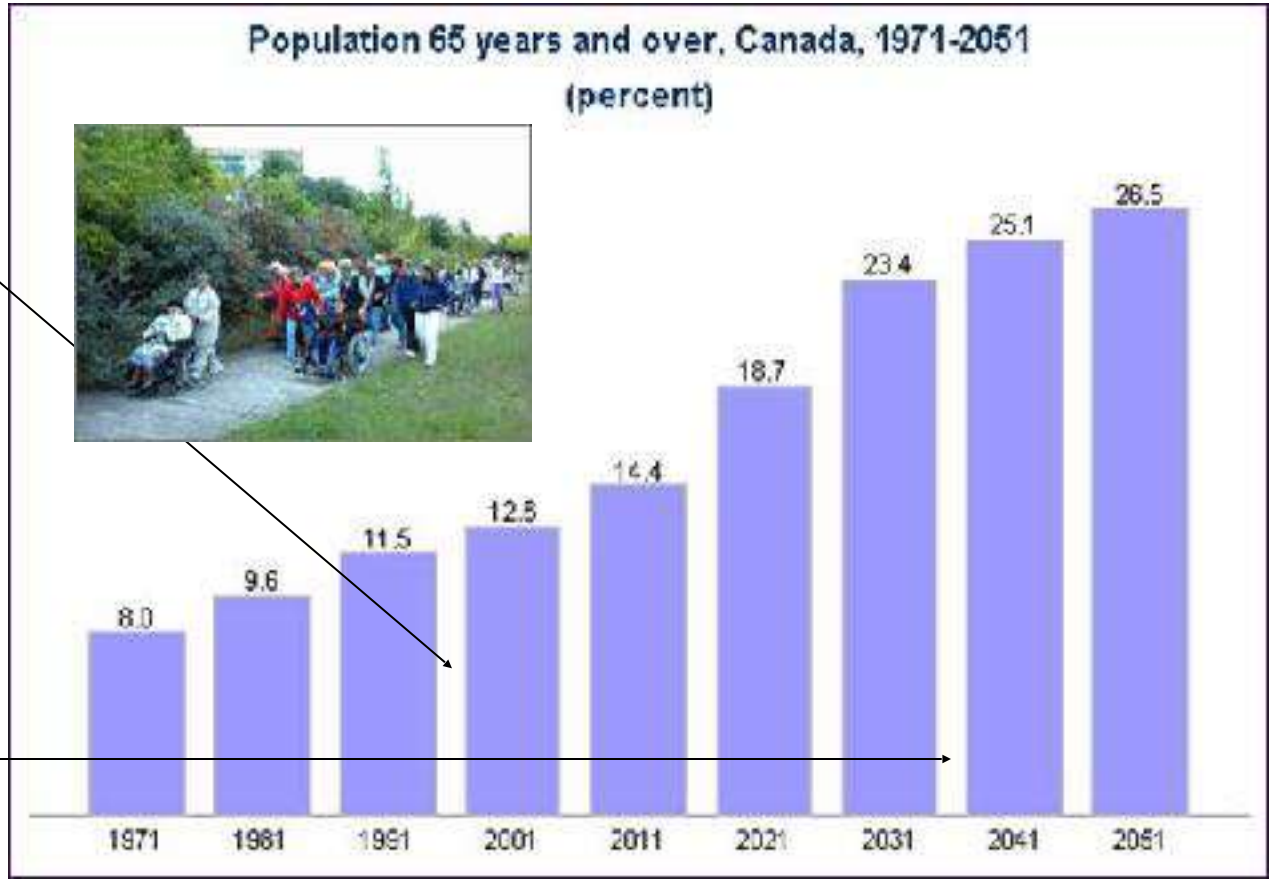
Heat


Factors affecting personal exposure
Factors affecting sensitivity to heat
Factors affecting access to treatment
Housing
Clothing choice
Cooling options
Personal behaviours
Acclimatization
Medications
Age
Health status
Health professional knowledge
Income
Health system capacity
Social networks
Climate change
Heat
Heat stress
Heat illness
Heat death
Urban design
Air pollution

3 Assess future health risks associated with extreme heat events

2009 – seniors 13.9% of population

2036 – seniors 25% of population



Source: Statistics Canada, 2010

Urban and rural characteristics that increase vulnerability to climate change and climate-related impacts

Key Vulnerability Factors	Examples of Urban Characteristics	Examples of Rural Characteristics
Exposure -Geography Land use Climate	○ Complex infrastructure, high density buildings and landscape dominated by impervious surfaces ○ Higher population density ○ Higher air pollutant levels	○ Increased health risks from water contamination due to a high reliance on small drinking water systems ○ More people employed in outdoor occupations ○ Higher risk of exposure to land shifts, wildfires, vector borne diseases and floods
Individual Sensitivity -Age and Gender -Health Status	○ Ageing population ○ Cardiovascular and respiratory conditions in large urban centers from air pollution and extreme heat	○ High elderly population and high incidence of chronic illnesses, smoking and obesity
Key Adaptive Capacity Factors -Socio-economic Status -Public Services and Risk Communication Programs Employment	○ Greater prevalence of high risk population groups, with limited adaptive capacity (e.g. low socio-economic status) ○ Higher prevalence of social isolation and limited access to services (e.g., immigrants, First Nations, homeless or persons of low income or mental illnesses) ○ High reliance on critical infrastructure for health care and emergency service provision that are vulnerable to extreme weather	○ Limited access to services during extreme events (e.g., power, water, food, medical) ○ Limited availability and accessibility of public services and programs and communication venues to deliver health and emergency messages ○ High dependency on natural resources that are vulnerable to disruption from extreme weather ○ Lower proportion of population highly educated ○ Limited livelihood and economic diversification ○ Limited resources and services to respond to extreme weather events and associated health burdens ○ Limited service access in remote communities

(Berry et al., 2015)

Fire Disasters in Canada

- Northern Ontario, 2011
- Quebec, 2013
- British Columbia 2014, 2017, 2018
- Northwest Territories, 2014
- Saskatchewan, 2015
- Alberta – Fort McMurray 2015

"Global smoke related fatalities estimated at 339,000 per year" (Johnston et al., 2012)

Catastrophic Health Impacts Can Occur Where Health Systems are not Prepared

Russian Heat Wave 2010
> 55,000 deaths

European Heat Wave 2003
> 70,000 deaths

Impacts that are caused by climate change
Base: Believe in climate change

	Definitely cause		Definitely or likely cause	
	Phone only (n=1379)	Phone & online (n=1751)	Phone only (n=1379)	Phone & online (n=1751)
Melting permafrost in the Arctic regions	58%	56%	89%	88%
Flooding of rivers and in coastal areas	47%	43%	83%	82%
Loss of wildlife habitat	45%	42%	79%	78%
More frequent storms	42%	41%	82%	82%
Impact to food supply	40%	36%	79%	76%
Extreme heat events or heat waves	39%	39%	83%	83%
Drought conditions	39%	38%	80%	81%
Coastal erosion	36%	35%	76%	75%
Forest fires	36%	34%	75%	72%
Physical health conditions of Canadians	20%	17%	52%	49%
Negative impacts on the economy/jobs	18%	16%	56%	51%
Mental health conditions of Canadians	11%	10%	40%	36%
Impact to health care availability	10%	10%	35%	32%

Environics, 2017

TOOLS AND INFORMATION FOR REDUCING HEALTH RISKS FROM EXTREME HEAT

Increasing Resiliency of Health Systems

- Climate-informed health planning
- Health and climate capacity development
- **Emergency preparedness and management**
- Vulnerability, capacity and adaptation assessment
- Integrated risk monitoring and early warning

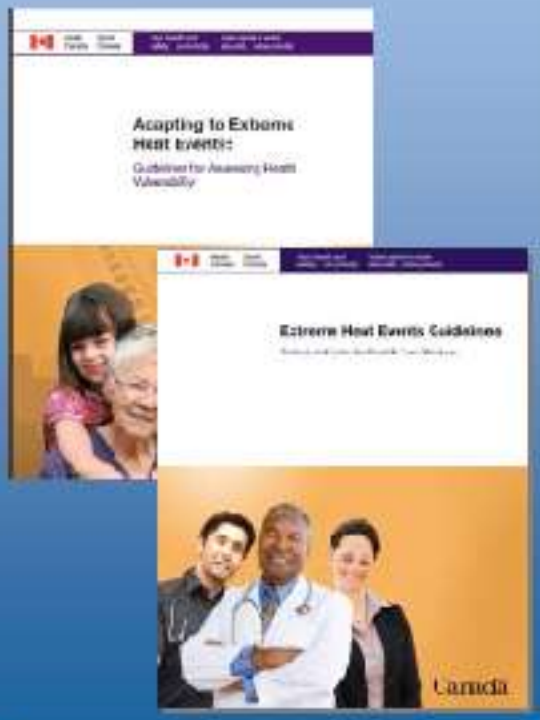
WHO, 2015

Resources from Health Canada

Communicating with the public

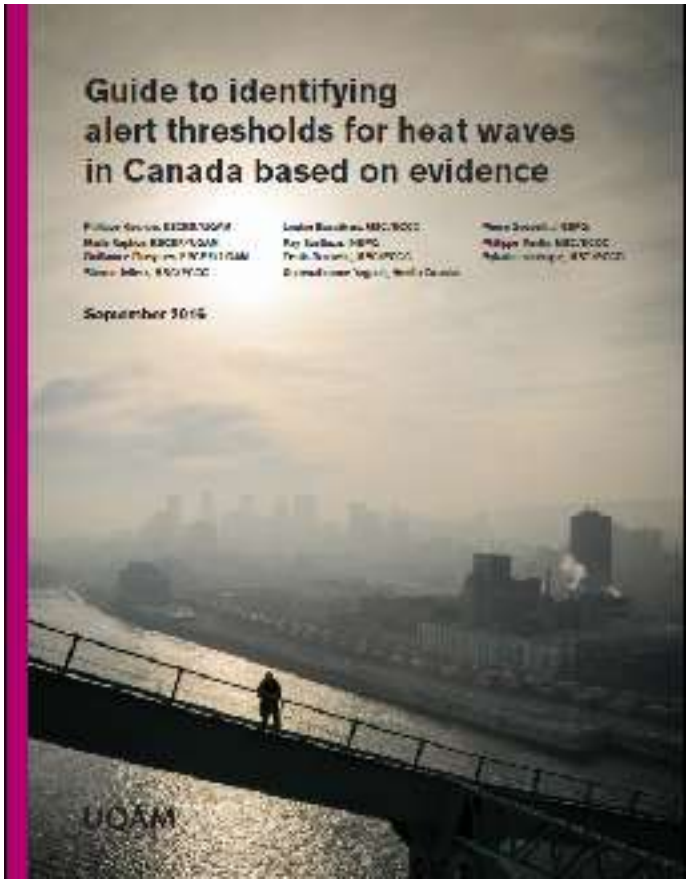
HARS Best Practices

Heat Adaptation Guidelines

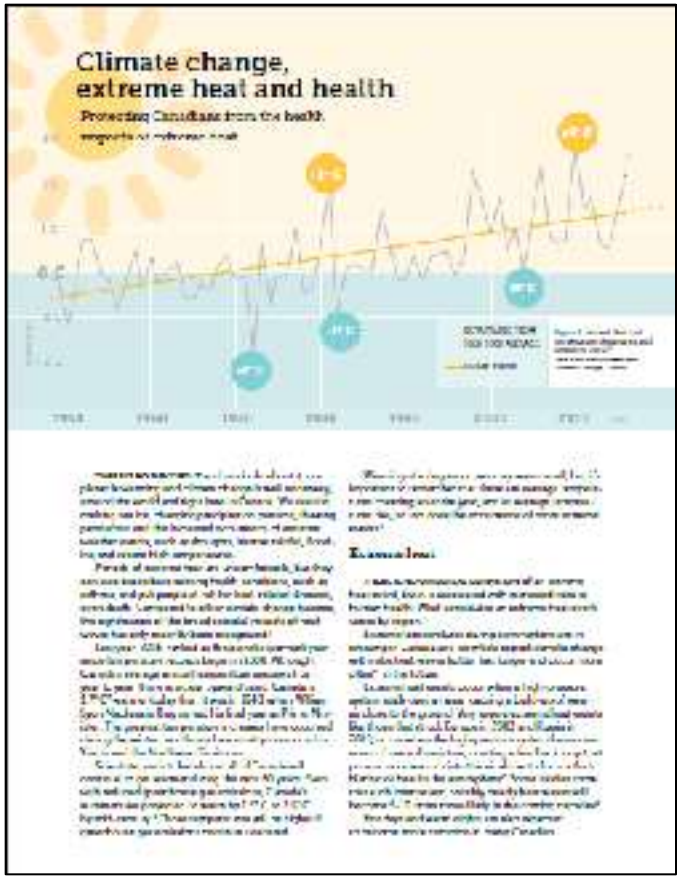


http://www.hc-sc.gc.ca/ewh-semt/pubs/climat/index-eng.php

Information to Support Decision Making



Guide to Identifying Heat Thresholds



http://sciencemediacentre.ca/site/?p=5646

Learning From Others – Cities Adapt to Extreme Heat

SURREY, BC

Mobilizing communities through sustainable long-term planning

The Science Adequate urban forest in cities can bring significant benefits to communities and help control the urban heat island effect

The Trigger Surrey is a rapidly growing city with approximately 12,000 new residents moving there every year. When development happens at such a fast pace, the urban forest cover also decreases quickly as trees are cleared to prepare the land for new constructions.

The Approach: Surrey developed a robust Street Tree Management Plan as well as a Shade Tree Management Plan.

The Outcome: Making trees a priority in Surrey allowed the city to plan for a future where a growing population is expected to face more extremely hot days. The priority on protecting trees in Surrey means that hard infrastructure sometimes needs to be planned differently

Guilbault et al., 2016

Cities Adapt to Extreme Heat: Celebrating Local Leadership

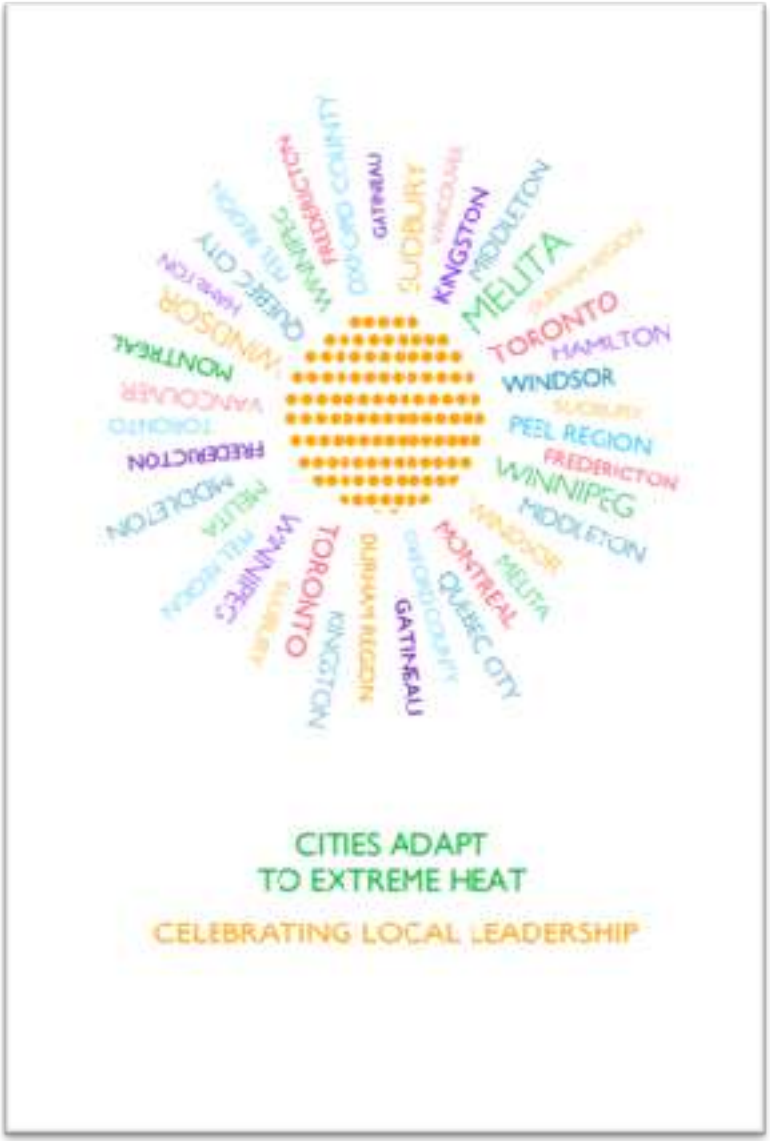
- Report produced by the Institute for Catastrophic Loss Reduction (ICLR) and Health Canada

- 20 case studies showcasing the leadership by Canadian municipalities and regions to reduce health risks from extreme heat events

- Case studies of HARS and preventative actions (i.e. reducing GHG emissions, reducing urban heat island effect, modify transportation policies, etc.) to adapt to extreme heat events

- Publication expected by the end of April and report will be available online on ICLR's website

http://www.iclr.org



Quebec SUPREME System

Methodology

Highly accessed

Open Access

An open source web application for the surveillance and prevention of the impacts on public health of extreme meteorological events: the SUPREME system

Steve Toutant[1], Pierre Gosselin[1,2,3*], Diane Bélanger[2,3], Ray Bustinza[1] and Sonia Rivest[4]

- open sourced web application system for surveillance and prevention of the health impacts of extreme weather events – including heat
- vulnerability variables include deprivation index, population density, age, housing conditions, landed immigrants, foreign language population, heat islands
- operated by provincial authority – INSPQ
- data available to regional and central public health authorities

http://www.ij-healthgeographics.com/content/10/1/39?fmt_view=mobile

Health of Canadians in a Changing Climate: Advancing Our Knowledge for Action
2021

https://www.nrcan.gc.ca/environment/impacts-adaptation/21189

Special Issue "Climate Change and Health Vulnerability and Adaptation Assessments"

- Special Issue Editors
- Special Issue Information
- Keywords
- Published Papers

MDPI

A special issue of *International Journal of Environmental Research and Public Health* (ISSN 1660-4601). This belongs to the section "Environmental Health".

http://www.mdpi.com/journal/ijerph/special_issues/climate_change_vulnerability

Thank You

Peter Berry Ph.D.
Climate Change and Innovation Bureau
Safe Environments Directorate
Health Canada
Peter.Berry@canada.ca

Adjunct Assistant Professor
Faculty of Environment
University of Waterloo
pberry@uwaterloo.ca