Climate, Health & Sustainable Care

Inaugural Symposium

UNIVERSITY OF TORONTO

COLLABORATIVE CENTRE FOR Climate, Health + Sustainable Care

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Life, Death, and Urban Health under Climate Change:

What can we learn from community narratives and data science in preventing premature mortality?

Laura Rosella, Inori Roy, Kim Perrotta

Moderator: Edward Xie

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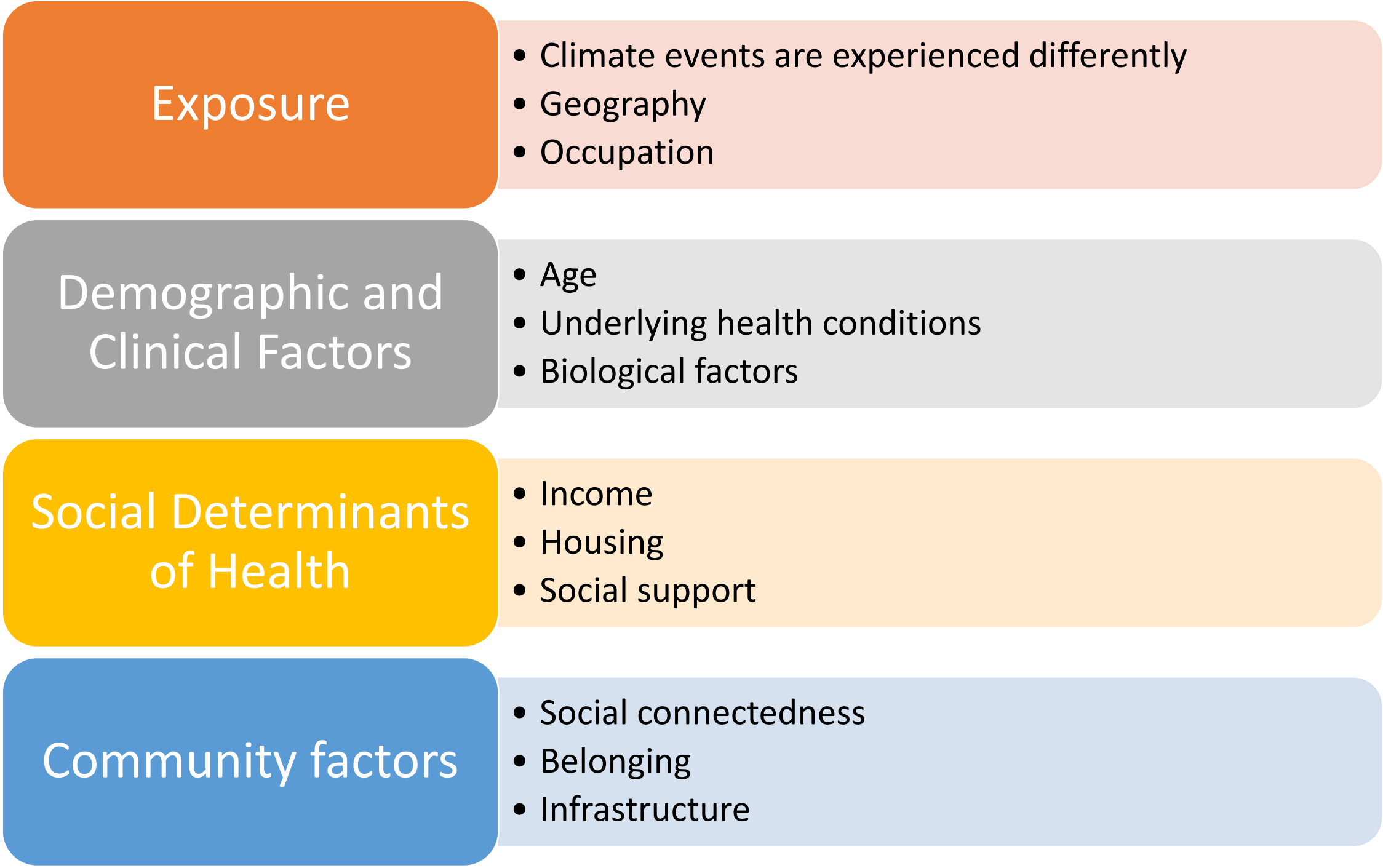
Life, Death, & Urban Health Under Climate Change

Laura C. Rosella, PhD
Professor, Dalla Lana School of Public Health
University of Toronto

Climate, Health & Sustainable Care Symposium
October 22, 2024

Climate Change Impact

Climate Change and Population Health


Exposure
• Climate events are experienced differently
• Geography
• Occupation
Demographic and Clinical Factors
• Age
• Underlying health conditions
• Biological factors
Social Determinants of Health
• Income
• Housing
• Social support
Community factors
• Social connectedness
• Belonging
• Infrastructure

The critical significance of data and analytics

Surveillance and risk assessment

Forecasting and modelling

Effectiveness of interventions and climate policies

Predicting the Health Co-Benefits of Climate Change Mitigation Strategies on Premature Mortality in Canadian Cities

Air Pollution Reduction and Premature Mortality Incidence

Aim: To develop a population-based, premature mortality risk prediction tool for Canadian cities. This tool will support health planning and help evaluate the impacts of premature mortality interventions in urban centers.

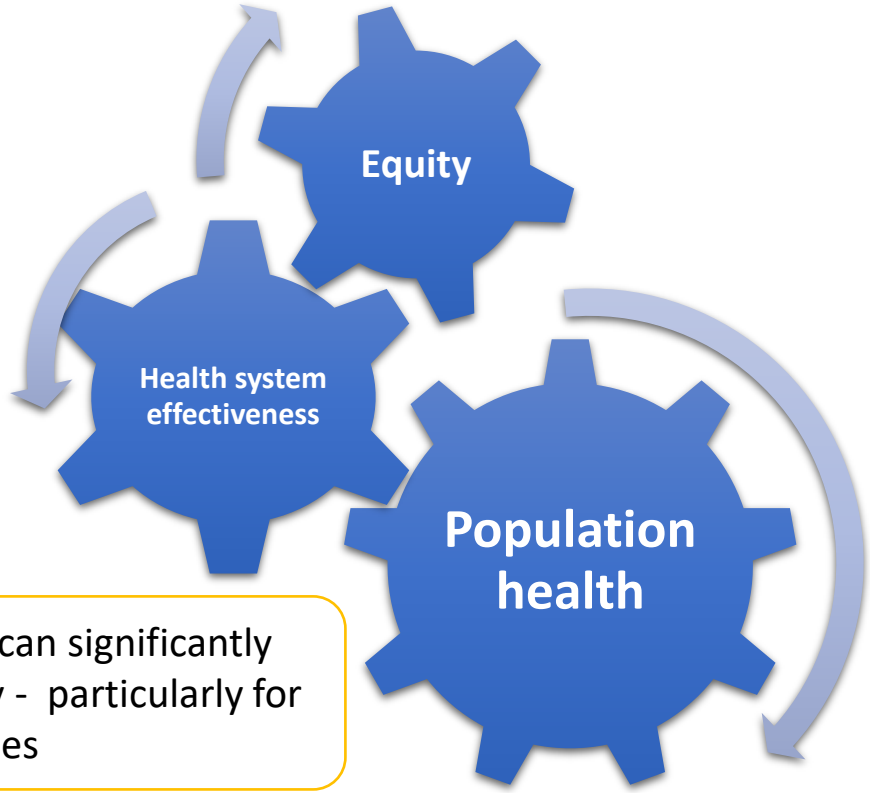
- ❑ **Climate Change and Cities:** Increasing climate-related risk for urban populations
- ❑ **Social Inequities:** Unequal distribution of risk among the population
- ❑ **Urban Data:** Meeting demand for analytic and decision-support health tools
- ❑ **Precision Public Health:** Harnessing data to proactively manage population health

Chiodo S, Pagalan L, Hurst M, O'Neill M, Stylianou H, Diemert LM, Chen H, Jeffrey R. Brook, Andy Hong, and Rosella LC.
Measuring the Health Co-Benefits of Air Pollution Interventions on Premature Deaths in Canadian Cities
Journal of City Climate Policy and Economy 2024 2:3, 428-464

Why look at *premature deaths*?

Reduction in premature mortality is one of the UN Sustainable Development Goals

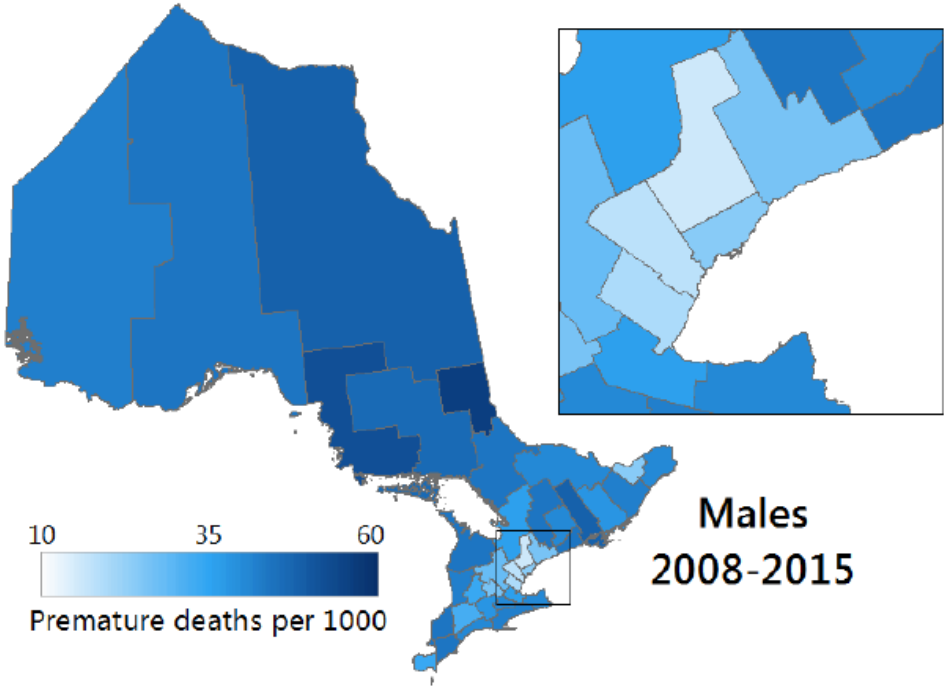
Who is getting left behind?

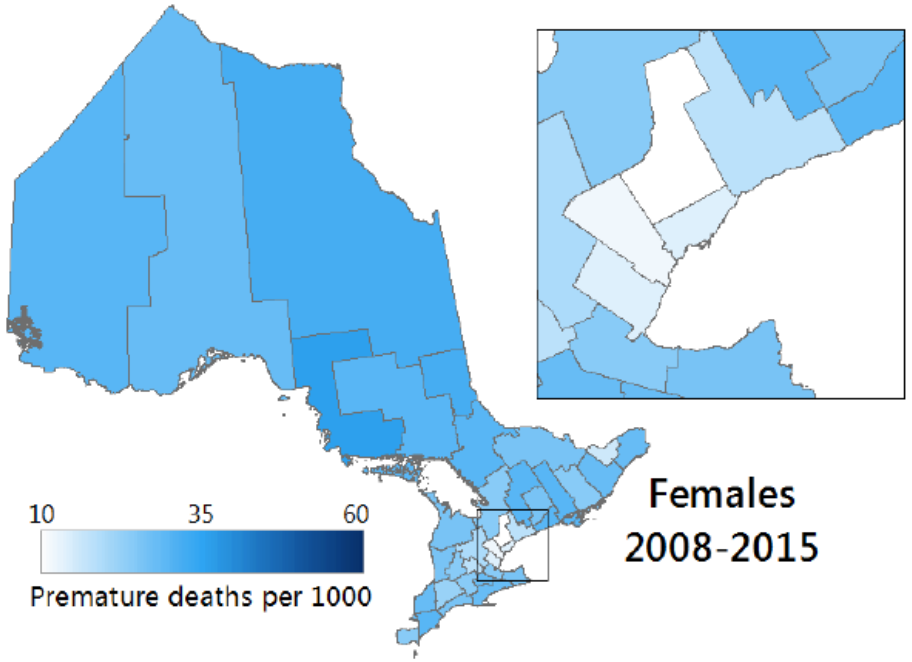


Many deaths can be prevented through effective public health and preventive care

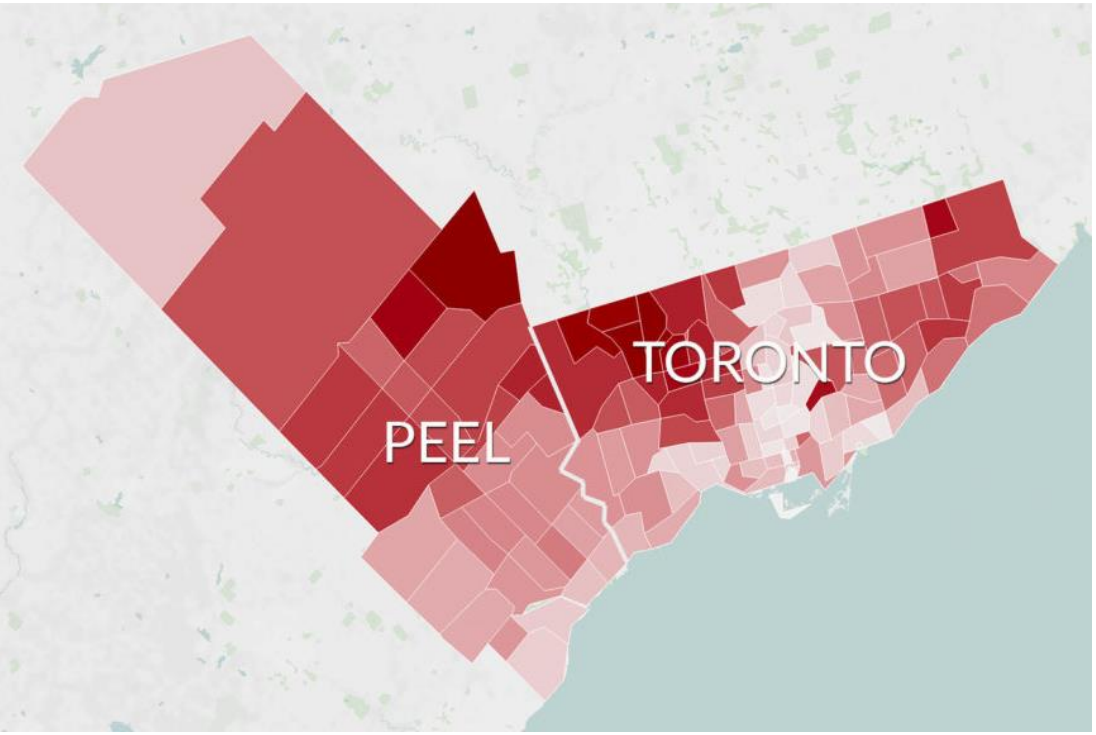
Health care interventions can significantly delay premature mortality - particularly for non-communicable diseases

Geographic variation of premature mortality in Ontario





https://pophealthanalytics.com/reports/



BMJ Public Health

Development and validation of a population-based risk algorithm for premature mortality in Canada: the Premature Mortality Population Risk Tool (PreMPoRT)

Meghan O'Neill,[1] Mackenzie Hurst,[1] Lief Pagalan ,[1] Lori Diemert,[1] Kathy Kornas,[1] Stacey Fisher,[1] Andy Hong,[2] Doug Manuel ,[3] Laura C Rosella [1]

Scenario Simulation Objective

Simulate various air pollution reduction scenarios to estimate potential reductions in premature mortality in Canadian cities

Air Pollution Variables

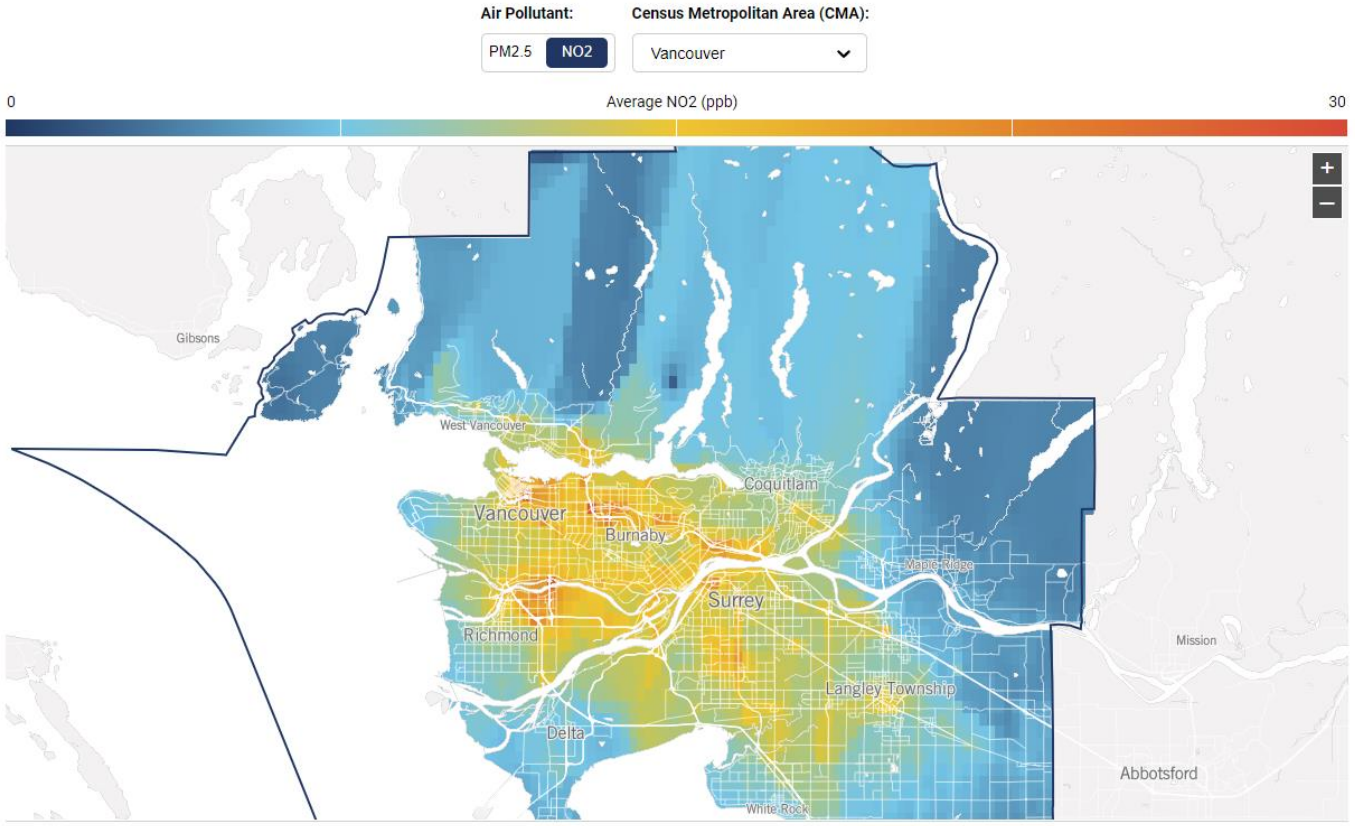
Fine Particulate Matter ($PM_{2.5}$)

Nitrogen Dioxide (NO_2)

Ozone (O_3)

Canadian Council of Ministers of the Environment (CCME) Canadian Ambient Air Quality Standards (CAAQS)

How reducing air pollution could extend thousands of lives



https://schoolofcities.github.io/air-pollution-and-premature-mortality

Total lives saved by reducing air pollution

SCHOOL OF CITIES

Summed for 31 Census Metropolitan Areas (CMAs) in Canada

Lives saved by reducing air pollutant levels to air quality standard targets
930

Lives saved with a 10% reduction + capping at the ambient air quality standards
2,145

Lives saved with a 25% reduction + capping at the ambient air quality standards
3,953

Lives saved with a 50% reduction + capping at the ambient air quality standards
6,545

Select Air Pollutants: PM2.5 and NO2

Select Sex: All

Census Metropolitan Area: Toronto

Select Air Pollutants: PM2.5 and NO2

Select Sex: All

Scenario	Predicted Premature Deaths *Per 100,000 People*	Estimated Lives Saved
Existing Conditions	3,200	
Reducing air pollutant levels to air quality standard targets	3,180	20
10% reduction + capping at the ambient air quality standards	3,160	40
25% reduction + capping at the ambient air quality standards	3,140	60
50% reduction + capping at the ambient air quality standards	3,100	100

Figure 1: Building Blocks of Resilient Cities

Social Connections

Cities have a critical role in supporting and building social connections, which underpin health system resilience

Local organizations

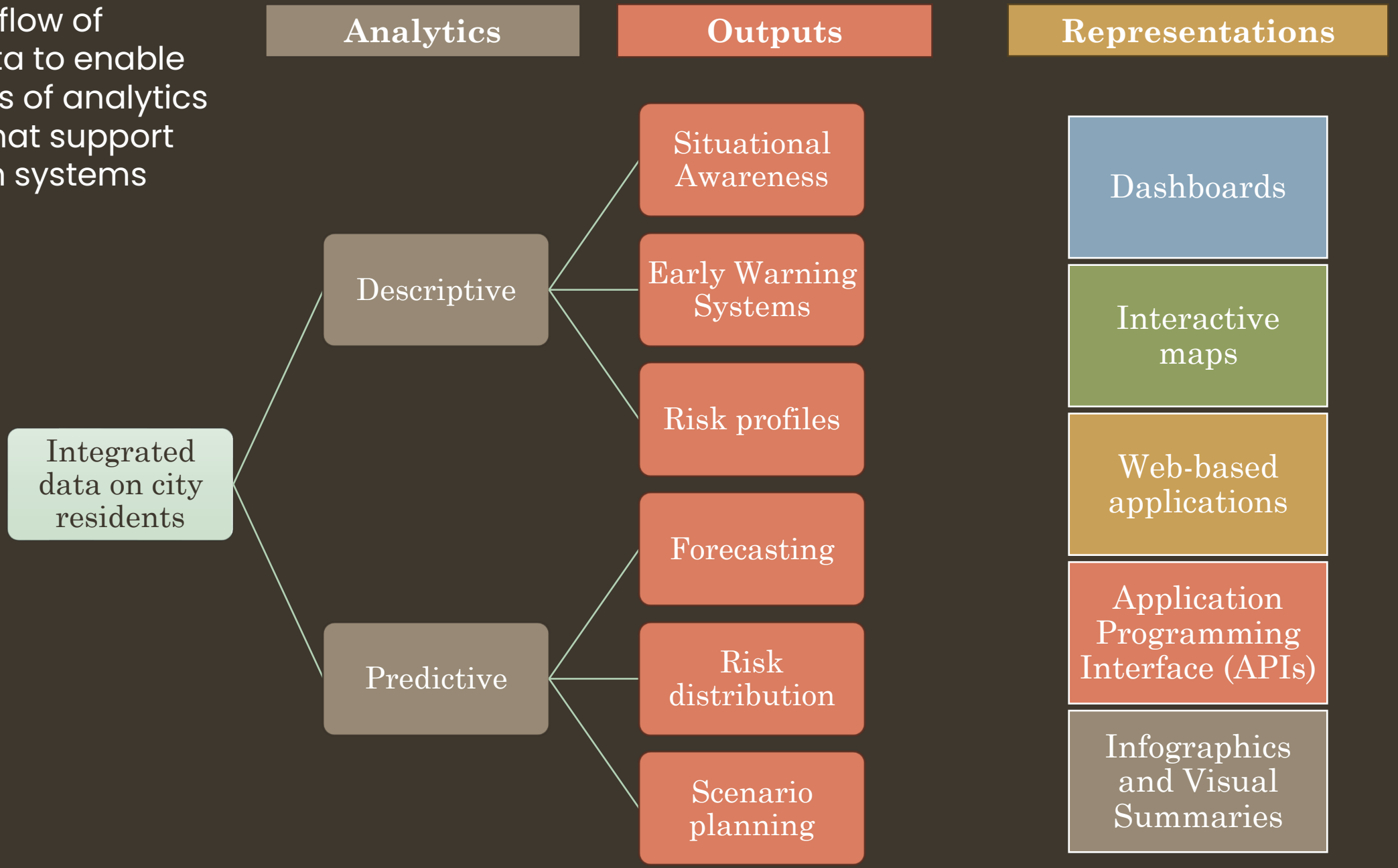
City government, local health system organizations and community-based organizations are pivotal in enabling an equitable and effective response and longer-term rebound

City Infrastructure

Robust physical infrastructure is needed in flexible ways before, during and after health threats

Rosella, L.C., 2024. Enabling health system resilience through resilient cities. In *Handbook of Health System Resilience* (pp. 113-127). Edward Elgar Publishing.

Figure 3: Workflow of integrated data to enable multiples types of analytics and outputs that support resilient health systems



Rosella, L.C., 2024. Enabling health system resilience through resilient cities.
In *Handbook of Health System Resilience* (pp. 113-127). Edward Elgar Publishing.

Summary

Climate change is an urgent & serious public health issue

The impact of climate change is especially significant for preventable mortality

The health-related hazards from climate change will increase health inequities

Data and analytic tools can support prevention and mitigation strategies in cities

ISSUE 15 - SUMMER 2022

As Toronto Temperatures Rise, Inequalities Widen

GTA

How will Toronto hold up if — and, inevitably, when — a deadly heat wave like London's happens here?

We have short-term measures, but face the urban heat island effect, and many buildings lack air conditioning and are not designed to keep cool.

HEALTH

Toronto, Montreal among the deadliest cities for Canadian heatwaves, federal research suggests

When will this heat wave end in Toronto?

Hundreds died because they couldn't escape B.C.'s extreme heat. Alerts wouldn't have saved them, advocates say

Toronto

'Prolonged heat event' to bake the GTA this week

Heat warning in place as it will feel like 40 and above most days this week

CBC News · Posted: Jun 17, 2024 6:08 AM EDT | Last Updated: June 17

CANADA

As heat waves get hotter, experts warn against becoming 'air conditioned society'

By Brenna Owen • The Canadian Press

Posted June 25, 2022 9:29 am · Updated June 25, 2022 1:35 pm

16 Canadian cities projected to have the most extreme heat in the future: report

Sarah Anderson | Apr 23 2022, 2:21 pm

VANCOUVER | News

Western Canada's 2021 heat waves among most extreme on record, study shows

Summer arrives in Canada, and so does extreme heat. How to stay safe

By Aaron D'Andrea • Global News

Posted June 22, 2022 2:29 pm · Updated June 22, 2022 2:39 pm

Canada

Extreme heat days are overheating schools more often — and experts say it needs our attention

Too hot to handle: How to survive amid extreme heat and humidity

'It feels like Florida outside': Environment Canada

Low Carbon
tter-case scenario)

3x as many days of 30°+ weather by 2050

Average length of heat wave is 6 days.

High Carbon
(business as usual)

4x as many days, or 55 days a year of 30°+ weather

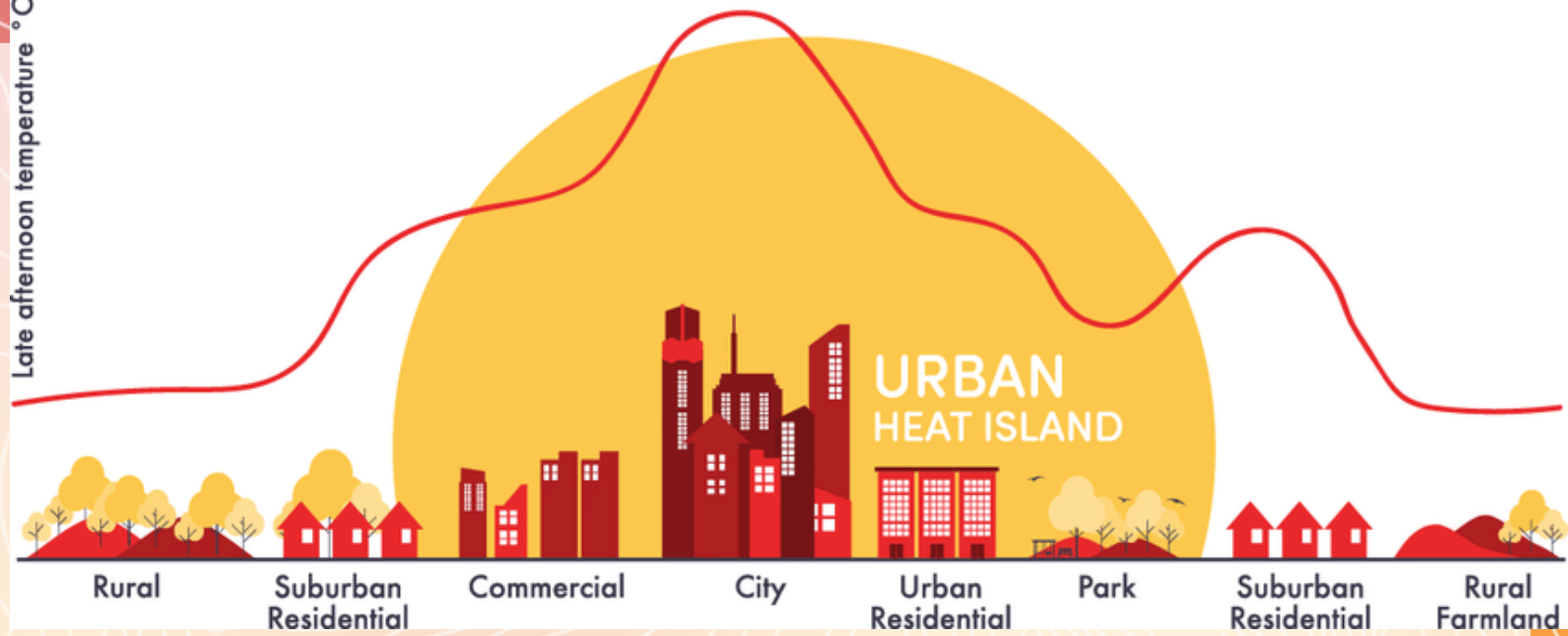
Average length of heat wave doubles, to 8 days.

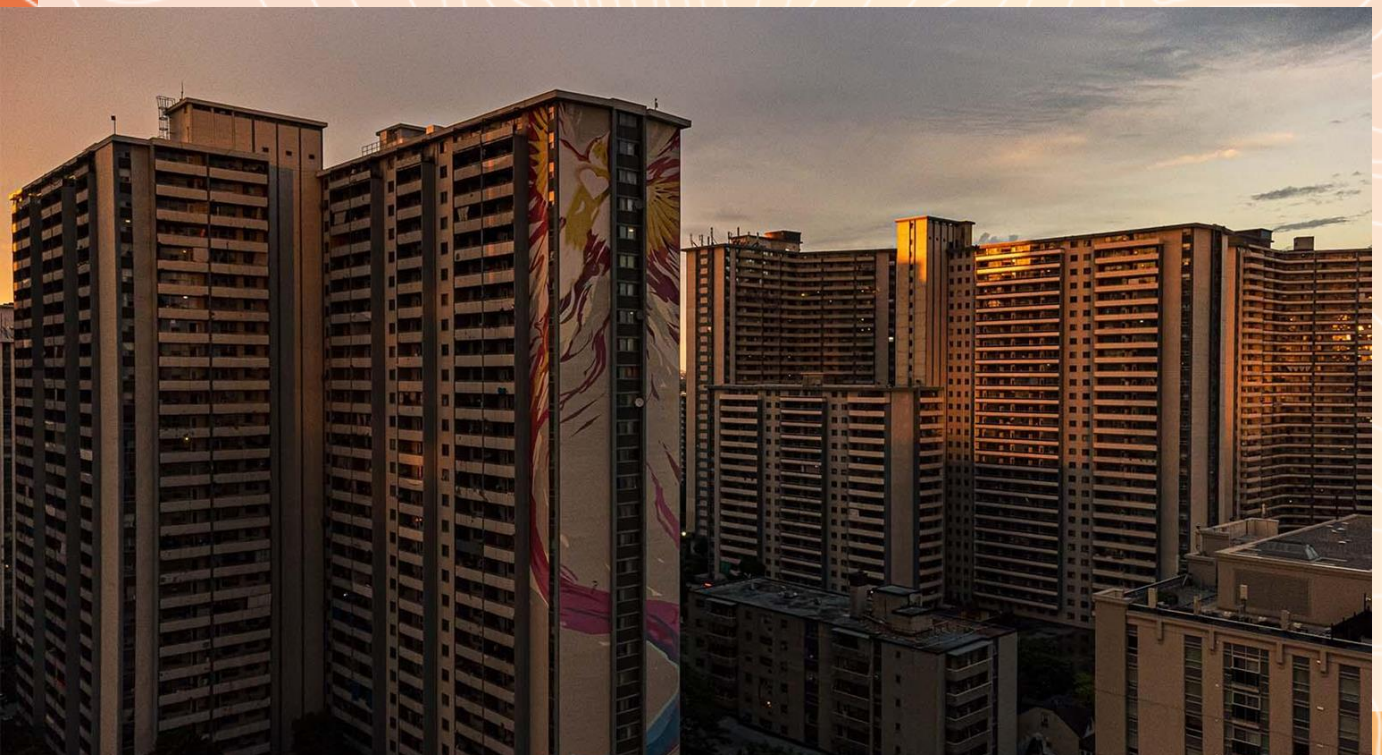
...with new, unexpected challenges to forecasting

Trees and land absorbed almost no CO2 last year. Is nature's carbon sink failing?

The sudden collapse of carbon sinks was not factored into climate models - and could rapidly accelerate global heating

Cities are not built equal.





You can’t control when a heat wave will strike, but you can control how people experience it.

Who's hurting?

- Seniors living in isolation or in LTC
- People with chronic illness or comorbidities
- Unhoused people

What helps?

- Community network building
- Improved and retrofitted infrastructure
- Rigorous standards enshrined in bylaws.

CHASE

CANADIAN HEALTH ASSOCIATION FOR SUSTAINABILITY & EQUITY

Making the Health Case for Climate Action

UofT Climate Health & Sustainable Care Symposium

Kim Perrotta MHSc
Executive Director, CHASE

October 22, 2024

Health Professionals & Climate Action

The Good News:

- Many of the actions needed to reduce GHGs will produce immediate and local health benefits
- Many of those actions can also reduce health inequities if directed at that intention

Reference: CHASE/CPHA/OPHA, 2023. Climate Change, Population Health and Health Inequity;

Health Professionals & Climate Action

Important Role for Health Professionals:

- Link health risks to Climate impacts
- Help public recognize climate action
- Identify immediate health co-benefits
- Identify potential health equity co-benefits

Reference: CHASE/CPHA/OPHA, 2023. Climate Change, Population Health and Health Inequity; Hatch, C. What do Canadians really think about climate change? Climate Access & Climate Narratives Initiative. March 2021

Health Arguments Support Climate Policies

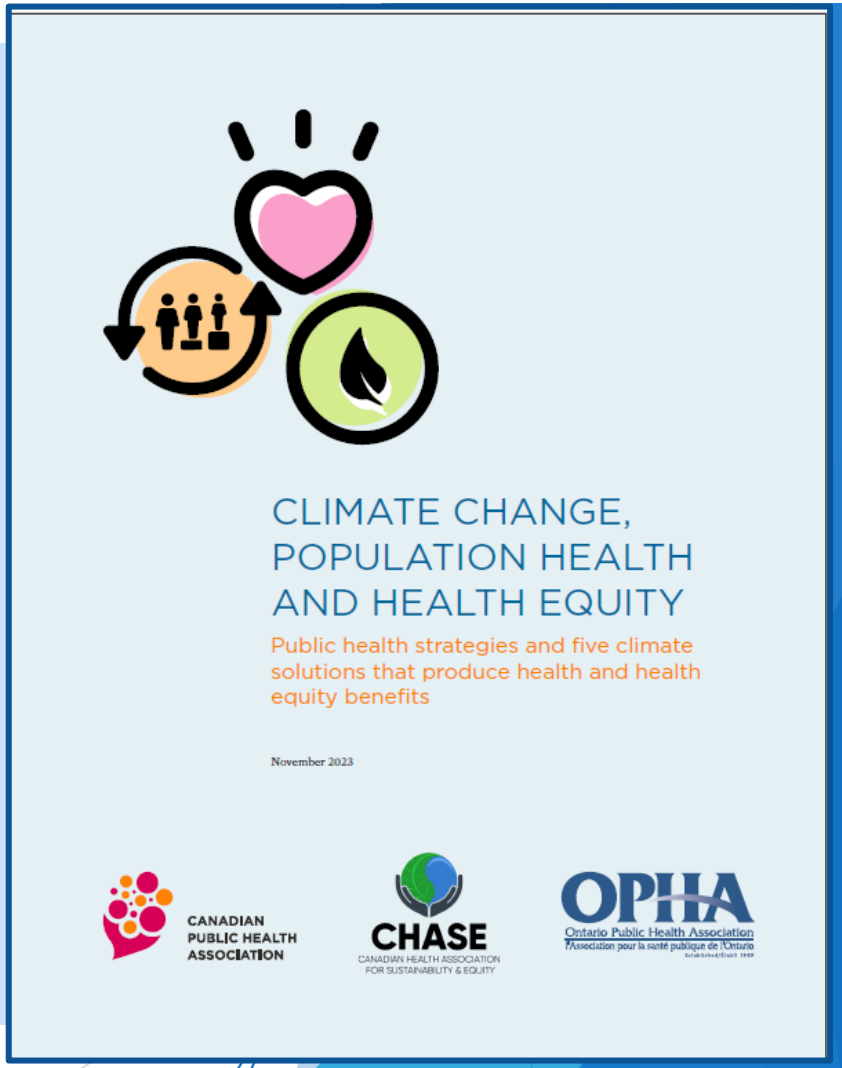
One US study found that the public can be motivated to support climate solutions when presented with:

- health risks associated with climate change
- health benefits associated with climate solutions
- clear calls to action
- **All 3 together – can influence people across the political spectrum**

Reference: Kotcher John et al.2021.Advocacy messages about climate and health are more effective when they include information about risks, solutions, and a normative appeal: Evidence from a conjoint experiment *Journal of Climate Change and Health*.Vol.3.August.

Climate Change Mitigation, Health & Health Equity

- **Summarized health & health equity benefits - 5 local climate solutions**
- 10 Brief Case Studies – Public Health Strategies
- 4 Brief Case Studies - Municipal/NGO Projects
- https://chasecanada.org/public-health-addressing-health-health-equity-and-climate-change/



Five Local Climate Solutions Selected

- 80% of E-related GHGs come from cities
- **Mostly - Transportation & Buildings**
  - Public transit
  - Walkable neighbourhoods
  - Active transportation infrastructure
  - Greener Buildings
  - Green Space

References: CHASE/CPHA/OPHA, 2023. Climate Change, Population Health and Health Inequity; Intergovernmental Panel on Climate Change (IPCC).2018.Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments

Public Transit - Climate, Health & Health Equity

Public Transit:

- Reduces VKT & GHGs
- Increases Physical Activity
- Reduces Traffic-Related Air Pollution
  - 1200 deaths/year - $9.5 Billion/year
- Increases access to jobs & services
- Reduces living costs
- Reduces vehicle-related deaths

References: CHASE/CPHA/OPHA, 2023. Climate Change, Population Health, and Health Equity; Health Canada, TRAP. 2022; Photo: City of Saskatoon, Saskatchewan

Active Transportation Infrastructure - Climate, Health & Health Equity

Safe & Connected AT Infrastructure:

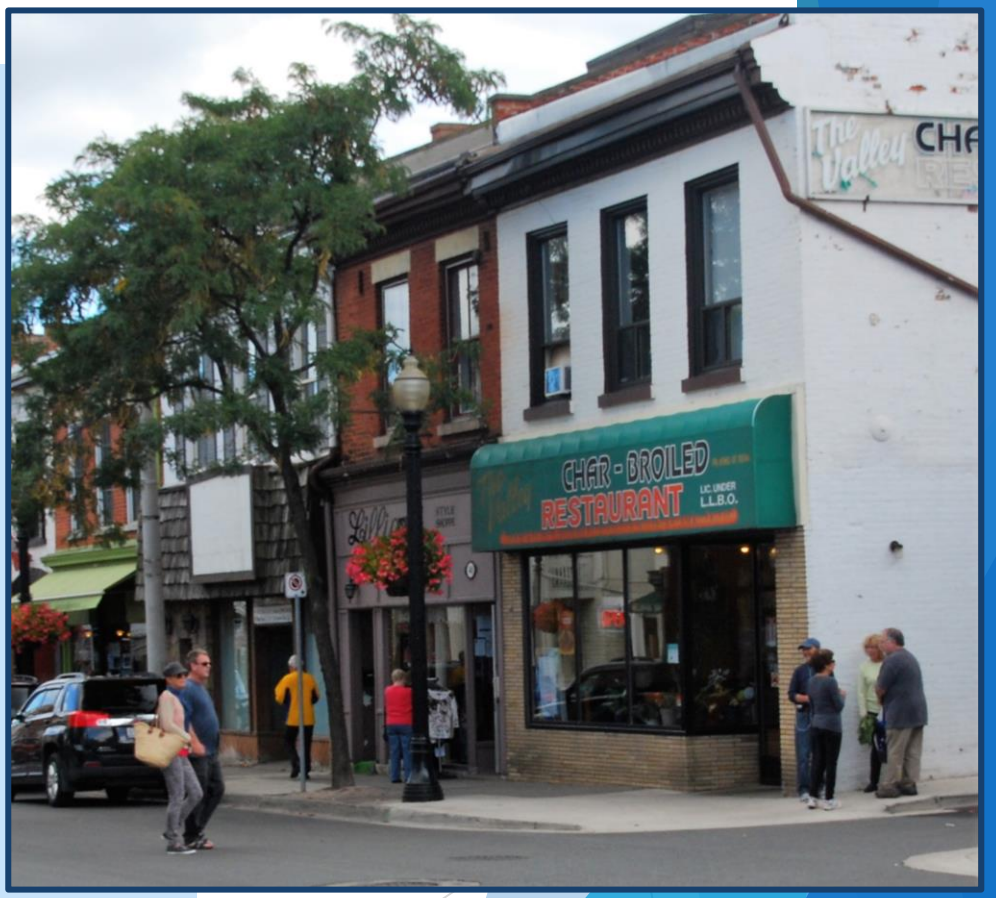
- Encourages walking & cycling
- Increases physical activity
- Increases safety of pedestrians & cyclists
- Reduces GHGs & air pollution
- Particularly important for women, older populations, & those with mobility challenges

Reference: CHASE/CPHA/OPHA, 2023. Climate Change, Population Health, and Health Equity. Photo: K Perrotta, Hamilton, Ontario

Walkable Neighbourhoods - Climate, Health & Health Equity

Walkable - Density, Diversity, Design, Destinations & Distance to Transit

- Reduce GHGs & air pollution
- Increase physical activity
- Reduces weight, diabetes, PDs
- Greater health benefits for low-income
- Improve access to essential amenities



Ref: CHASE/CPHA/OPHA, 2023. Climate Change, Population Health, and Health Equity. Photo: K Perrotta, Hamilton, Ontario.

Green Space - Climate, Health & Health Equity

Green Space:

- Acts as a carbon sink & reduces flood risk
- Cools & cleans the air
- Appears to improve mental health
- Associated with healthier births, healthier weights, reduced risk of diabetes & premature deaths from all causes
- Children & low-income populations appear to benefit the most

References: CHASE/CPHA/OPHA, 2023. Climate Change, Population Health, and Health Equity; DSF, 2015; Zupancic, TPH, 2015; Cottageri, 2022; Villeneuve, 2022; De la Fuente, 2021; Crouse, 2017; Doiron D, 2020. Photo: Beech Street Play Area, Peel Region

Green Buildings & Building Retrofits - Climate, Health & Health Equity

Green buildings & retrofits:

- Reduce GHGs & outdoor air pollution
- Improve indoor environments
- Stabilize temperatures
- Reduce energy costs & energy poverty
- **Cold Climate Air-Source Heat Pumps (ccASHP):**
  - Replace furnaces & air conditioners (-25C)
  - Use 70% less energy

Reference: CHASE/CPHA/OPHA, 2023. Climate Change, Population Health, and Health Equity; Torrie, 2020; Vardoulakis, 2015; Kosatsky, 2009, Belanger, 2014; Health Canada, 2022; MacNaughton, 2018; Chatterjee, 2021; Das & Martiskainen, 2022. Photo: Kim Perrotta, Student Housing, Hamilton

CHASE

CANADIAN HEALTH ASSOCIATION
FOR SUSTAINABILITY & EQUITY

E-Mail: Kim@chasecanada.org

Website: https://chasecanada.org/

LinkedIn: Kim Perrotta

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