Public Health Ontario | Santé publique Ontario

To view an archived recording of this presentation please click the following link:

https://youtu.be/A5vVsYE7OVw

Please scroll down this file to view a copy of the slides from the session.

Disclaimer

This document was created by its author and/or external organization. It has been published on the Public Health Ontario (PHO) website for public use as outlined in our Website Terms of Use. PHO is not the owner of this content. Any application or use of the information in this document is the responsibility of the user. PHO assumes no liability resulting from any such application or use.

From Projections to Prevention:
What Ontario's Illness Projections mean for Public Health

PHO Rounds 2025-12-09

Laura C. Rosella, PhD

Professor and Epidemiology Division Head

Dalla Lana School of Public Health, University of Toronto

Tier 1 Canada Research Chair in Population Health Transformation and Analytics

Population Health Analytics Laboratory

UNIVERSITY OF TORONTO
DALLA LANA SCHOOL OF PUBLIC HEALTH

Disclaimer

- This presentation was created by its author (Dr. Laura Rosella)

- PHO is not the owner of this content. Any application or use of the information in this document is the responsibility of the user.

- PHO assumes no liability resulting from any such application or use.

Disclosures

- I do not have any disclosures to report

Learning Objectives

1. Describe key findings from the Projected Patterns of Illness in Ontario report, including projected trends in major illness and multimorbidity through 2040.
2. Explain demographic, behavioural, and system drivers underlying Ontario's future health burden.
3. Interpret the implications of these projections for public health policy, prevention, and health system planning.
4. Apply insights from the report to identify actionable opportunities for public health standards, public health intervention, particularly in prevention & equity-oriented planning.

Main Messages

Ontario's burden of illness is rising to unprecedented levels

Public health has distinct levers to influence that trajectory

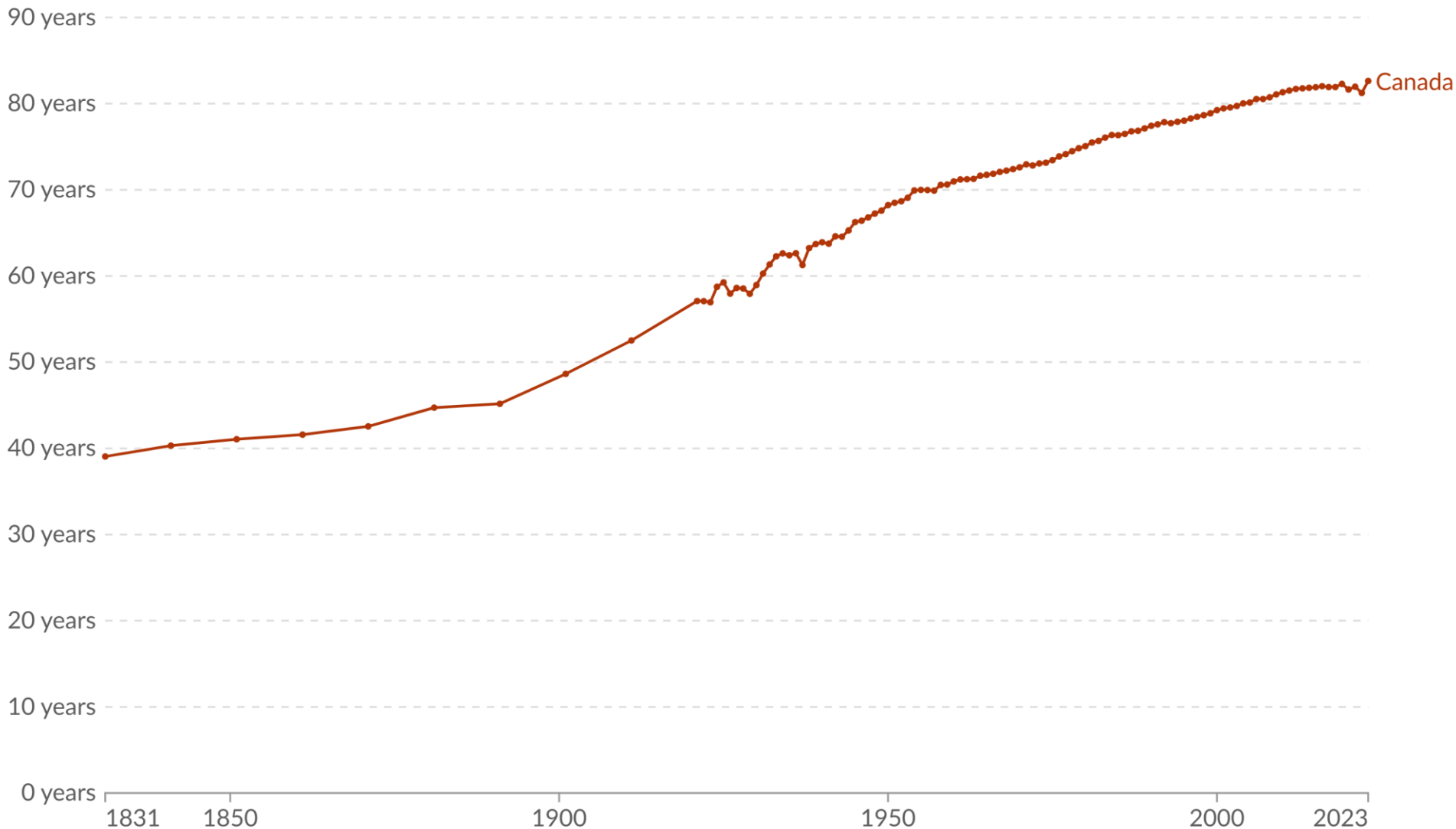
Projections provide focus, alignment, and accountability for action

Data + modelling + indicators + evidence enable targeted local action

Life expectancy

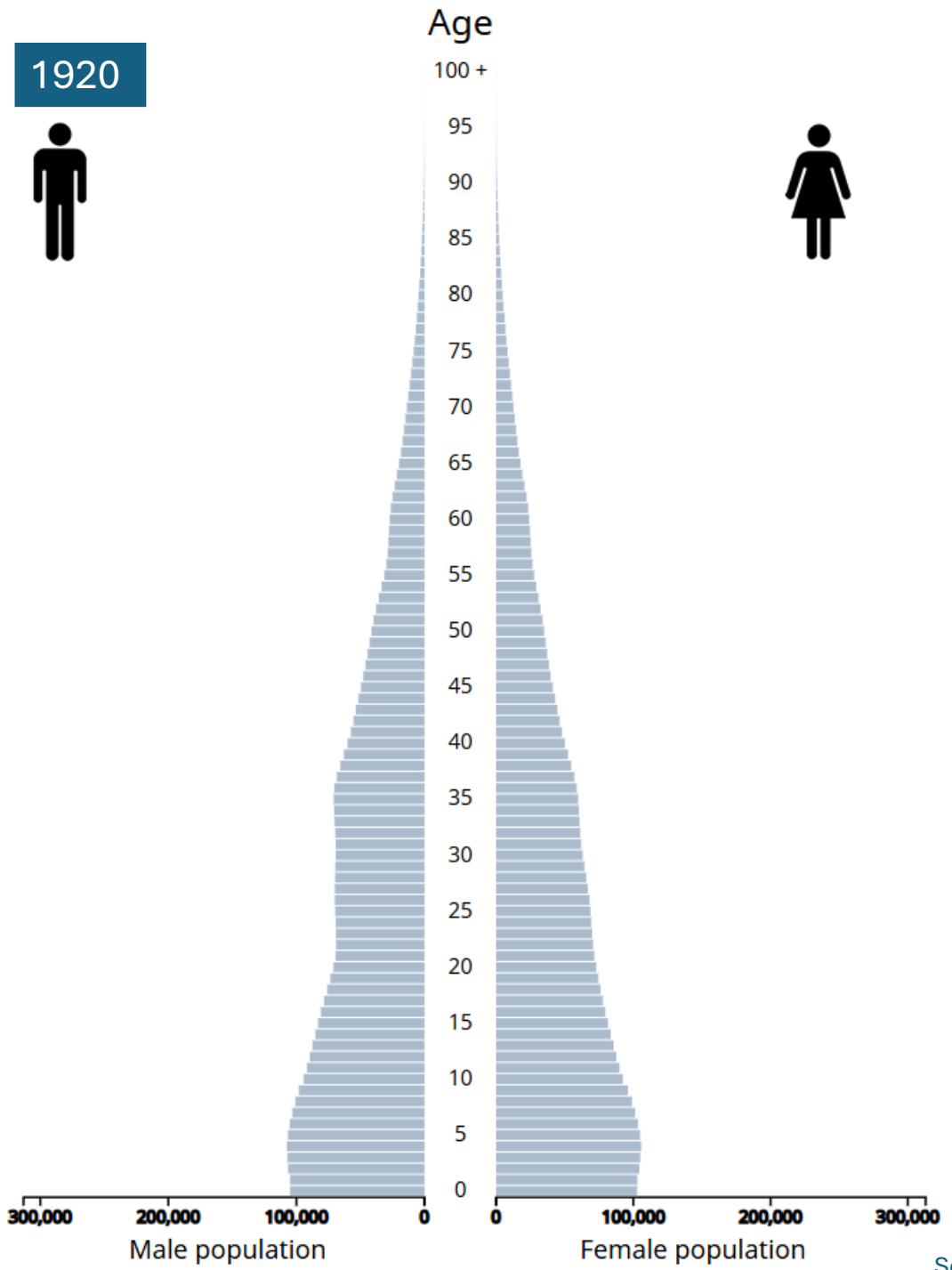
Our World in Data

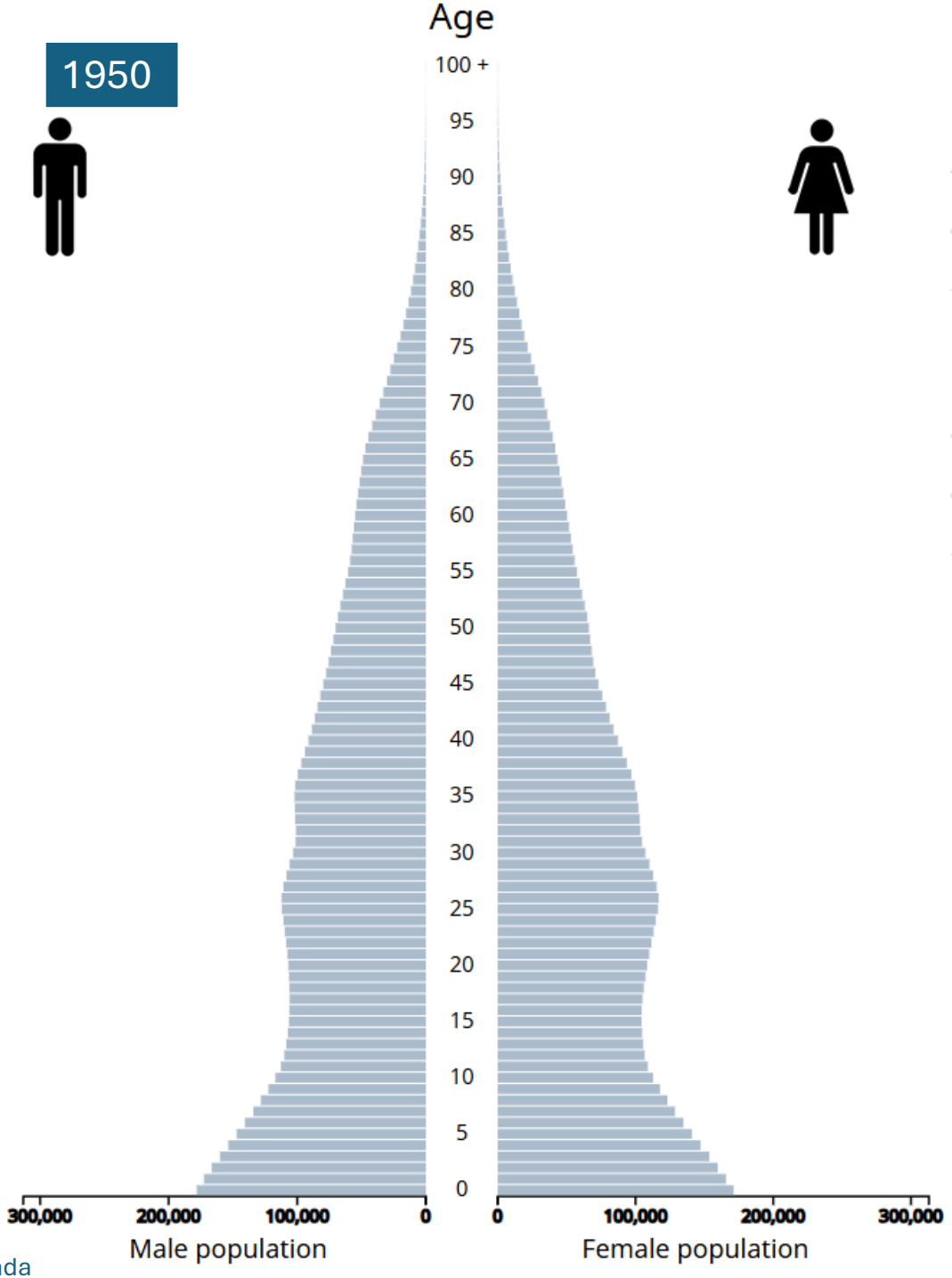
Period life expectancy[1] is the number of years the average person born in a certain year would live if they experienced the same chances of dying at each age as people did that year.



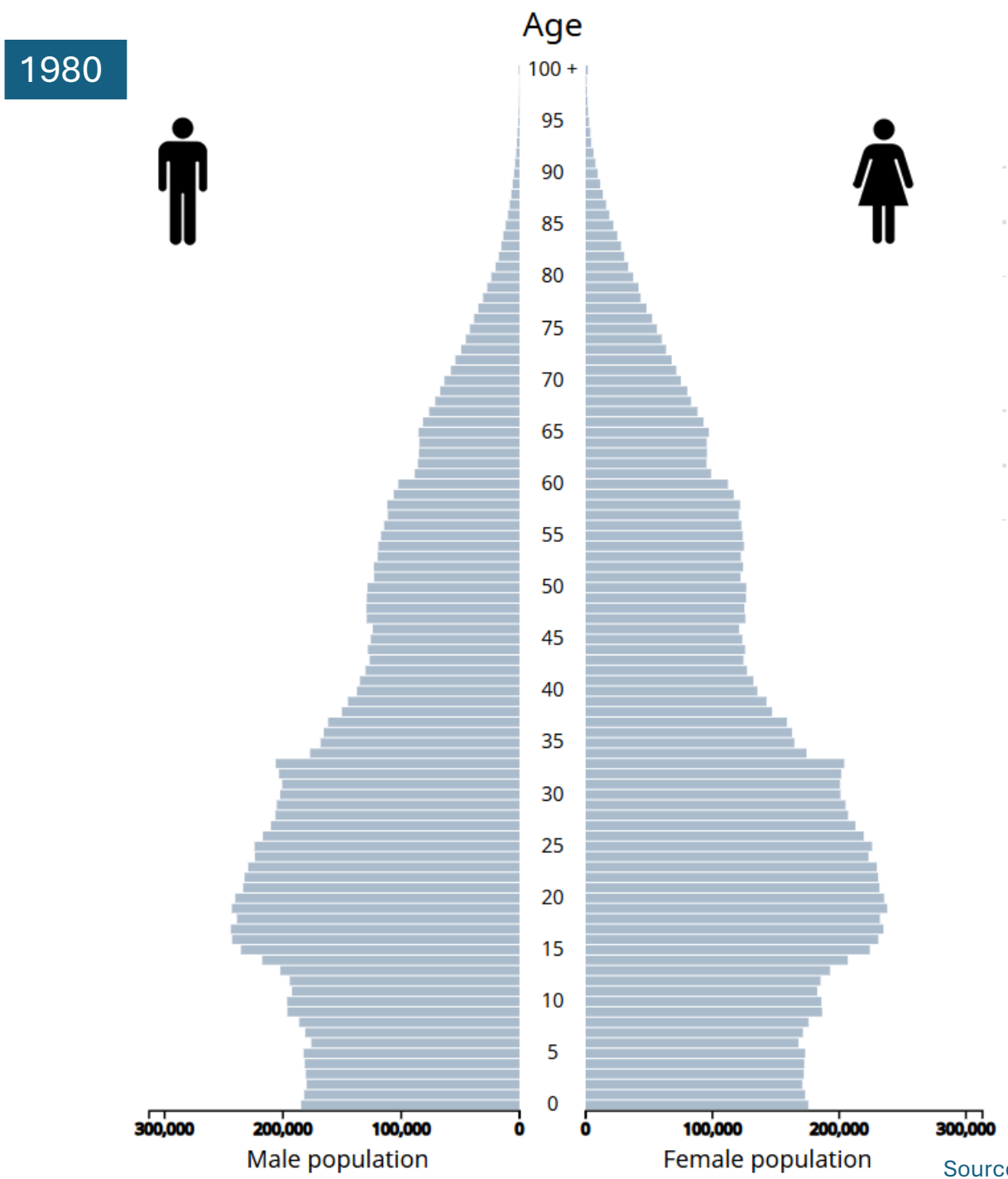
Data source: Riley (2005); Zijdeman et al. (2015); HMD (2025); UN WPP (2024)

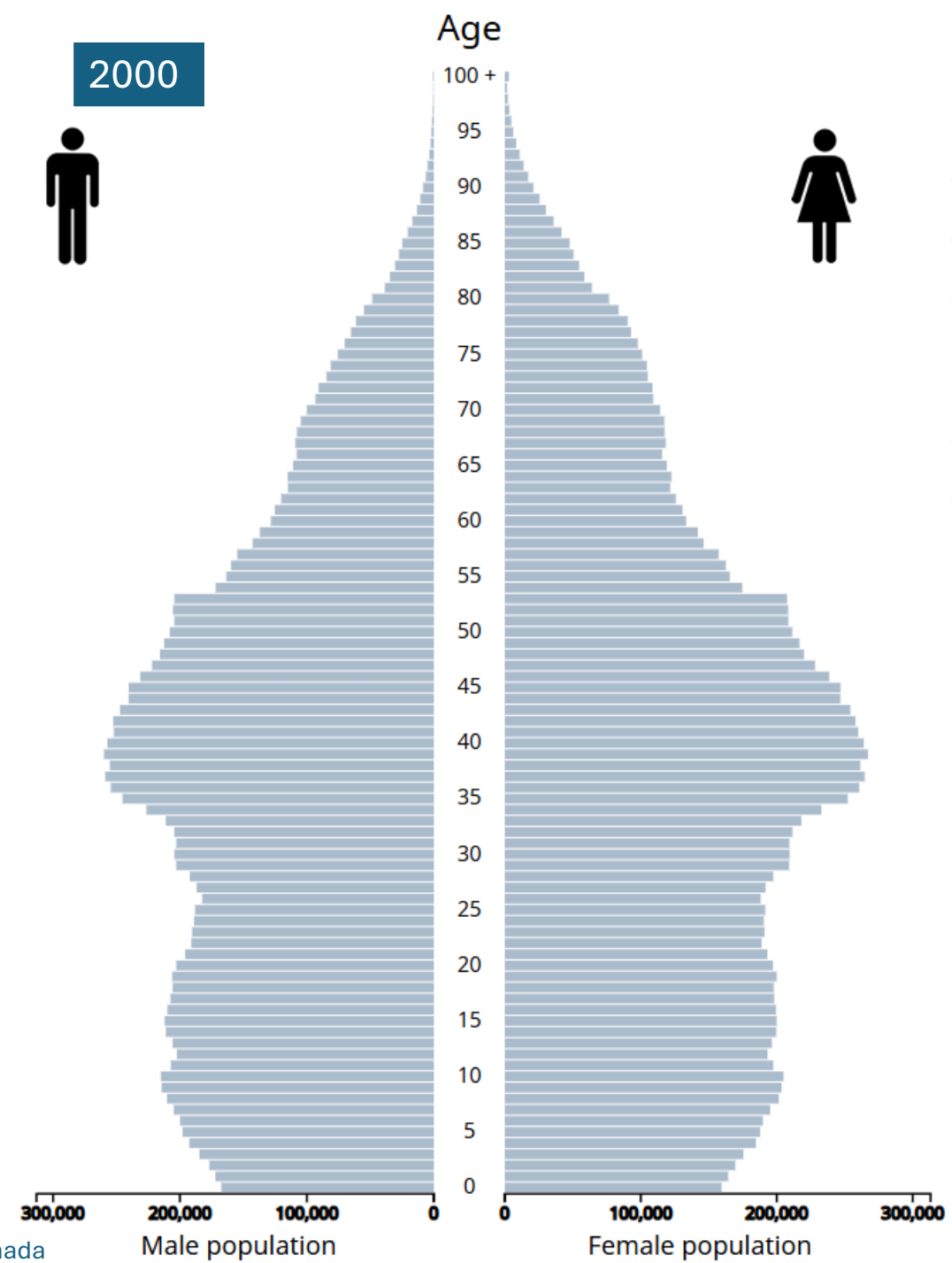
OurWorldinData.org/life-expectancy | CC BY





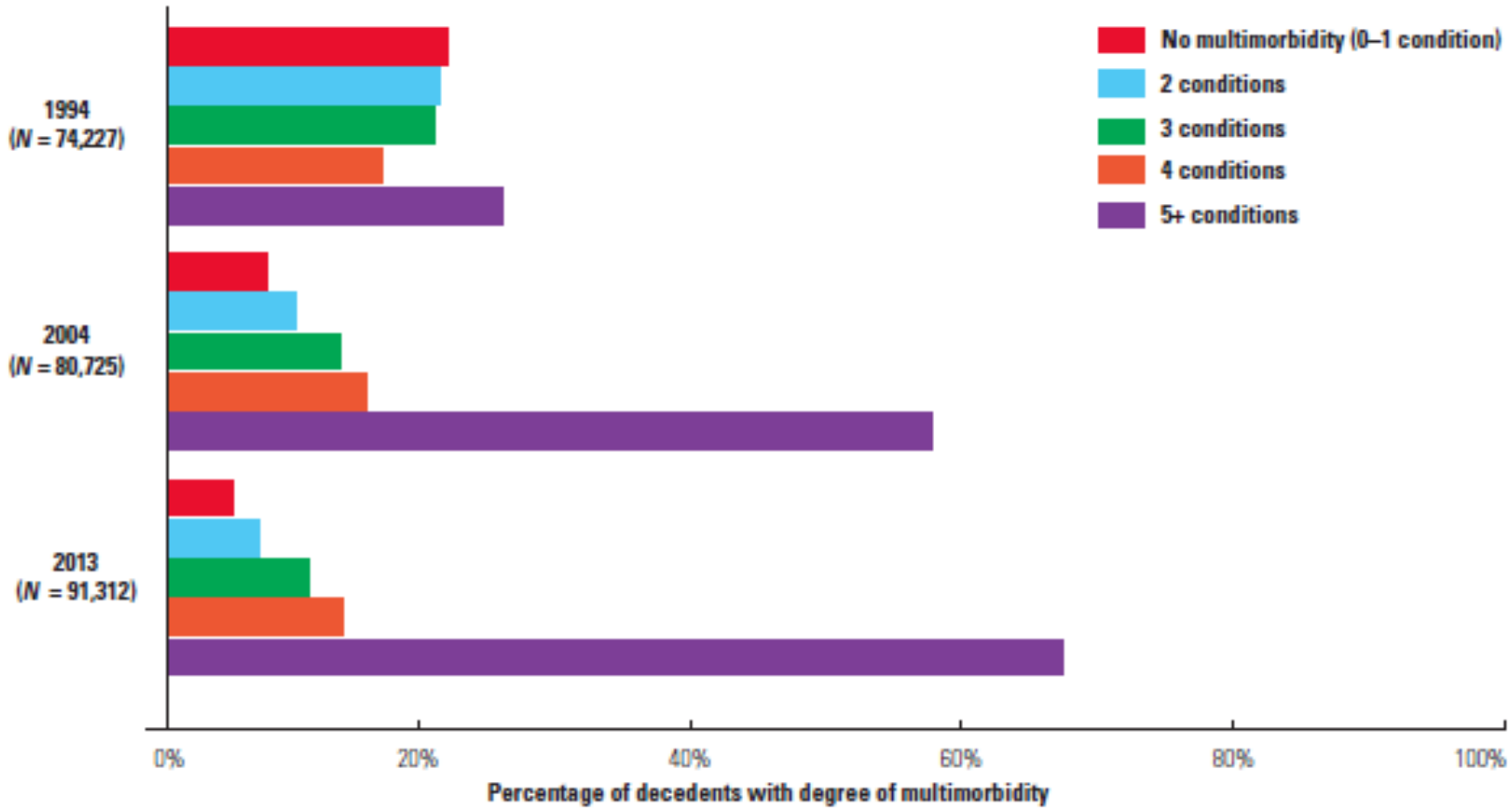
Source: Statistics Canada





Source: Statistics Canada

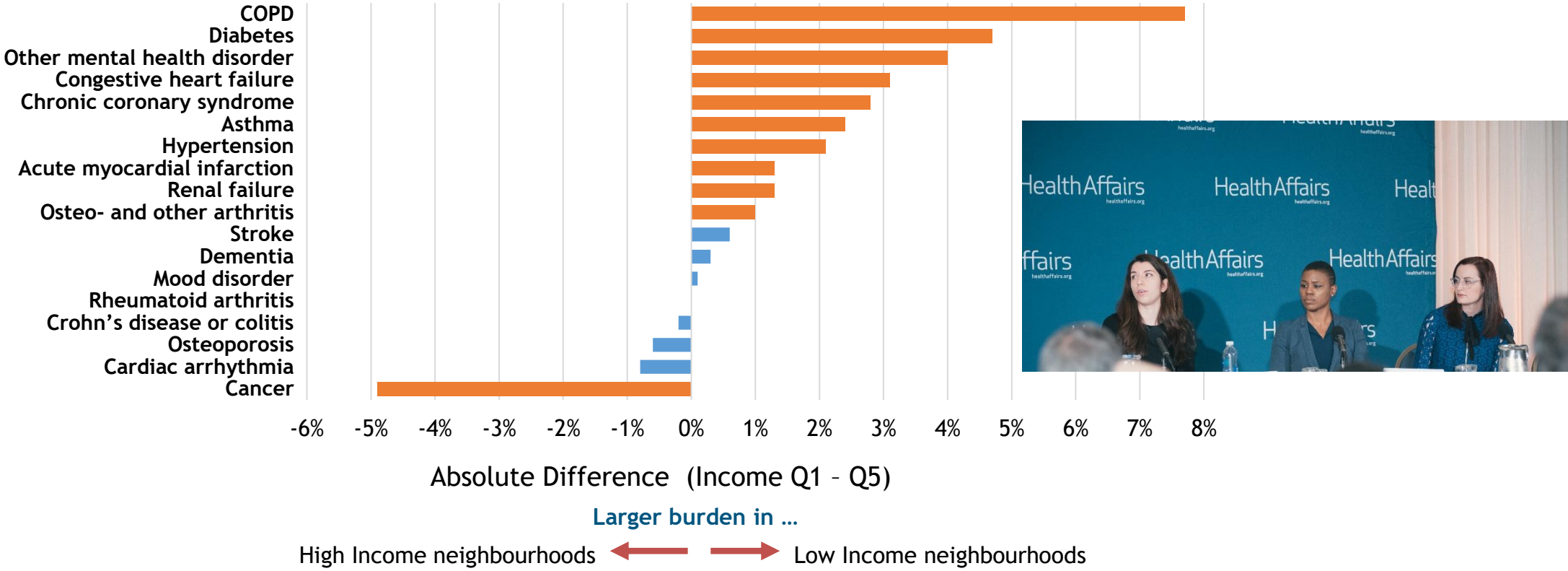
Living longer with more illness



Rosella L, Kornas K. Putting a Population Health Lens to Multimorbidity in Ontario. Healthc Q. 2018 Oct;21(3):8-11.

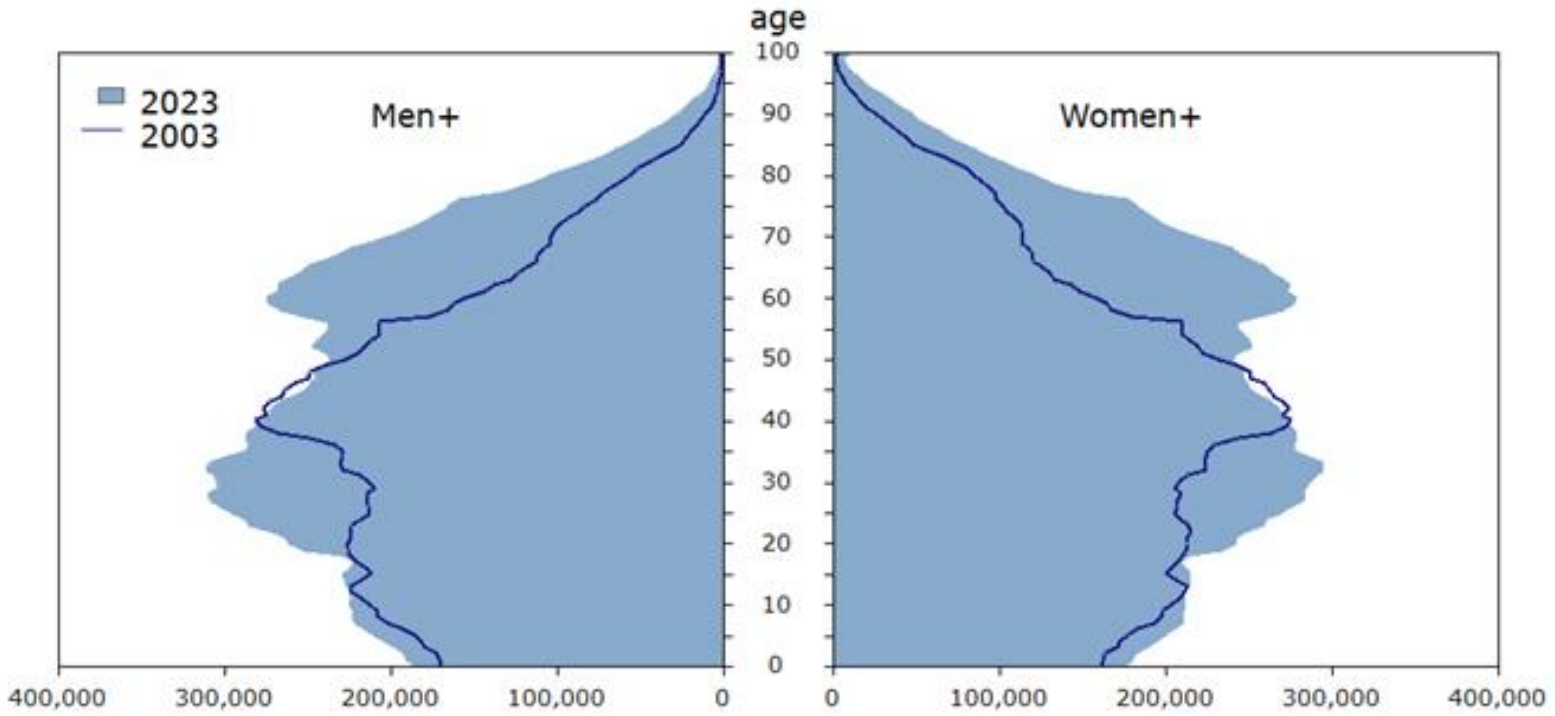
Socioeconomic Gradients in Chronic Conditions at Time of Death

AGE ADJUSTED ABSOLUTE PERCENTAGE DIFFERENCE
In Chronic Condition At Time of Death (1994-2013)
Between Area Income Quintile 1 (lowest) and 5 (highest)



Rosella et al. Accumulation of chronic conditions at the time of death increased in Ontario from 1994 to 2013; Health Affairs, 2018.

From Baby Boom to Gray Wave

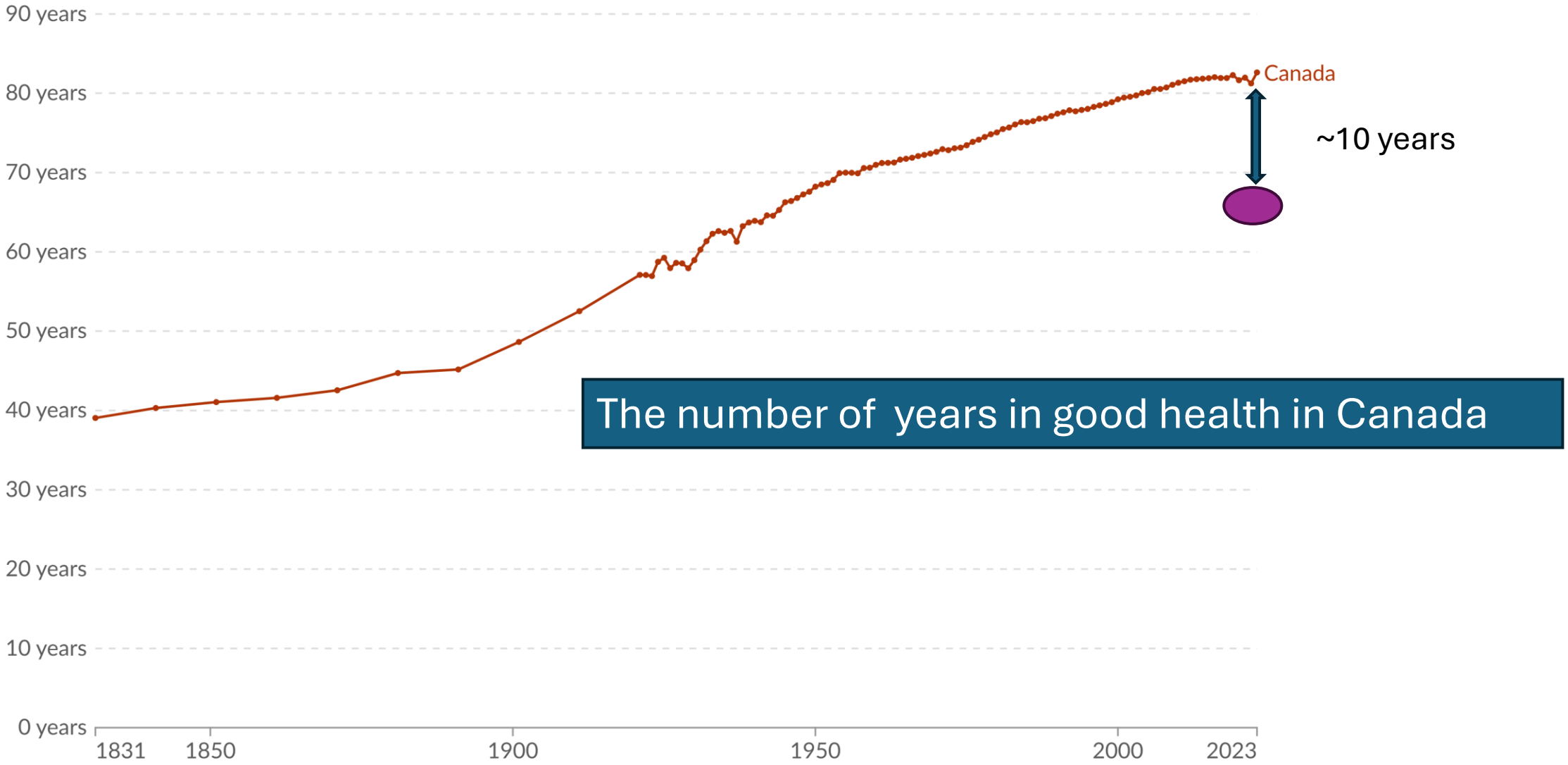


Source: Statistics Canada. (2024, February 21). Millennials now outnumber baby boomers in Canada. The Daily.

Life expectancy

Our World in Data

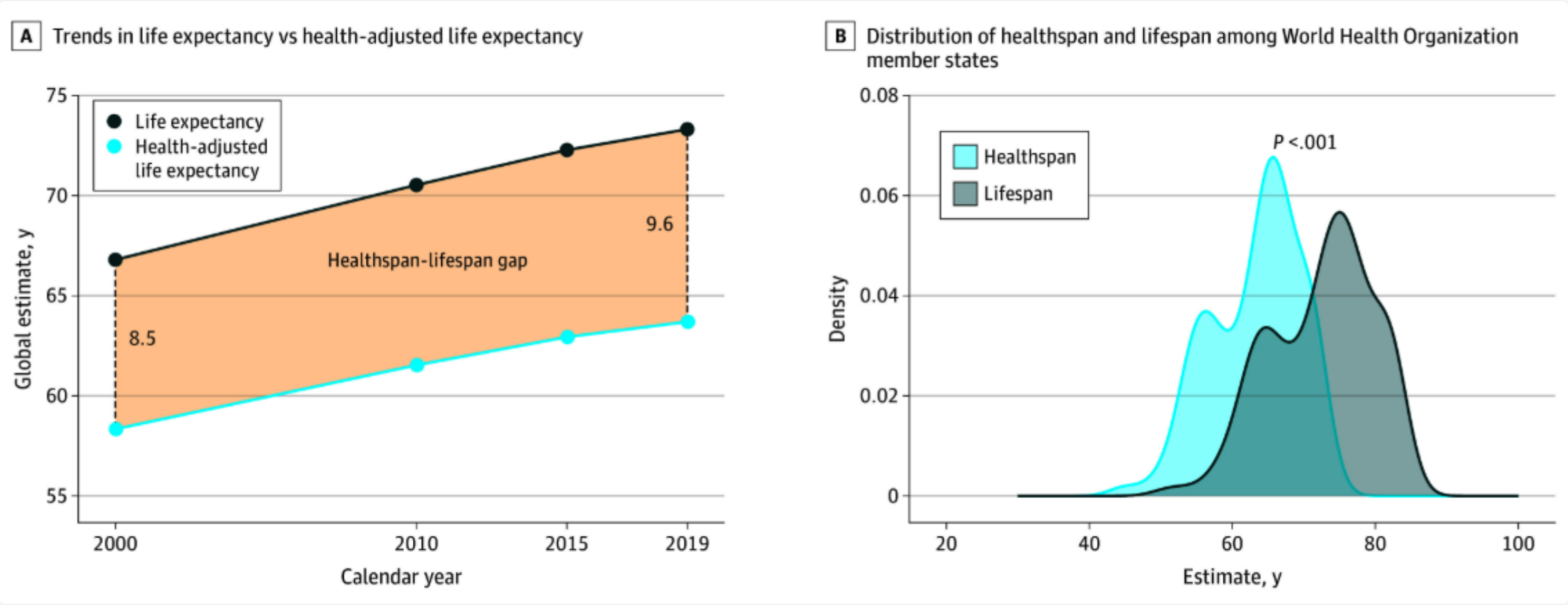
Period life expectancy[1] is the number of years the average person born in a certain year would live if they experienced the same chances of dying at each age as people did that year.



Data source: Riley (2005); Zijdeman et al. (2015); HMD (2025); UN WPP (2024)

OurWorldinData.org/life-expectancy | CC BY

Figure 1. Global Life Expectancy, Health-Adjusted Life Expectancy, and Healthspan-Lifespan Gap.



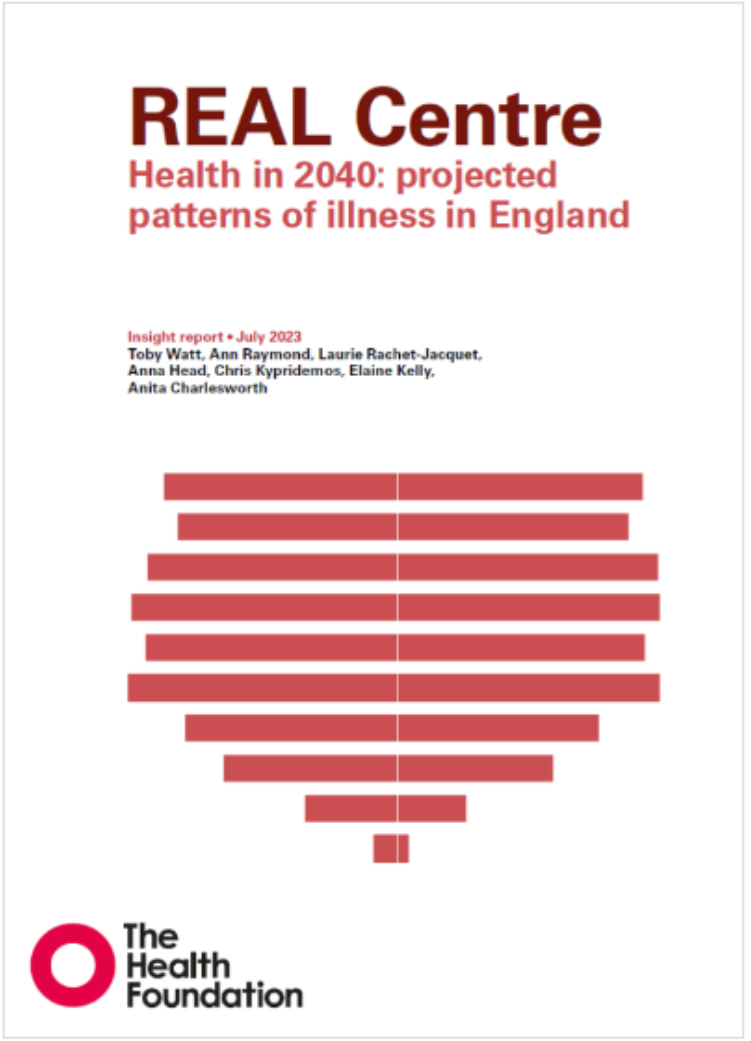
A, Trends of life expectancy, health-adjusted life expectancy, and healthspan-lifespan gap. B, Distribution of healthspan and lifespan among 183 World Health Organization member states.

Garmany A, Terzic A. Global Healthspan-Lifespan Gaps Among 183 World Health Organization Member States. JAMA Netw Open. 2024 Dec 2;7(12):e2450241.

The Health Foundation – Projected Pattern of Illness in England

New approach to projections – with U. Liverpool

- Health in 2040: First report from a long-term programme of research **in development with academic partners**
- **Better data**: Linked primary care, secondary care and mortality records with complete patient diagnostic history
- They model illness with **20 highly prevalent and/or high cost conditions** – summarized by the Cambridge Multimorbidity Score (CMS). "Major illness" is a score above a certain threshold (1.5)

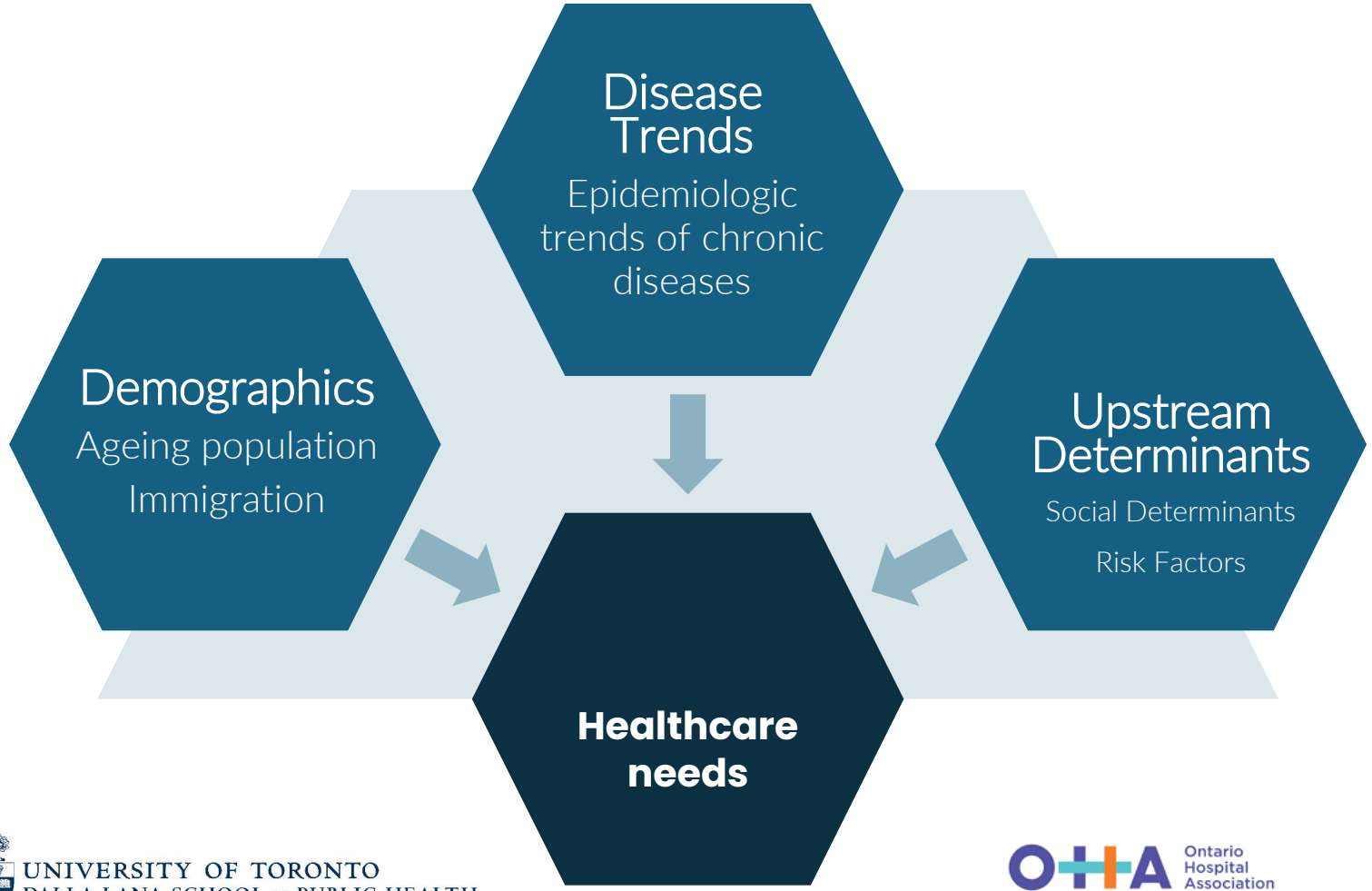


Ontario Hospital Association

UNIVERSITY OF TORONTO
DALLA LANA SCHOOL OF PUBLIC HEALTH

Factors affecting healthcare needs

We incorporate population data and projections on these factors



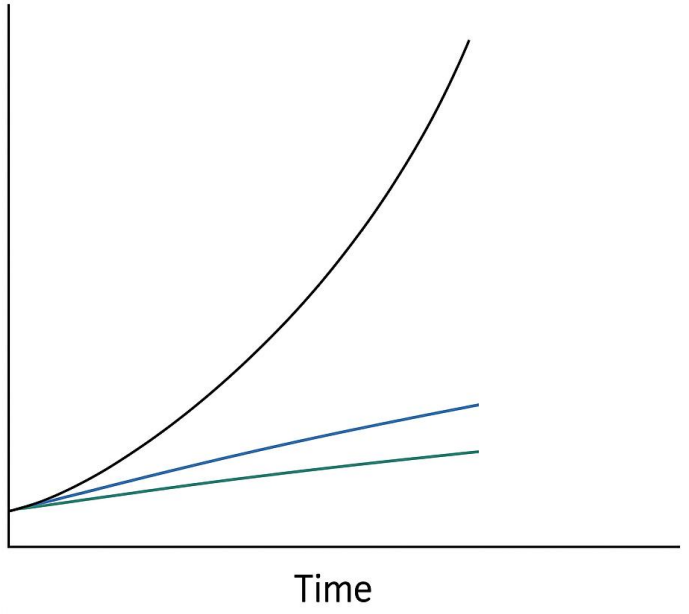
Projections based on robust epidemiologic & population patterns enable:

- Anticipating and planning for population health needs
- Informing policy and health system change
- Targeting mitigation and prevention strategies

Projections that shift us into a planning mindset

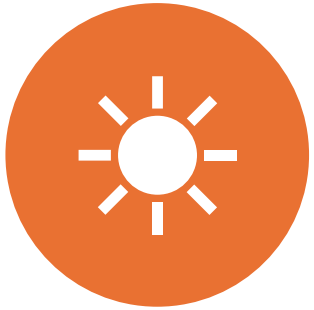
Tools for shaping policy choices and system readiness

- Proactive not reactive
- What would it take to change this trajectory?
- Exploring alternative futures based on different prevention, program & policy, scenarios.



Long-term projections are standard practice in sectors responsible for long-term performance

Used routinely to guide infrastructure, investment, and risk management

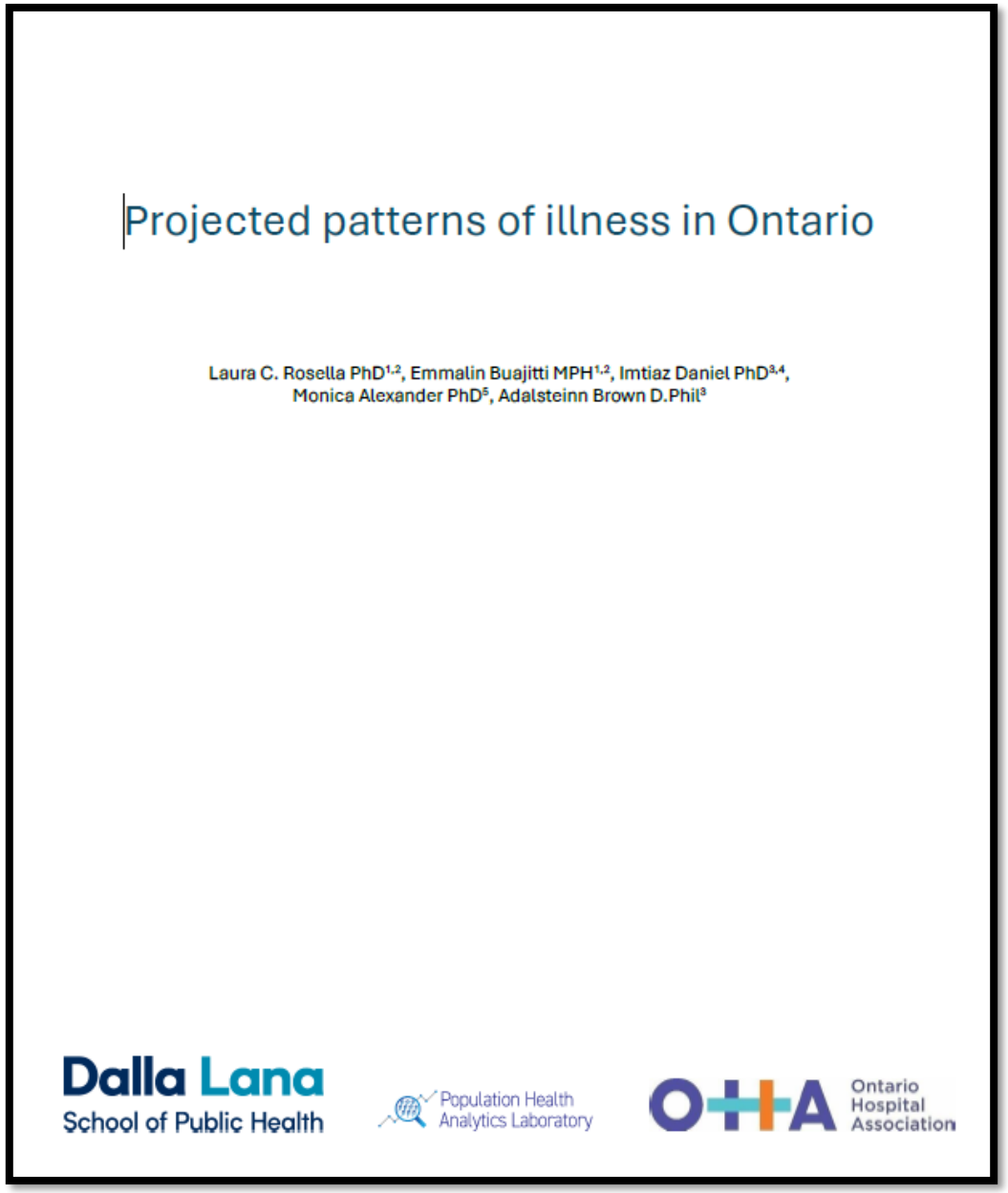


CLIMATE & ENVIRONMENTAL POLICY

URBAN PLANNING & TRANSPORTATION

ENERGY & UTILITIES

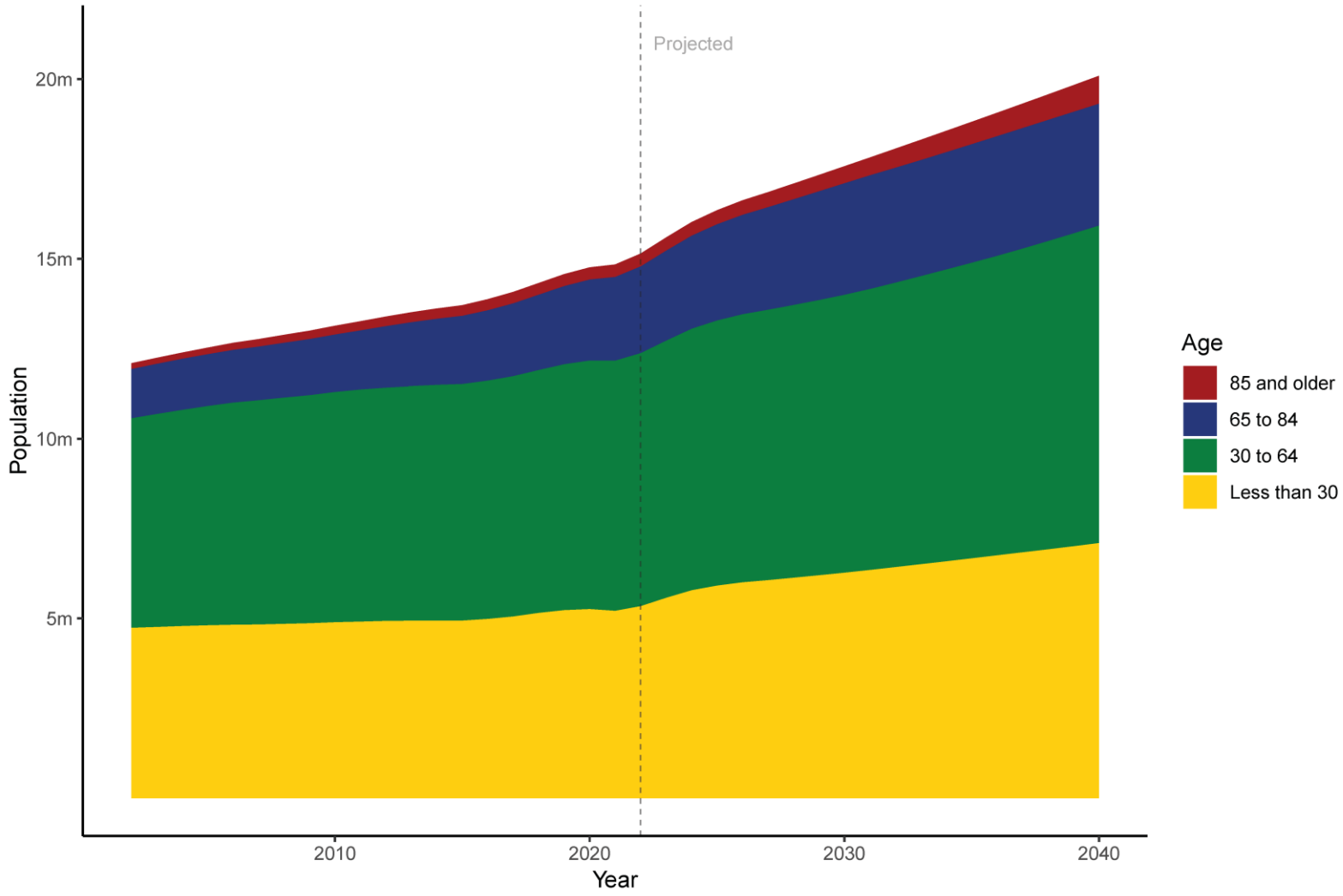
FINANCE & INSURANCE



https://pophealthanalytics.com/wp-content/uploads/2024/10/Study-Projected-Patterns-of-Illness-in-Ontario-Released-October-16-Final.pdf

How will the age structure of the population of Ontario change?

- Population will grow by 36% in Ontario
- Largest increase happening in 65+ age group
- Dependency ratio will be >50% by 2040



Quantifying Burden of Illness in the Ontario Population

Measure 22 conditions that account for the majority of illness in the Ontario Population

We measure diagnosed conditions in the population and categorize using a modified Cambridge Morbidity Score (CMS)*

Weighted score based on expected demand on health care system impact and impact on life expectancy

Divide the population into:

No illness	Some illness	Major Illness

* Payne et al. CMAJ 2020 192(5): E107-E144

High-burden conditions in the 30+ population	
Acute myocardial infarction (AMI)	Hypertension
Asthma	Osteo arthritis
Anxiety and mood disorders	Osteoporosis
Cancer	Renal failure
Cardiac arrythmia	Rheumatoid arthritis
Chronic coronary syndrome	Schizophrenia and other psychotic disorders
COPD	Substance use disorders
Crohn’s and colitis	Stroke
Congestive heart failure (CHF)	Constipation
Dementia	Epilepsy
Diabetes	Hearing loss

Description of the morbidity groups

No Illness

- Mean age: 31
- No major conditions

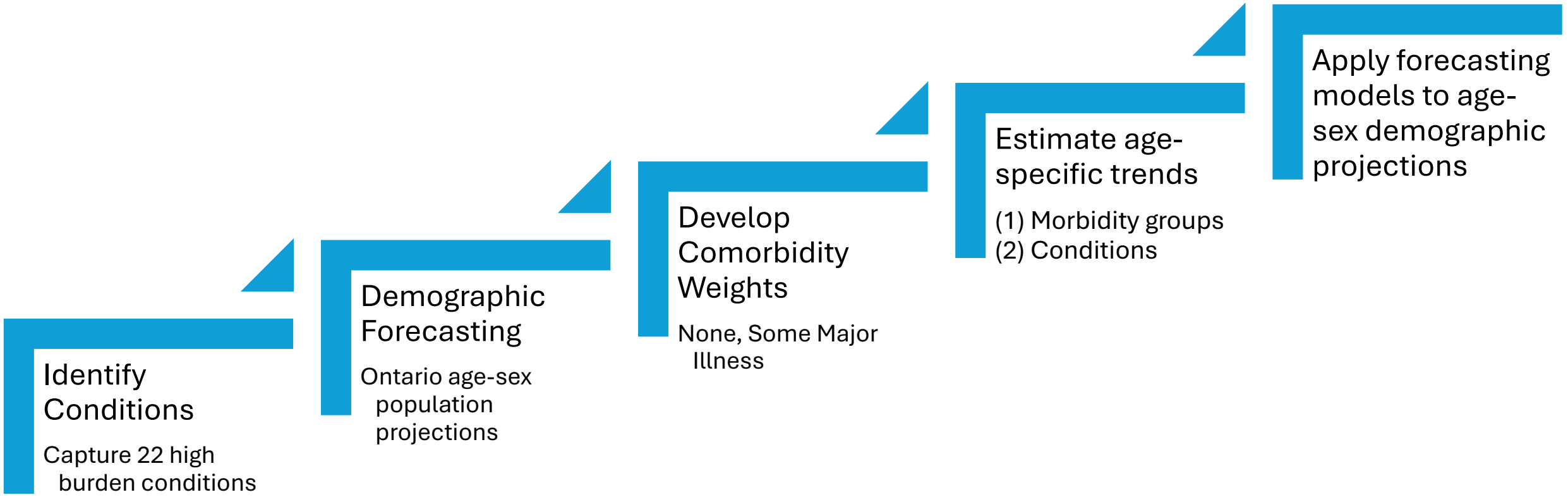
Some Illness

- Mean age: 46
- Common conditions: Mood disorders (18%), Asthma (29%), Diabetes (8%)
- 0.5% with 3 or more chronic conditions

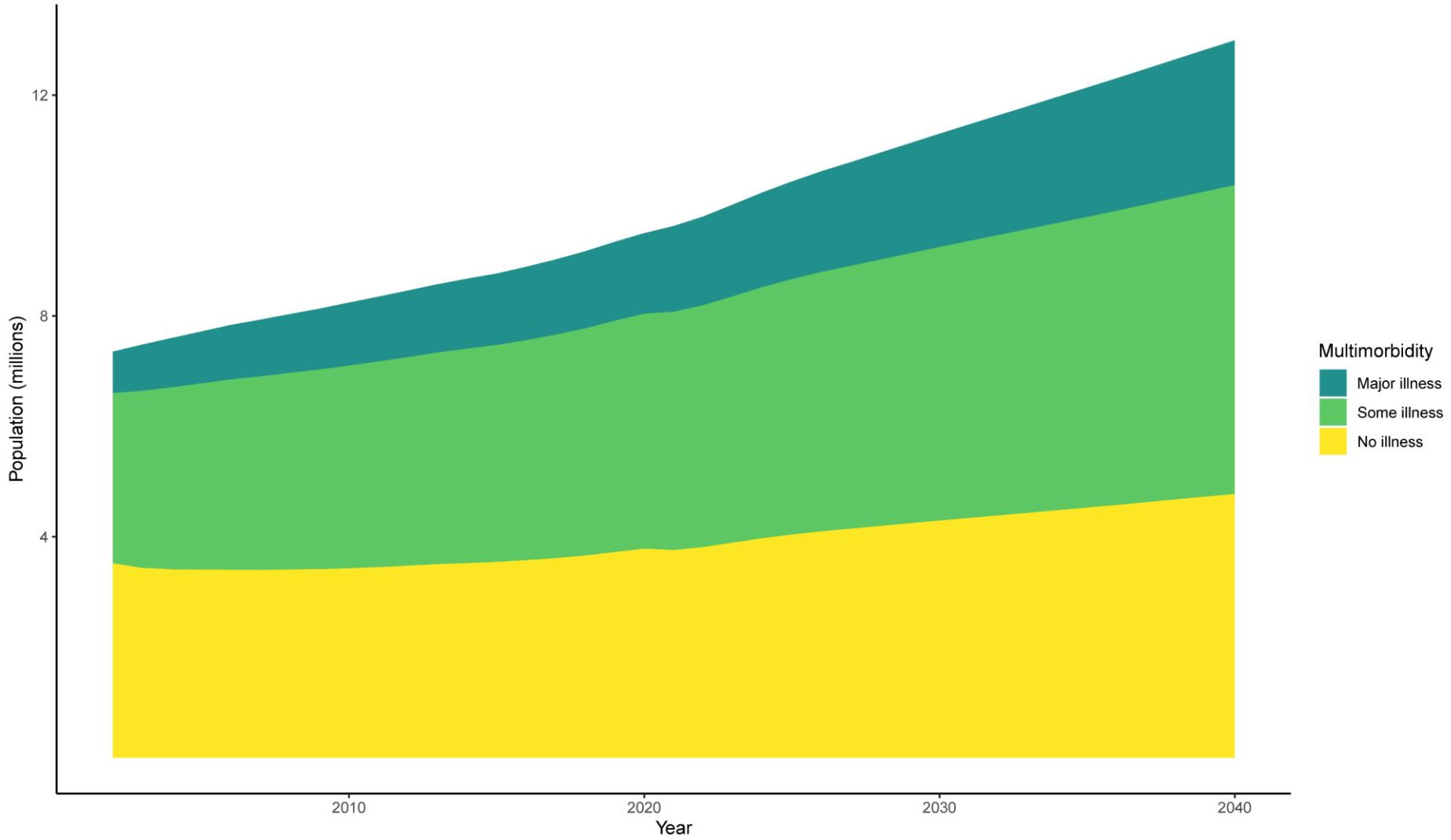
Major Illness

- Mean age: 68
- Common conditions: Diabetes (41%), Cancer (21%), Dementia (8%), Stroke (12%)
- 66% with 3 or more chronic conditions

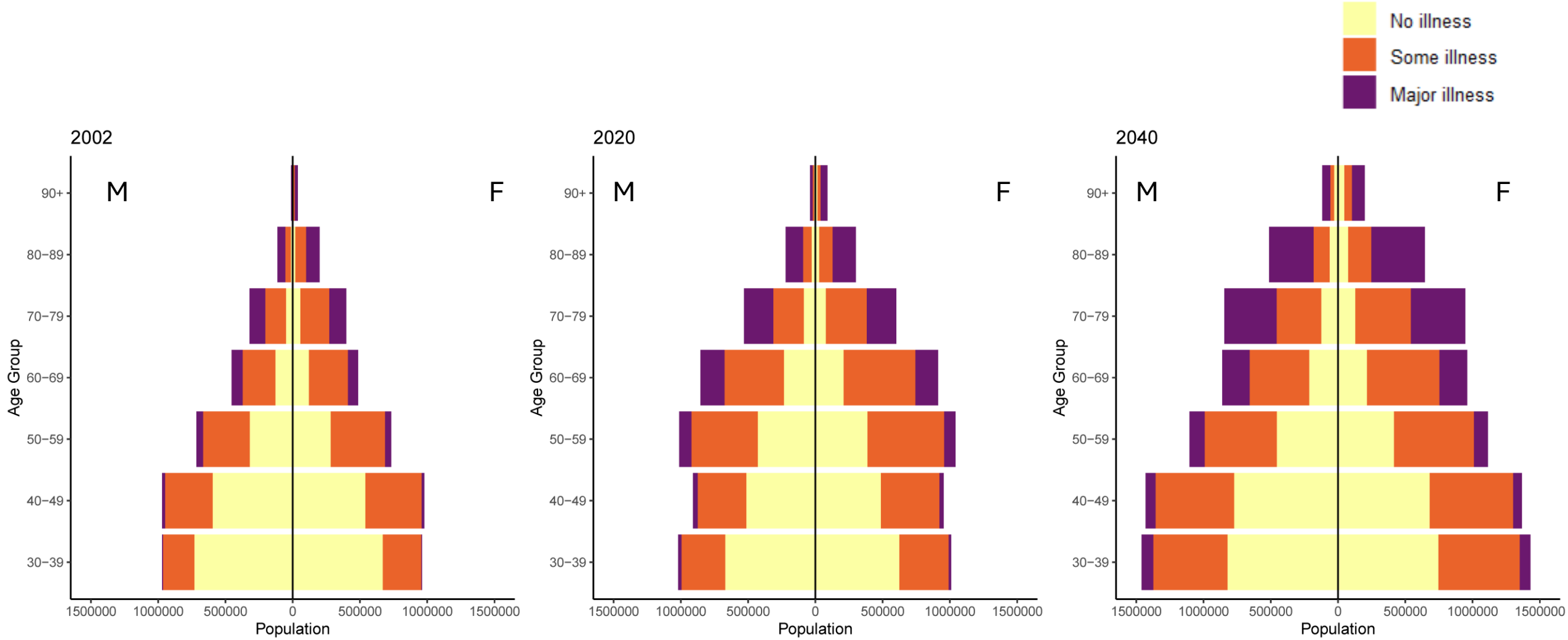
Summary of approach



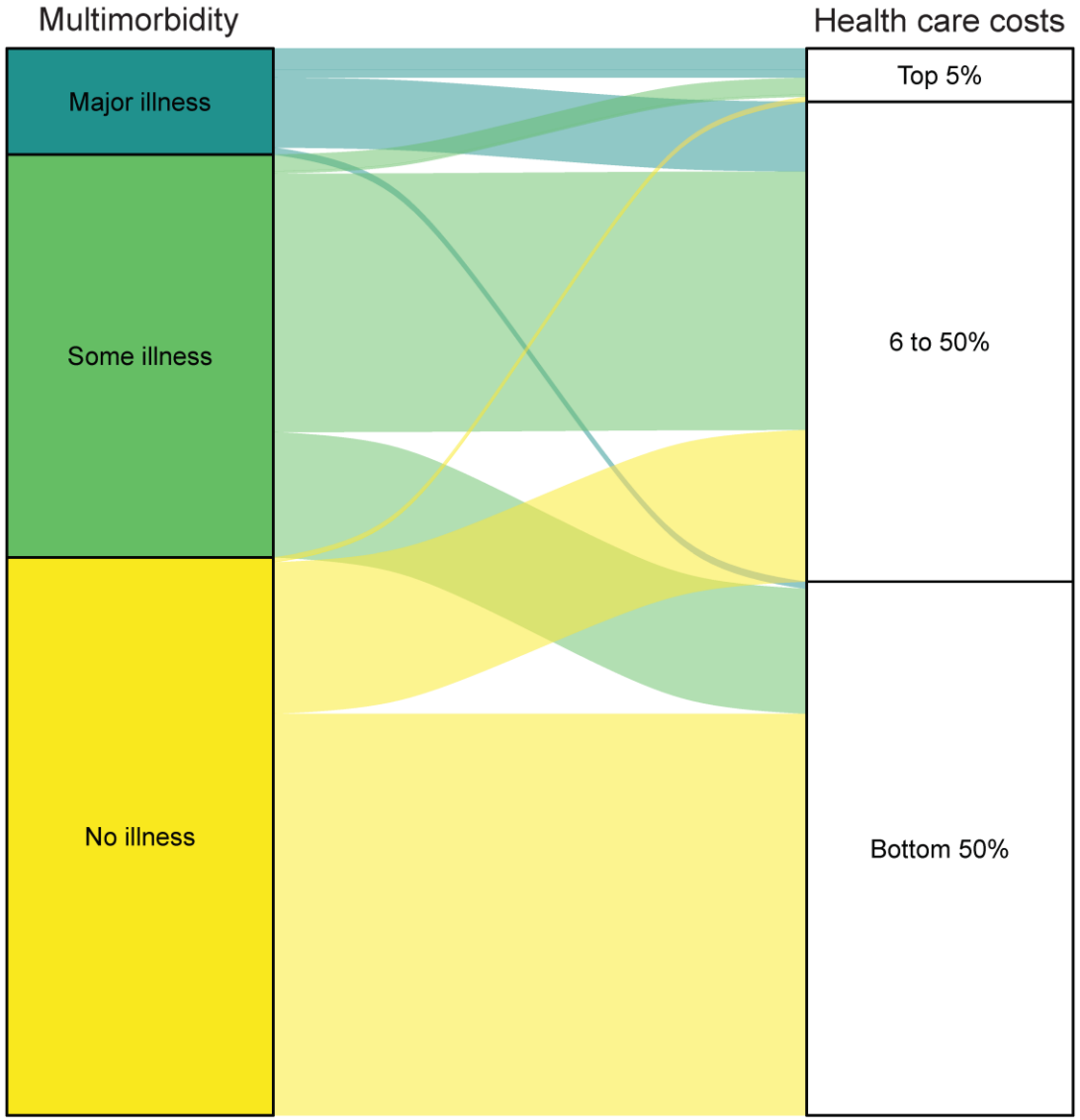
The number of years people spend with illness is increasing



Ontarians will be living longer with more major illness



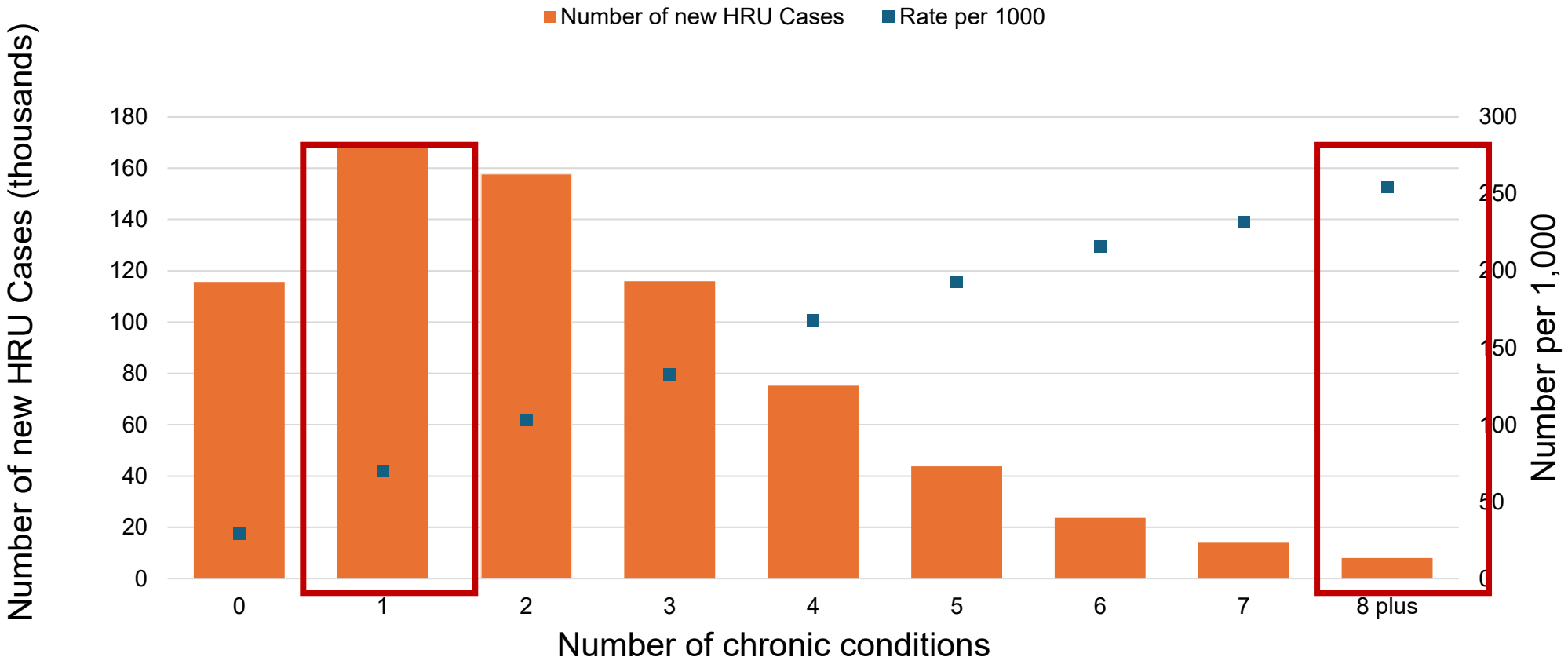
Those with major illness will account for most of the healthcare resources



Top 5% ~40K avg/person

Bottom 50% < $1000 avg/person

Expected number and rate of high resource users in Ontario by number of chronic conditions (2013/14- 2018/19)[1,2]

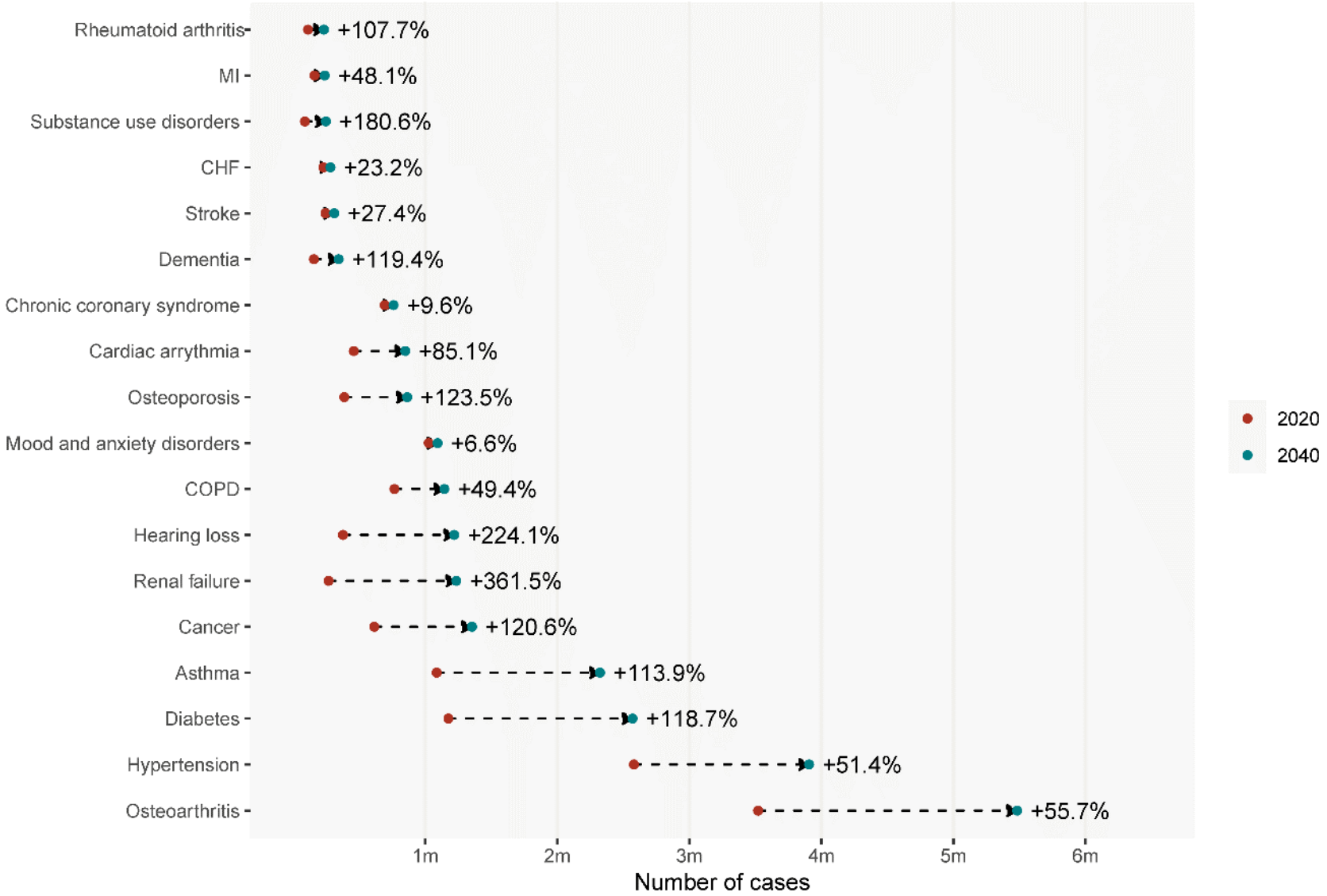


[1]*Note*: number of new HRU cases do not sum to 758,184 due to missing information on key stratification variables for some individuals.
[2]Chronic conditions include self-reported asthma, arthritis, back problems, migraine headaches, chronic obstructive pulmonary disease, diabetes, hypertension, heart disease, cancer, stomach ulcers, stroke, urinary incontinence, bowel disorder, mood disorder, and anxiety disorders.

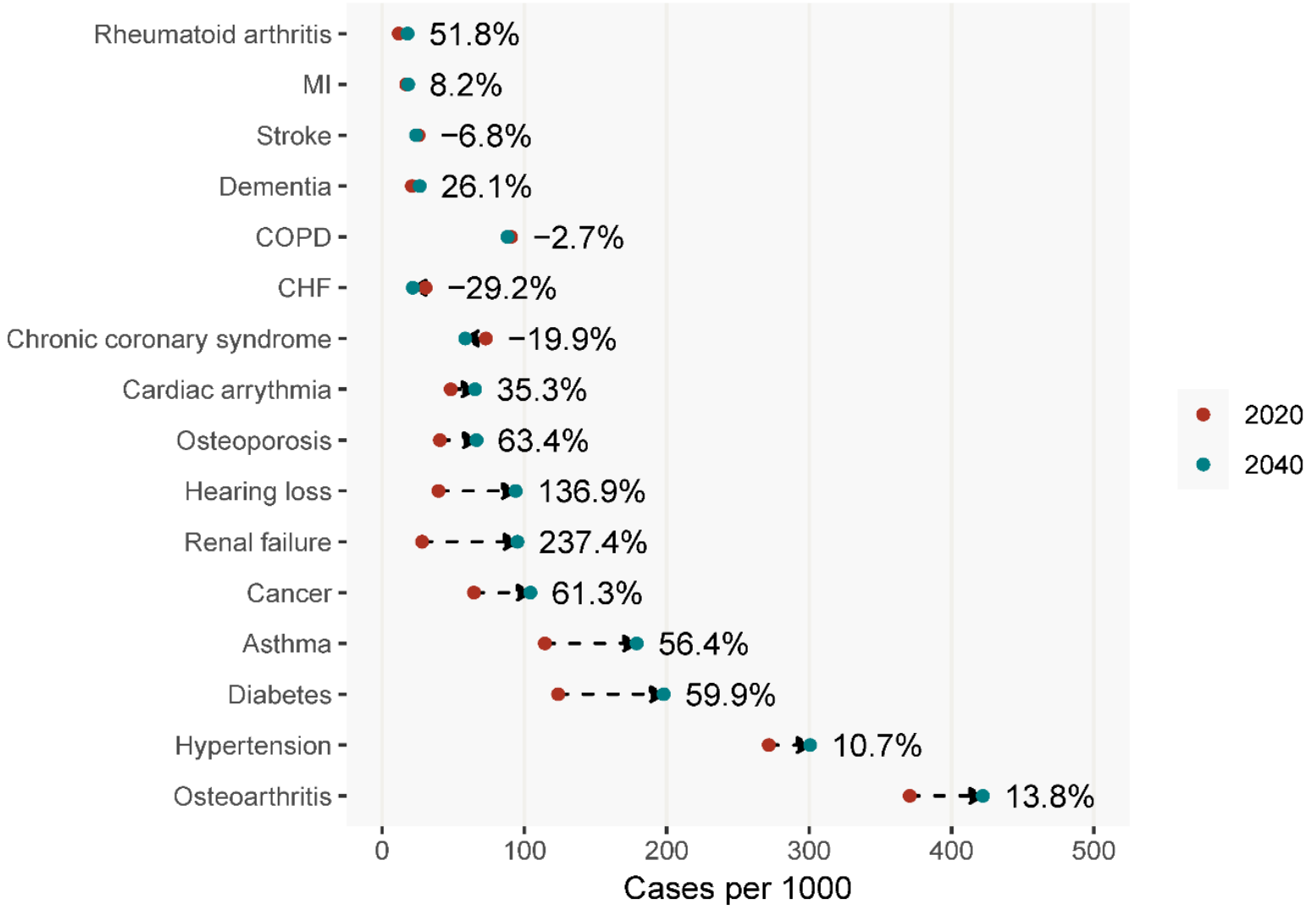
O'Neill M, et al. Predicting high healthcare resource utilization in Ontario, 2013/14-2018/19: Characterizing high resource users in Public Health Units. Toronto, ON: Population Health Analytics Lab; 2019.

Rosella L, et al. Medical Care. 2018 Oct;56(10):e61-e69

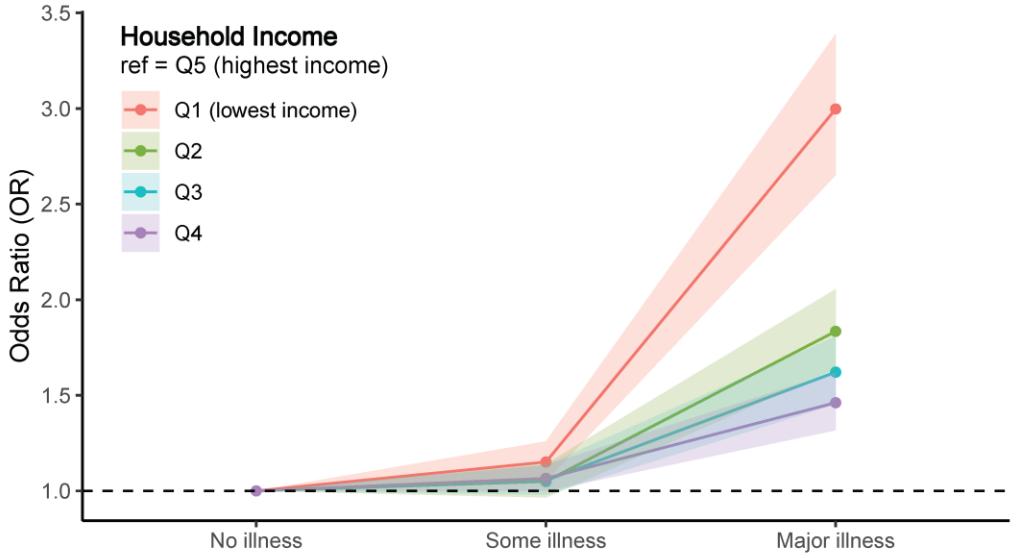
Total number of cases increasing by condition

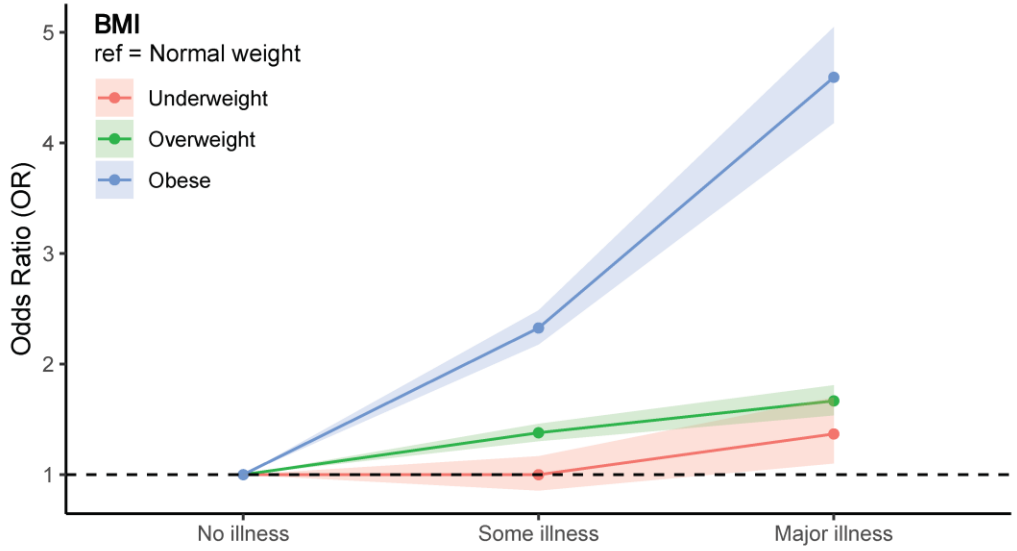


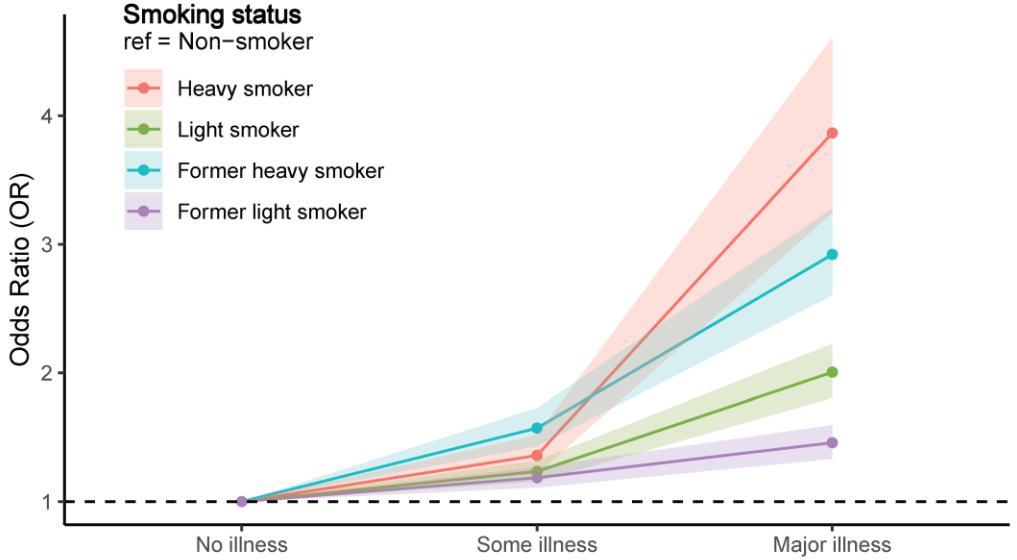
Rates (per 1000) increasing by condition

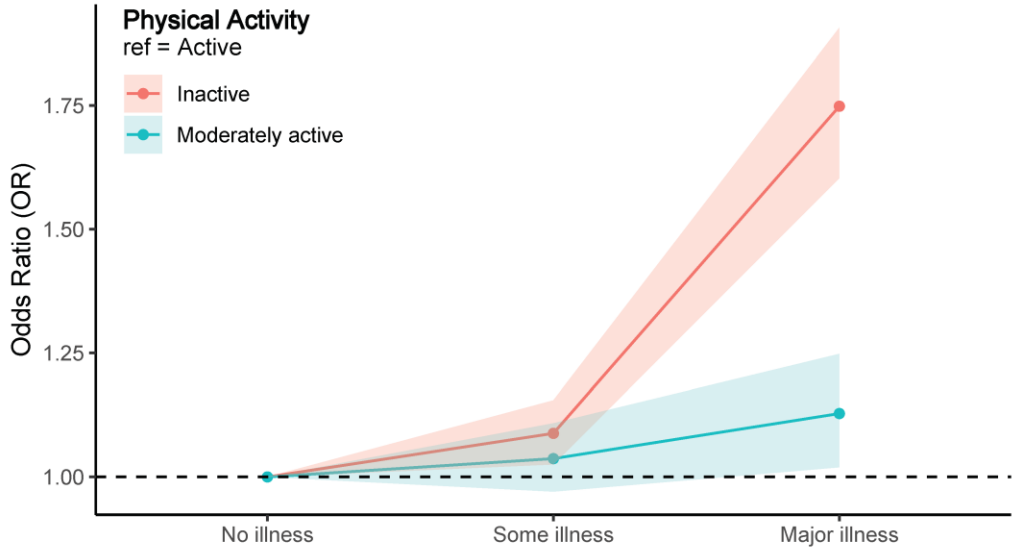


Strong determinants of risk groups



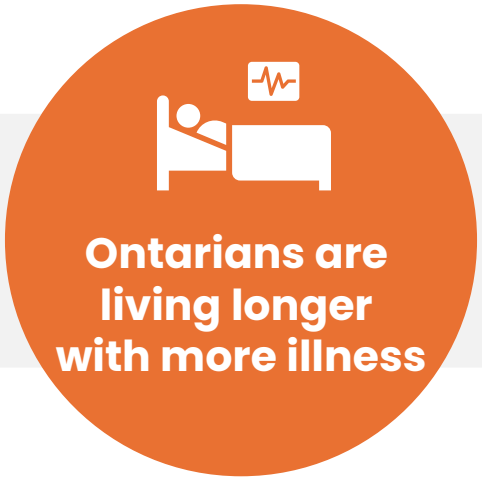






Implications for the Ontario Health System

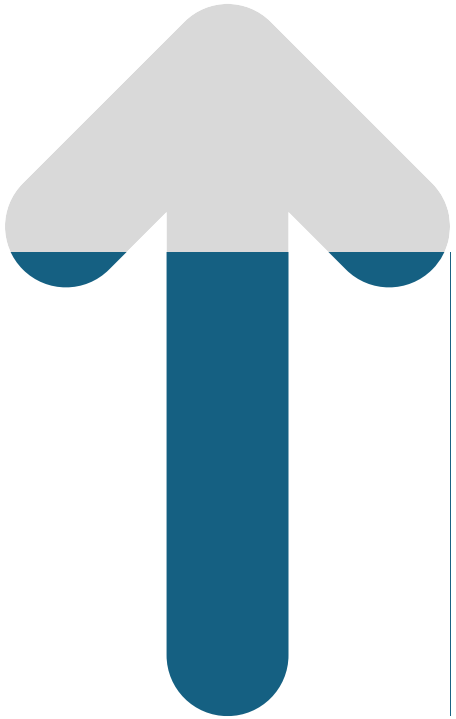
- The burden of illness and subsequent strain on the system will be **increasing considerably** in the next two decades



- Many of conditions can be managed outside hospital
- This burden **will not be equally felt** in the population
- Many chronic disease can be **prevented or postponed**

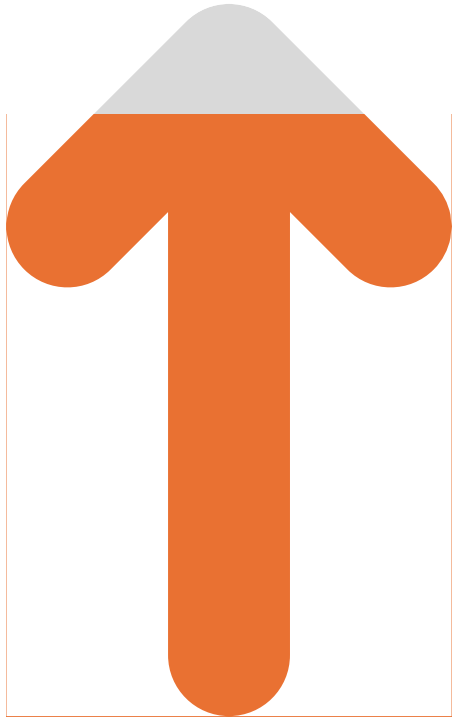
- Important opportunities for **prevention** and postponing major illness
- Increased focus on **community care** and the determinants of health

The drivers of increasing future health care needs are known



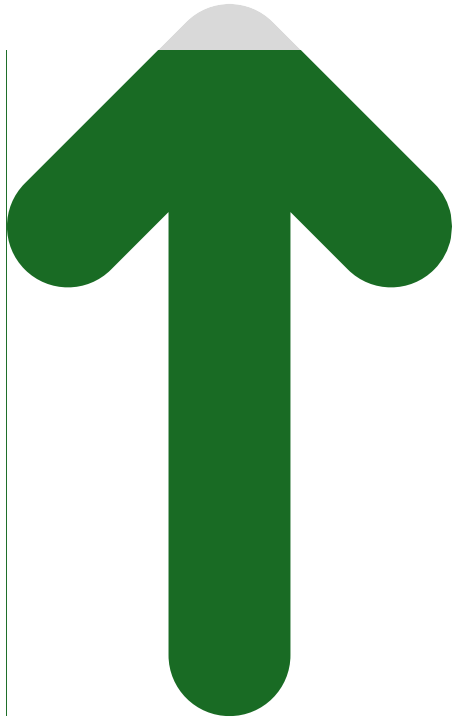
Ageing Population

The number of people living over 70 will increase steadily and considerably in the next 2 decades



Individual Factors

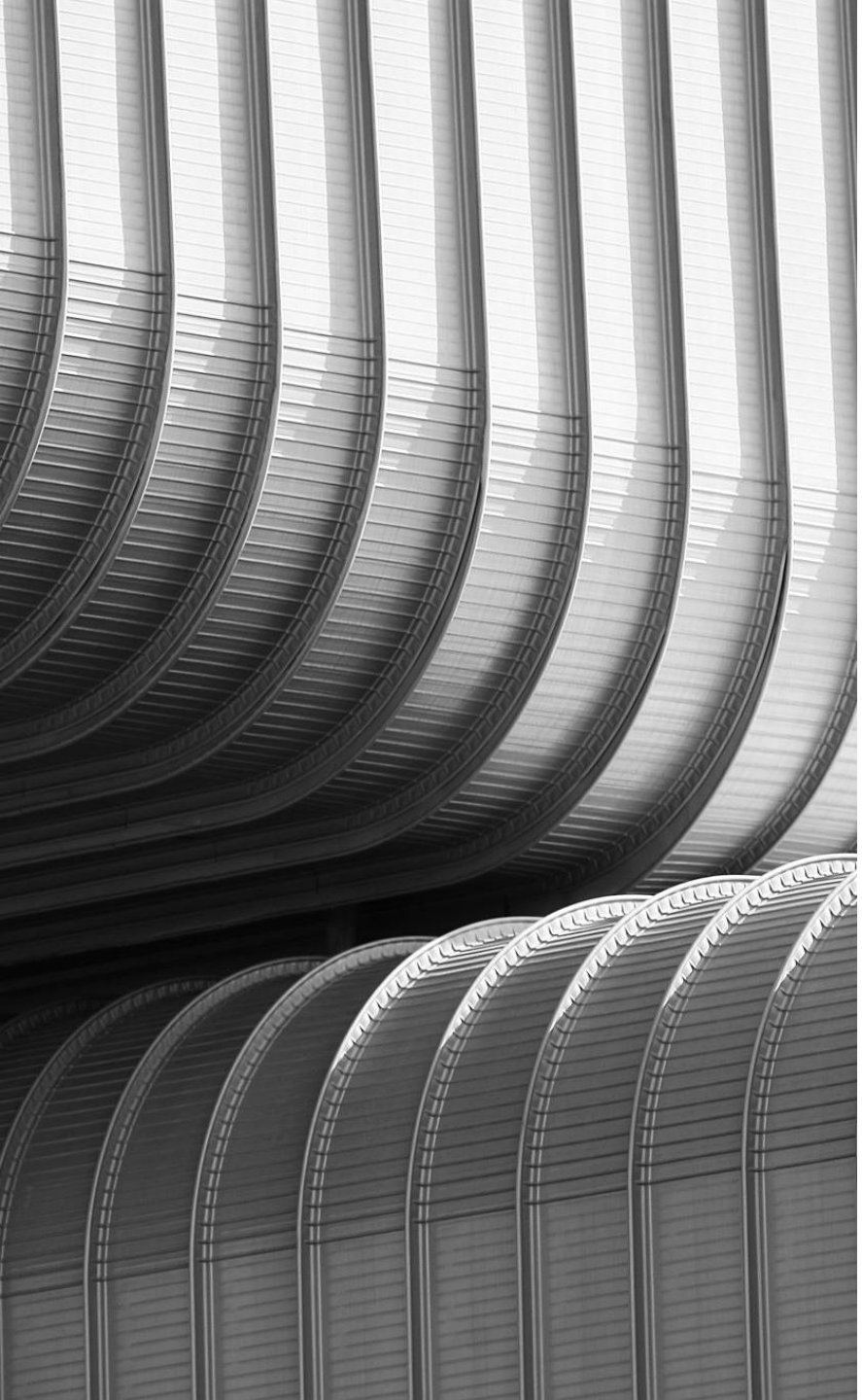
Physical activity, healthy food, obesity, social support



Social and Structural factors

Social and structural determinants of health will increase health needs, especially among younger ages, increasing the number of years lived in poor health

The Tipping Point

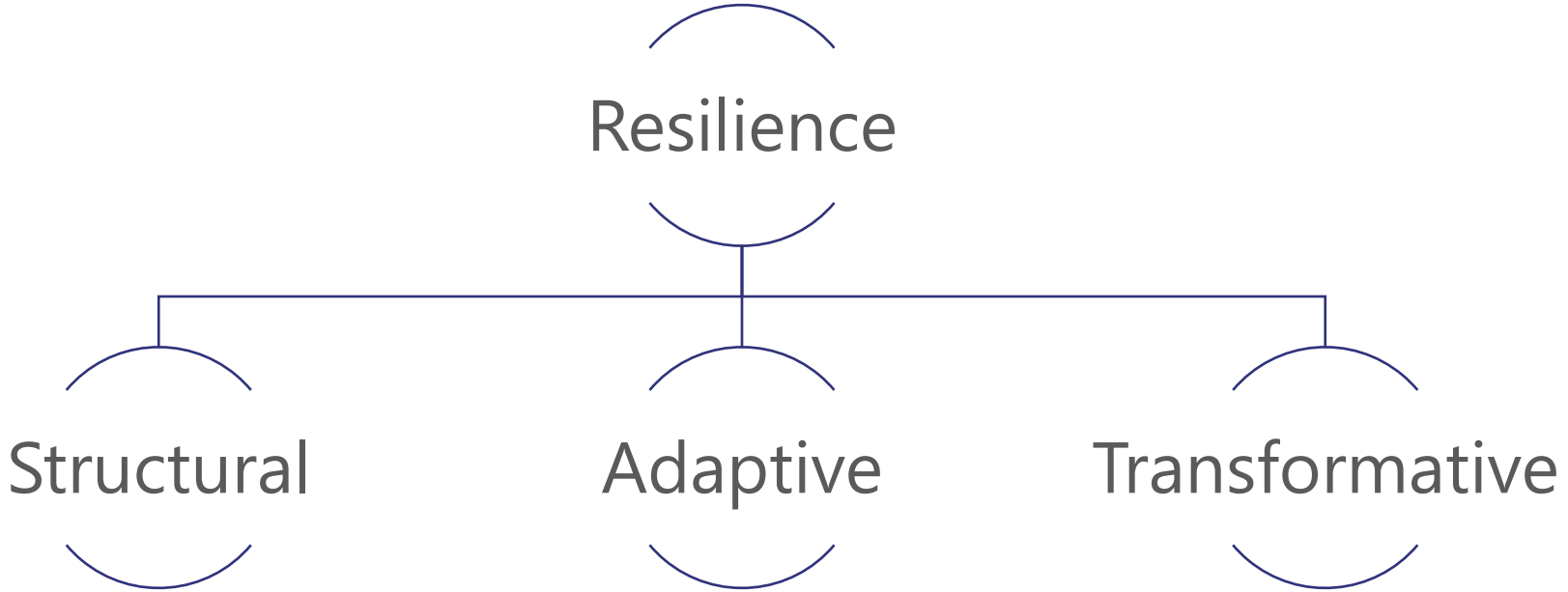


Without intervention, the system is not simply strained; it becomes structurally non-resilient

- Chronic disease growth is as destabilizing to the system as acute shocks, only slower and harder to reverse
- Rising multimorbidity reduces system agility and increases vulnerability during crises
- Resilient health systems must anticipate both sudden shocks and chronic pressures
- Strengthening prevention and community health infrastructure is foundational to system resilience

Resilience

The ability to recover or adjust to shocks

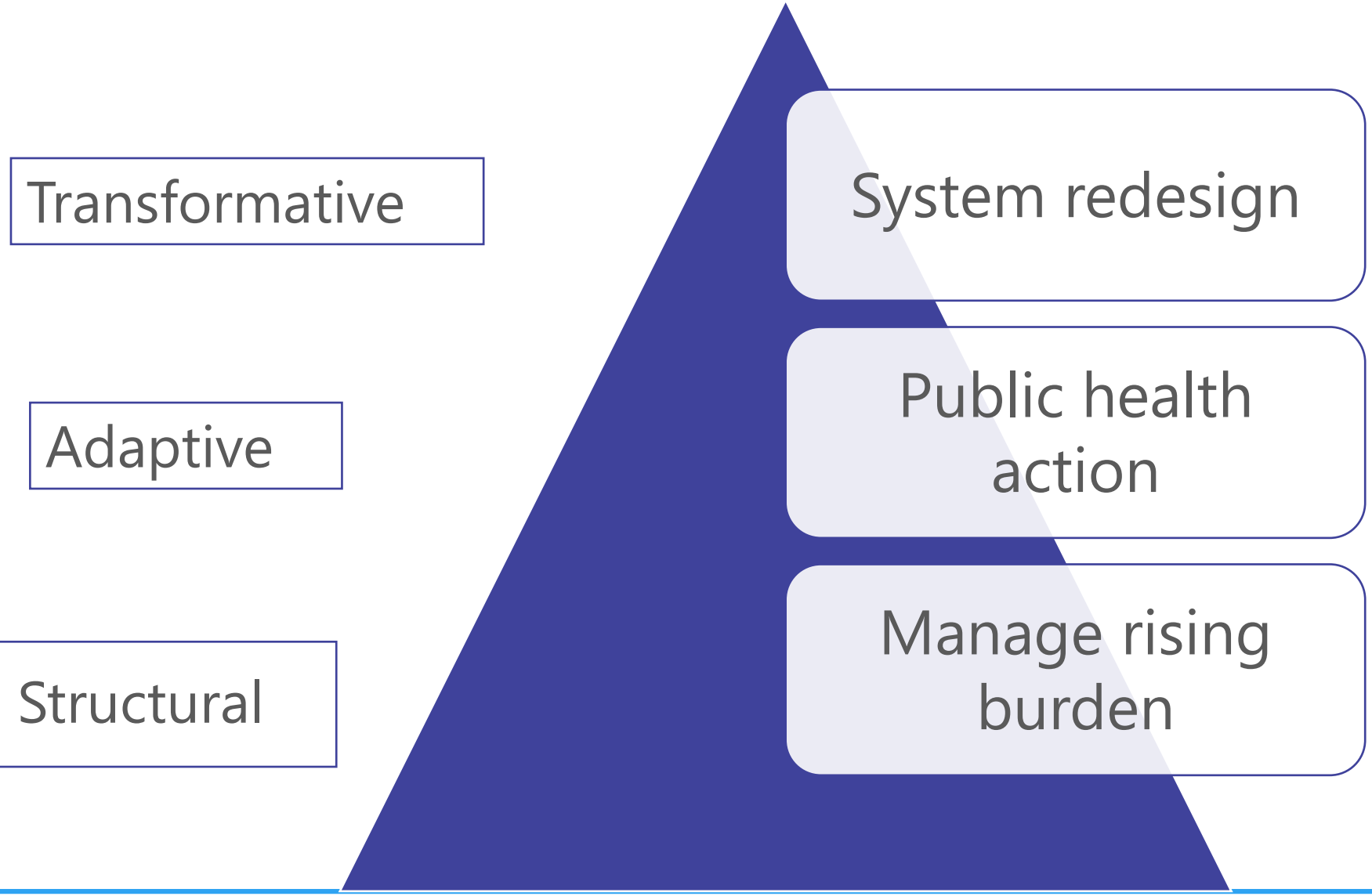


Can we absorb the shock?

Can we adjust during the shock?

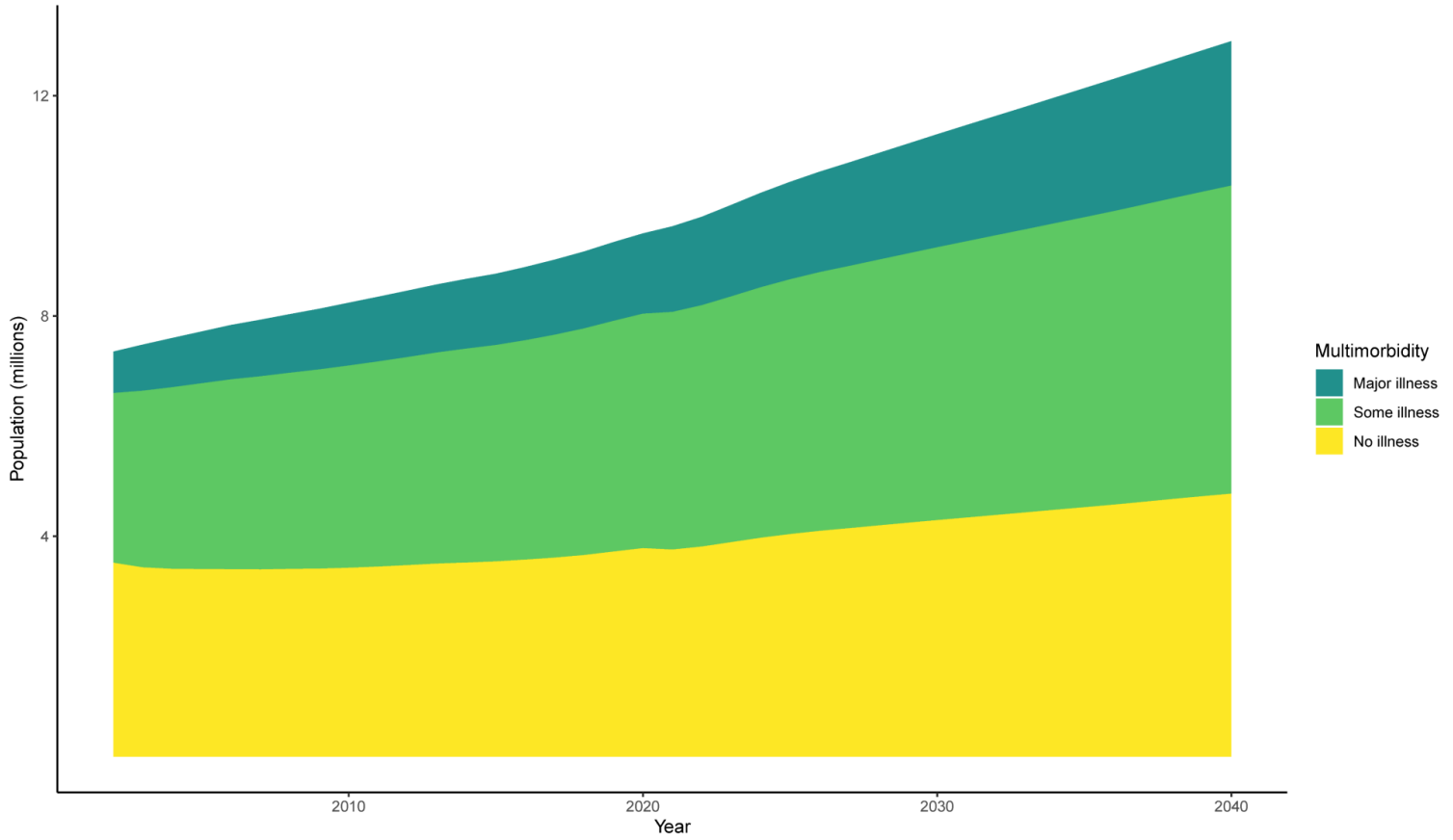
Can we emerge stronger?

Thomas et al. BMC HSR 2013
Vainieri M et al. Int J Envrion Res Pub Health 2020


Transformative
Adaptive
Structural
System redesign
Public health action
Manage rising burden

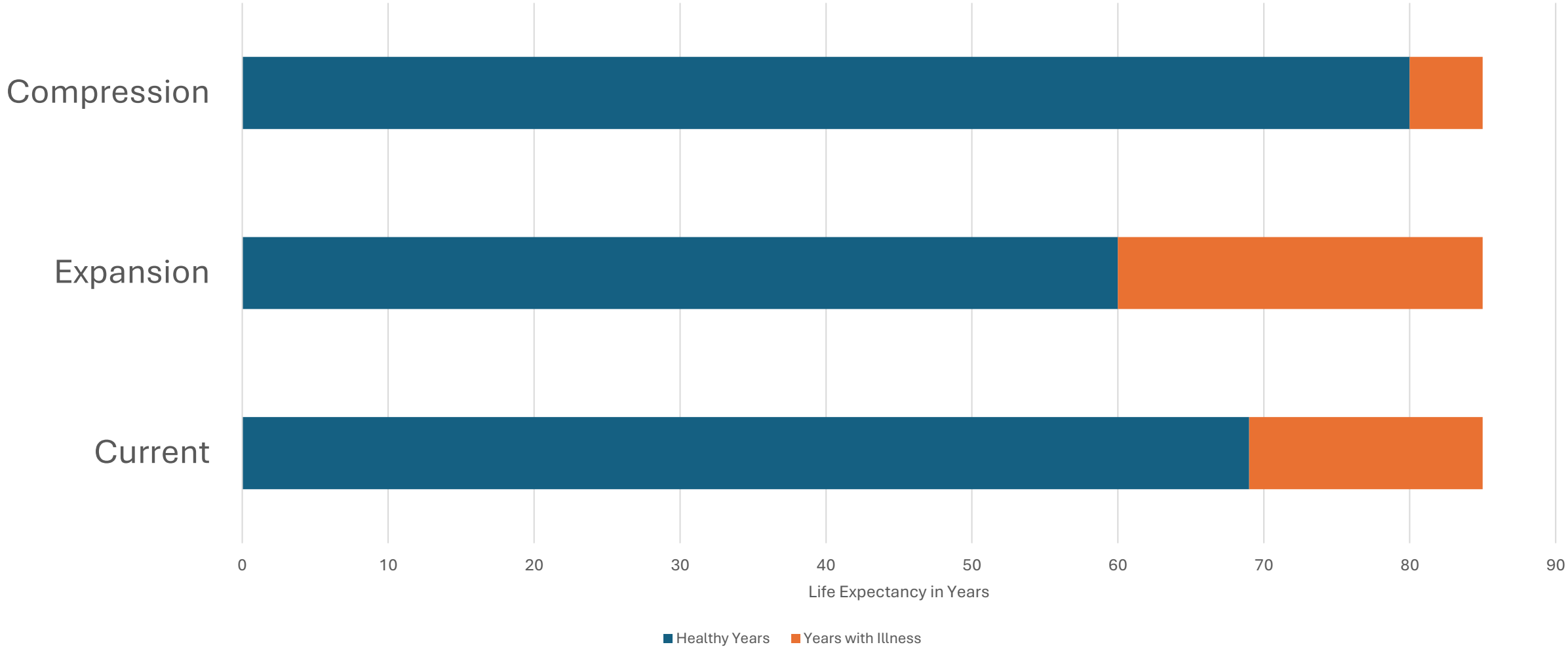
What Does this mean for public health?

Bending the curve: The role of public health



- Ontario is now entering the decade where prevention has the highest leverage
- Demographic momentum means that by 2035, our ability to change 2040 outcomes declines sharply
- Chronic disease is now a resilience threat, not just a health or system burden

Goal: Living more years of healthy life



National Goals: Extending Life vs. Extending Healthy Life

Lifespan Goals

- Achieve the highest life expectancy
- Increase total life expectancy (e.g., target of 85 years)
- Reduce mortality and extend survival

VS

Healthspan Goals

- Add 5 years of healthy, independent life
- Extend healthy life expectancy (disease-free, functional years)
- Narrow the gap between lifespan and healthspan

How public health turns projections into prevention

Identify priority risks and conditions
Highlight conditions, risks, and inequities needing most attention

Set meaningful prevention targets
Align indicators with the timelines where prevention can realistically bend the curve

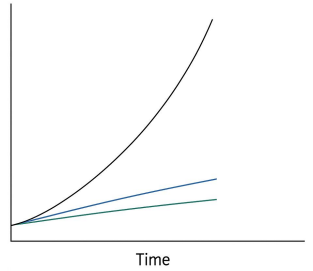
Equip regions for focused local action
Provide localized forecasts to tailor programs, planning, and resource allocation

Strengthen accountability
Use indicators and scorecards to track progress and demonstrate impact

System Alignment and Action

- **Align decision-making across ministries, PHUs, municipalities, and health system partners**
  Use shared projections to coordinate priorities and expectations.
- **Support long-range system planning**
  Inform budget cycles, workforce planning, infrastructure needs, and prevention investment.
- **Guide regional prioritization**
  Help identify where pressures will emerge and where early intervention has the greatest effect.
- **Enable transparent accountability for outcomes**
  Use projections as a reference point to assess progress and the cost of inaction.

Public health levers that bend the curve



- Healthy built environments (walkability, transportation, greenspace)
- Tobacco and alcohol policy
- Food environments & nutrition security
- Housing stability and neighbourhood conditions
- Physical activity opportunities
- Early-life interventions
- Community design for aging populations
- Equity-focused approaches

Figure 1: Building Blocks of Healthy & Resilient Cities

Social Connections

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

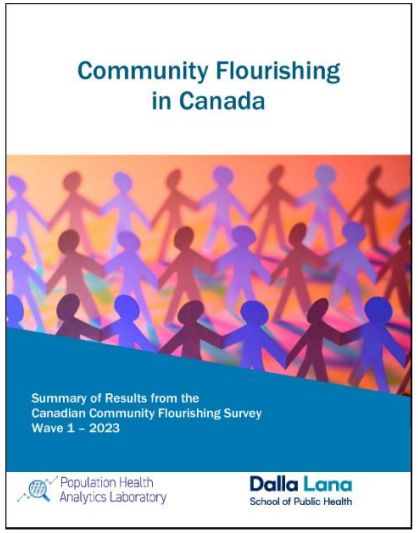
Local organizations

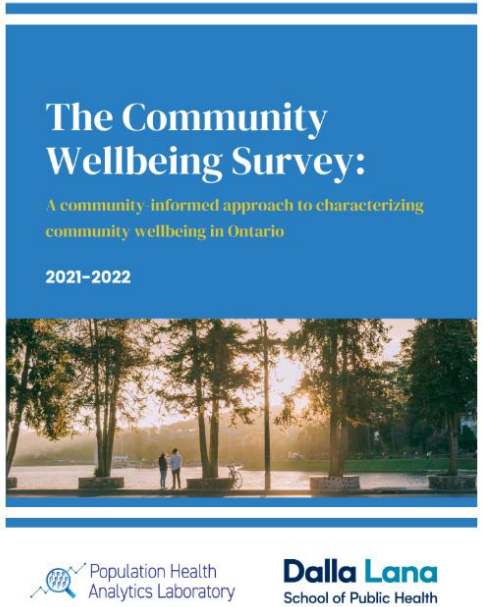
City government, local health system organizations and community-based organizations are pivotal in enabling an equitable and effective response and longer-term rebound

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.





https://experience.arcgis.com/experience/acc19be978844d6c9bcca3fb53f73166

What’s next for this work

- Patterns of illness among children and young adults
- Partnership with PHO
- Health region-specific forecasts in Ontario to support local system planning.
- Partnership with other provinces
- Patient, community , community & partnership tables
- Integrating the social determinants and risk factors to inform prevention indicators
- Monitoring, interventions, system planning approaches and local action

What success looks like

- More years of healthy life
- Later onset of multimorbidity
- Narrowing socioeconomic gradients
- Slower disease burden curve

How we get there

Build	Develop shared, province-wide foresight models that give all partners a common view of future burden and system needs
Use	Apply projections to guide long-range public health investment; setting targets, aligning priorities, and focusing prevention for population impact
Strengthen	Deepen partnerships with cities, communities, and sectors that shape the determinants of health, so action aligns with the real drivers of illness and inequity

Main Messages

Ontario's burden of illness is rising to unprecedented levels

Public Health has distinct levers to influence that trajectory

Projections provide focus, alignment, and accountability for action

Data + modelling + indicators enable targeted local action

Acknowledgments

- Ontario Hospital Association
- Dr. Adalsteinn Brown, DLSPH, U of T
- Dr. Imtiaz Daniel, OHA
- Dr. Monica Alexander, Statistics & Demography, U of T
- Dr. Emmalin Buajitti, U of T
- Toby Watt, The Health Foundation, UK
- Dr. Chris Kypridemos, University of Liverpool, UK
- Dr. Laura C. Rosella, DLSPH, U of T

Thank you!

Laura C. Rosella, PhD

laura.rosella@utoronto.ca

@LauraCRosella

Population Health Analytics Laboratory

Population Health Analytics Lab

www.pophealthanalytics.com

@PopHlthAnalytic

AI4PH AI FOR PUBLIC HEALTH

https://ai4ph-hrtp.ca/

@ai4ph

UNIVERSITY OF TORONTO
DALLA LANA SCHOOL OF PUBLIC HEALTH