

Measuring Health Inequalities: Applying a Toolkit

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Disclosure Statement

- I have no affiliation (financial or otherwise) with a pharmaceutical, medical device or communications organization.

Welcome

- Groups
- Folders
- Provide your email address
- Who's joined us today?



Time	Topic
1:00 pm – 1:20 pm	Introduction <ul style="list-style-type: none">○ Video 1: <i>Measuring health inequalities: An Introduction</i>○ Activity 1: Why measure health inequalities?
1:20 pm – 1:25 pm	Plan your analysis
1:25 pm – 1:45 pm	Analyze your data <ul style="list-style-type: none">○ Video 2: <i>Interpreting Health Inequalities to Inform Action</i>
1:45 pm – 2:00 pm	Report your findings
2:00 pm – 2:20 pm	GROUP WORK <ul style="list-style-type: none">○ Activity 2: Quantify inequalities using summary measures and present findings to your audience
2:20 pm – 2:30 pm	Moving forward and questions

CIHI's mandate

Vision

**Better data.
Better decisions.
Healthier Canadians.**

Mandate

Deliver comparable and actionable information to accelerate improvements in health care, health system performance and population health across the continuum of care.

Values

Respect • Integrity • Collaboration • Excellence • Innovation

Data holdings



Types of care

- Acute and emergency
- Mental health
- Home care
- Long-term care
- Rehabilitation
- Pharmaceuticals
- More



Health workforce

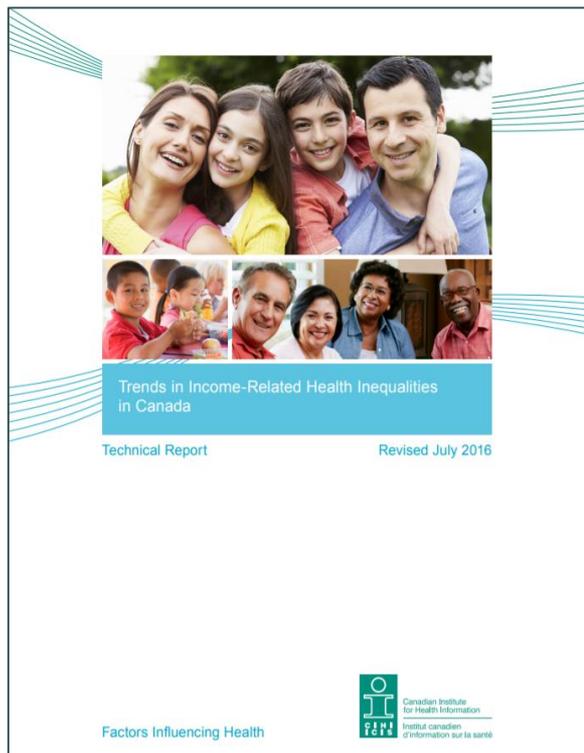
- Physicians
- Regulated nurses
- Pharmacists
- Occupational therapists
- Physiotherapists
- More



Health spending

- Macro health expenditures
- Hospital and regional health authority financial accounts
- Patient costing

Examples of CIHI reports that measure inequalities



Health inequalities by income have largely persisted and in **some cases have increased over time.**



Hospitalization rates **more than 2 times higher** for Canadians living in lower income neighborhoods

Measuring Health Inequalities: A Toolkit



- Consists of guidelines and resources organized in 3 phases:



Resource: Glossary of Terms



Glossary of Terms | February 2019



Measuring Health Inequalities: A Toolkit — Glossary of Terms

absolute inequality: The magnitude of difference observed between population subgroups.

area-level analysis: Analysis using socio-economic or socio-demographic information aggregated by geographic areas such as neighbourhoods.

complex measure of inequality: A measure of inequality that incorporates data from all population subgroups (e.g., inequality across all income groups); it is a single number indicating the level of inequality. Examples include potential rate reduction (PRR) and population impact number (PIN).

composite index: An area- or individual-level measure consisting of a number of socio-demographic variables that can be used to identify population subgroups with similar characteristics. Variables commonly used in composite indices include income, education and unemployment (see the table). Composite indices can be used as equity stratifiers to measure health inequalities.

deprivation index: A composite index that can identify population subgroups based on the level of deprivation using a number of variables (see *composite index*).

equity stratifier: A demographic, social, economic or geographic characteristic that can identify population subgroups for the purpose of measuring differences in health and health care that may be considered unfair and avoidable.

health equity: Absence of unfair and avoidable differences in health and health care access, quality or outcomes across the population. It is the ideal state in which all people are able to reach their full health potential and receive high-quality care that is fair and appropriate to them and their needs, no matter where they live, who they are or what they have.

health indicator: A measure designed to summarize information about a given priority topic in population health or health system performance. Health indicators provide comparable and actionable information across different geographic, organizational or administrative boundaries and/or can track progress over time.

health inequality: Any difference in health and health care access, quality or health outcomes between population subgroups. Health inequalities may be due to unavoidable biological and natural factors.

Equity stratifier: A demographic, social, economic or geographic characteristic that can identify population subgroups for the purpose of measuring differences in health and health care that may be considered unfair and avoidable.

Resource: Supplementary Resources



 Resources | February 2019

Measuring Health Inequalities: A Toolkit — Supplementary Resources

This document contains a list of organizations that have helpful resources to support planning for, analyzing and reporting on health inequalities. Many of these resources informed the development of CIHI's Measuring Health Inequalities: A Toolkit. If you have suggestions for this list, please email cphi@cihi.ca.

Table 1 Canadian organizations — National

Organization	Examples of resources
Canadian Council on Social Determinants of Health (CCSDH)	Communicating the Social Determinants of Health: Guidelines for Common Messaging (2013)
Canadian Institute for Health Information (CIHI)	Health inequalities Trends in Income-Related Health Inequalities in Canada (2015) Asthma Hospitalizations Among Children and Youth in Canada: Trends and Inequalities (2018) CIHI's Indicator Library A Performance Measurement Framework for the Canadian Health System (2013)
Canadian Research Data Centre Network (CRDCN)	Information on how to access Research Data Centres for Statistics Canada survey, census and administrative data sets Data set descriptions and resources (e.g., search data sets such as PCCF)
National Collaborating Centre for Determinants of Health (NCCDH)	A Guide to Community Engagement Frameworks for Action on the Social Determinants of Health and Health Equity (2013)
Public Health Agency of Canada (PHAC)	Health Inequalities Data Tool Key Health Inequalities in Canada: A National Portrait (2018)
Statistics Canada	Data available in the Research Data Centres (RDCs) Postal Code Conversion File Plus (PCCF+)

 Canadian Institute for Health Information
Institut canadien d'information sur la santé



A guide to community engagement frameworks for action on the social determinants of health and health equity

National Collaborating Centre for Determinants of Health | 2013

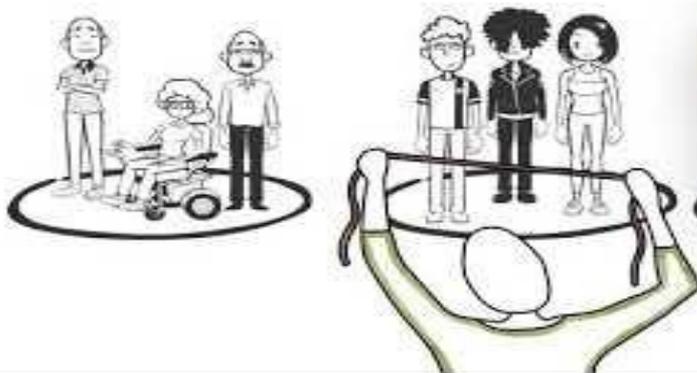
Series of 4 eLearning courses

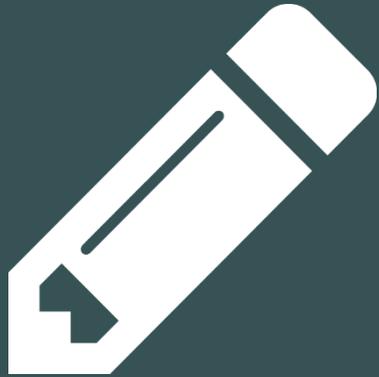


- **Courses are available in English and French**
- **To access the courses:**
 - Go to: <https://www.cihi.ca/en/news-events-and-education/education>
 - Create an account to login to the CIHI Learning Centre
 - Search for the courses listed above and click ‘Enrol now’

Measuring Health Inequalities: An Introduction

Measuring health inequalities: a critical





Activity 1: Why measure health inequalities?

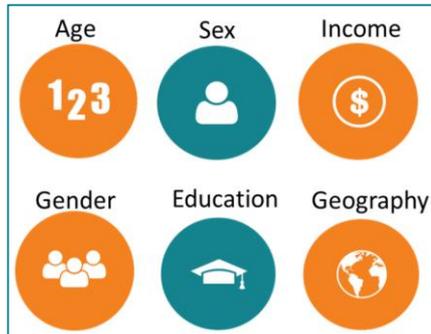


Plan your analysis

1. Select relevant equity stratifiers
2. Explore approaches for accessing equity stratifiers

1. Select relevant equity stratifiers

- 20+ commonly used equity stratifiers
- Standard definitions for 6 equity stratifiers



- Toolkit resource – Literature Review Template (not shown)



Pan-Canadian Dialogue to
Advance the Measurement of
Equity in Health Care

Proceedings Report



In Pursuit of Health Equity: Defining Stratifiers
for Measuring Health Inequality

A Focus on Age, Sex, Gender, Income,
Education and Geographic Location

April 2018



Equity stratifier definitions: e.g., income



In Pursuit of Health Equity: Defining Stratifiers for Measuring Health Inequality

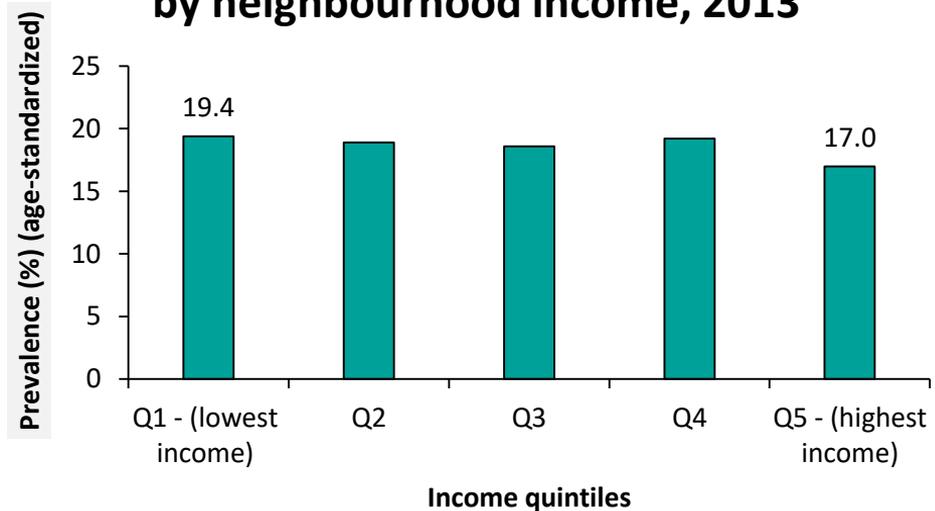
A Focus on Age, Sex, Gender, Income, Education and Geographic Location

April 2018

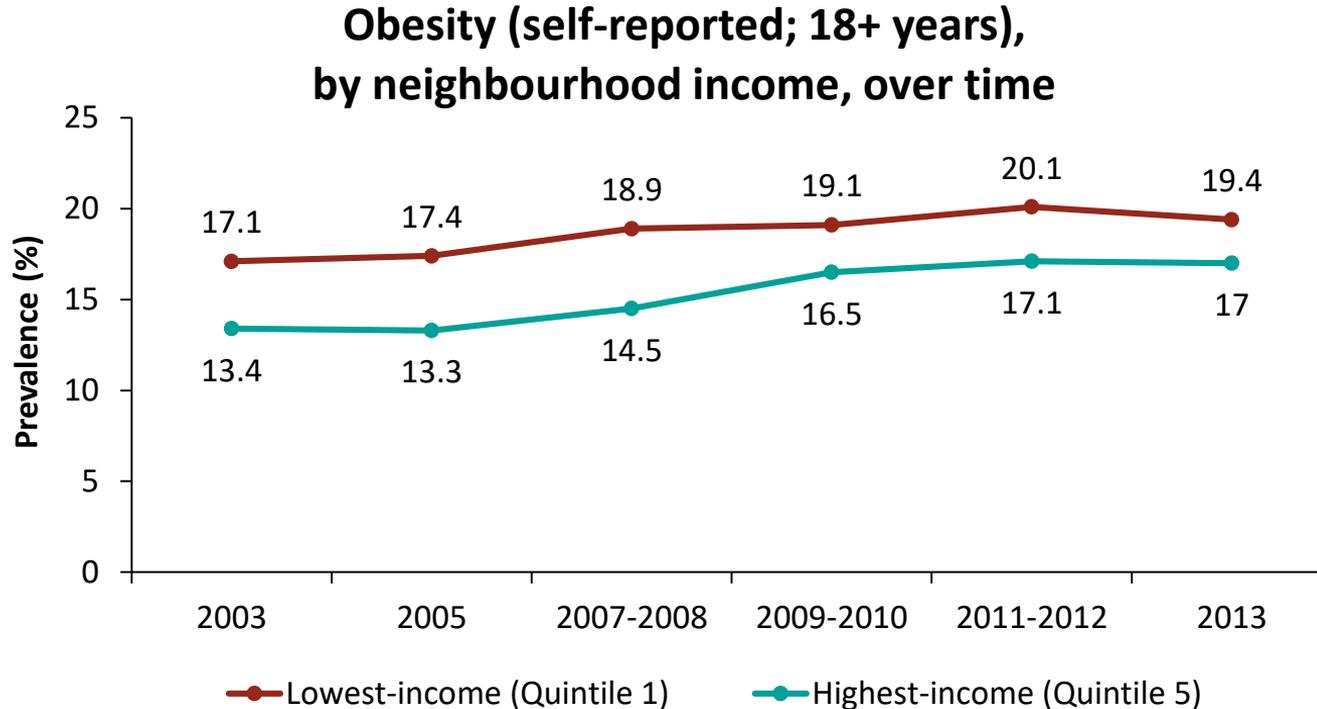


Construct	Measure
Relative income	Income quintiles

Obesity (self-reported; 18+ years), by neighbourhood income, 2013



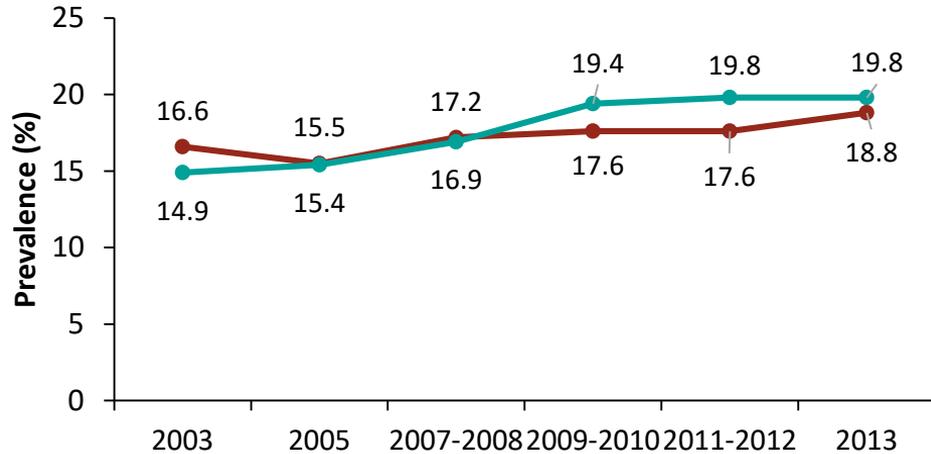
Considering multiple stratifiers simultaneously: obesity by income



Considering multiple stratifiers simultaneously: obesity by sex **AND** income

Obesity by neighbourhood income over time,

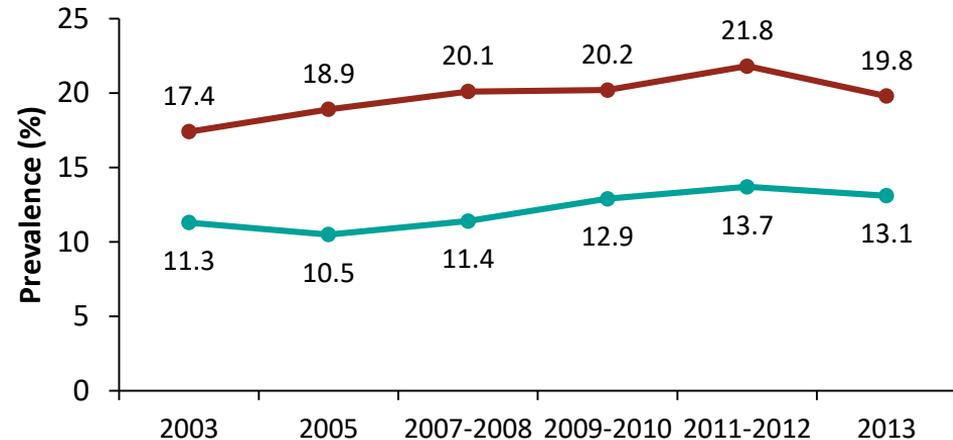
men



● Lowest-income (Quintile 1) ● Highest-income (Quintile 5)

Obesity by neighbourhood income over time,

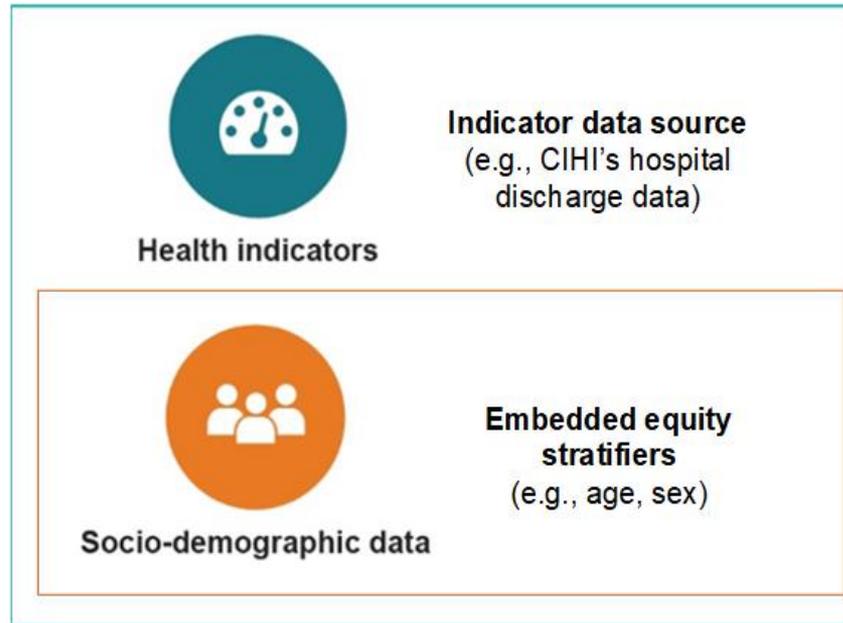
women



● Lowest-income (Quintile 1) ● Highest-income (Quintile 5)

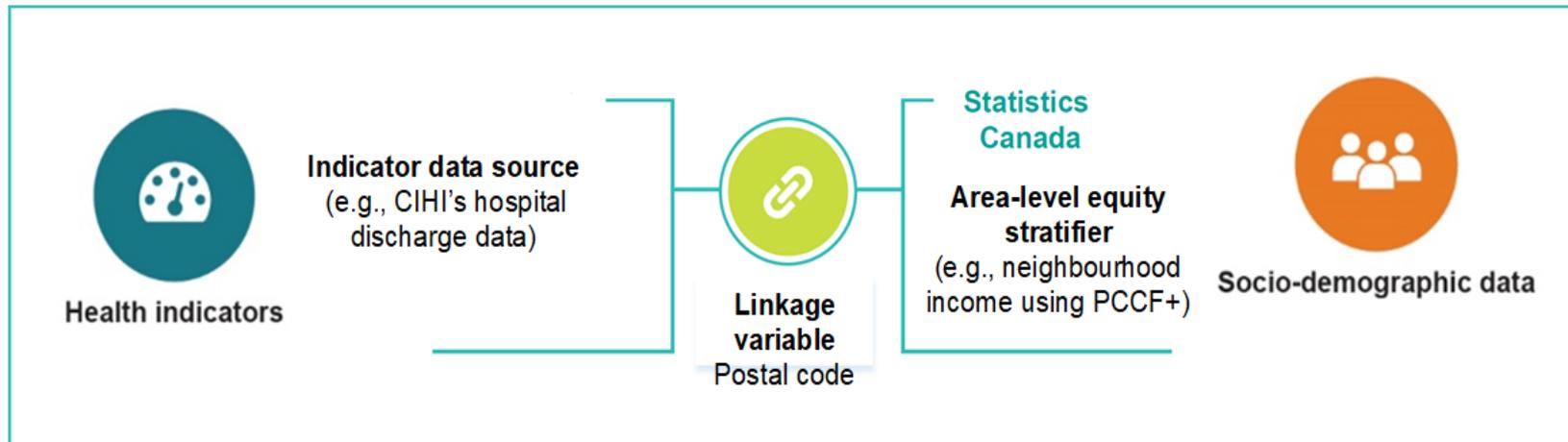
2. Explore approaches for accessing equity stratifier data

- Approach 1: Use equity stratifier data embedded within health databases



2. Explore approaches for accessing equity stratifier data (cont'd)

- Approach 2: Link health and equity stratifier data at the area level



Resource: Area-Level Equity Stratifiers Using PCCF and PCCF+ Guide

- Information on data quality, accessing the PCCF and PCCF+ tools and definitions of census geographies
- Main differences between PCCF and PCCF+
- Key considerations for use

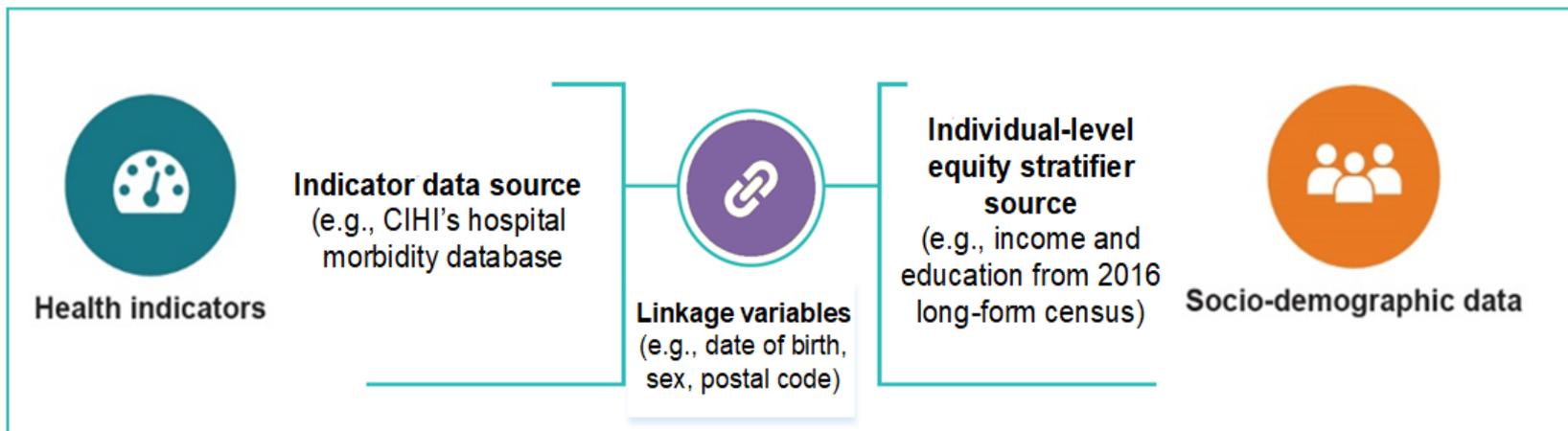


Measuring Health Inequalities: A Toolkit

Area-Level Equity Stratifiers Using PCCF and PCCF+

2. Explore approaches for accessing equity stratifier data (cont'd)

- Approach 3: Link health and equity stratifier data at the individual level



Key Resource: Equity Stratifier Inventory

- Summarizes the availability of 19 equity stratifiers in selected CIHI and Statistics Canada data sources
- Assess feasibility of measuring inequalities for each stratifier based on data availability and quality



Stratifier	HMDB (DAD + MED-ÉCO) 2016–2017		Hospital Morbidity Database (HMDB-DAD + MED-ÉCHO) 2016–2017
Age*	A		Data element: Age (derived variable calculated using Admission Date and Birthdate.)
Sex*	A	→	Data element: Birthdate
Gender*	N		Data element: Gender
Income*	A ¹		Categories: M, F, U (Undifferentiated for Stillbirths), Other or Unknown
Education*	N		Note: Data element name is labelled as gender. This data is sourced from the health card information which predominantly captures sex assigned at birth as identified on the birth certificate.
Geographic location (urban versus rural/remote)*	A ¹		
Ethnicity [†]	N		
Racialized groups [†]	N		
Indigenous identity [†]	N		
Disability	N		
Employment status	N		
Occupation	N		
Homeless	P		
Immigrant status	N		N
Language	N		N
Marital status	N		N
Sexual orientation	N		N
Social support	N		N
Health insurance	N		N
Residential postal code	A		A

By the end of the planning phase, you'll have:



Analysis Plan Template

Health indicator: [Insert indicator name]

Definition: [Insert description of indicator, including numerator and denominator definitions]

Rationale: [Describe the purpose of reporting the health indicator]

Desired direction: [State whether lower or higher rates are desirable]

Indicator data sources: [List all data sources required to calculate the indicator]

Stratification plan

Equity stratifier	Relevant	Definition	Feasible	Source of stratifier data	Interactions
[List all stratifiers that you considered including]	[Y/N; if no, record supporting evidence]	[List construct and measures/categories to be used]	[Y/N; if no, record supporting evidence] [Record year(s) and reporting level(s) of available data, if applicable]	[List approach and data source used for accessing equity stratifier]	[List stratifiers that you will examine interactions with]

- ✓ Selected relevant stratifiers (including interactions) for your indicator
- ✓ Decided how to define and access data for these stratifiers
- ✓ Created an analysis plan



Analyze your data

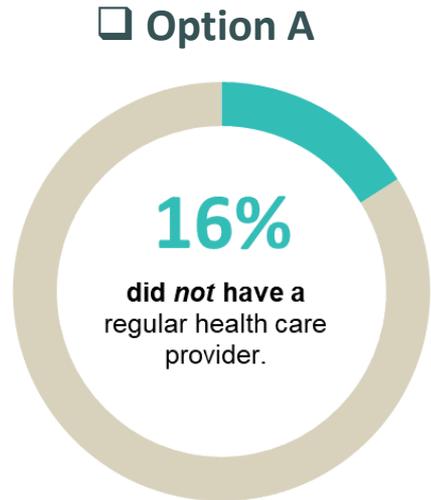
1. Carry out a stratified analysis
2. Quantify inequalities using summary measures

Step 1. Carry out a stratified analysis

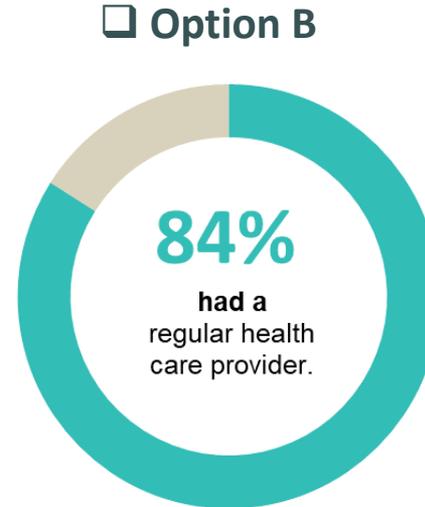
- Define your health indicator
- Obtain your equity stratifier data
- Check for missing data and small numbers
- Calculate stratified indicator rates

Polling question: Define your health indicator – consider the indicator direction

For which of these indicator definitions are lower rates desirable?



Vs.



Define your health indicator – consider the indicator direction

- **If there is a commonly used methodology for defining your health indicator, you may want to apply the same definition in your analysis.**
 - This enables comparison with other reporting initiatives
 - E.g., Seniors without influenza vaccinations vs. Seniors with influenza vaccinations
- **For reporting on multiple health indicators, it is easier to interpret the results if all the indicators have the same direction**

Obtain your equity stratifier data

Example – health indicator using CIHI hospital data

Equity stratifier	Source of stratifier data
Age	Embedded within CIHI hospital data
Sex	Embedded within CIHI hospital data
Income	Link hospital with area-level data using PCCF+
...	

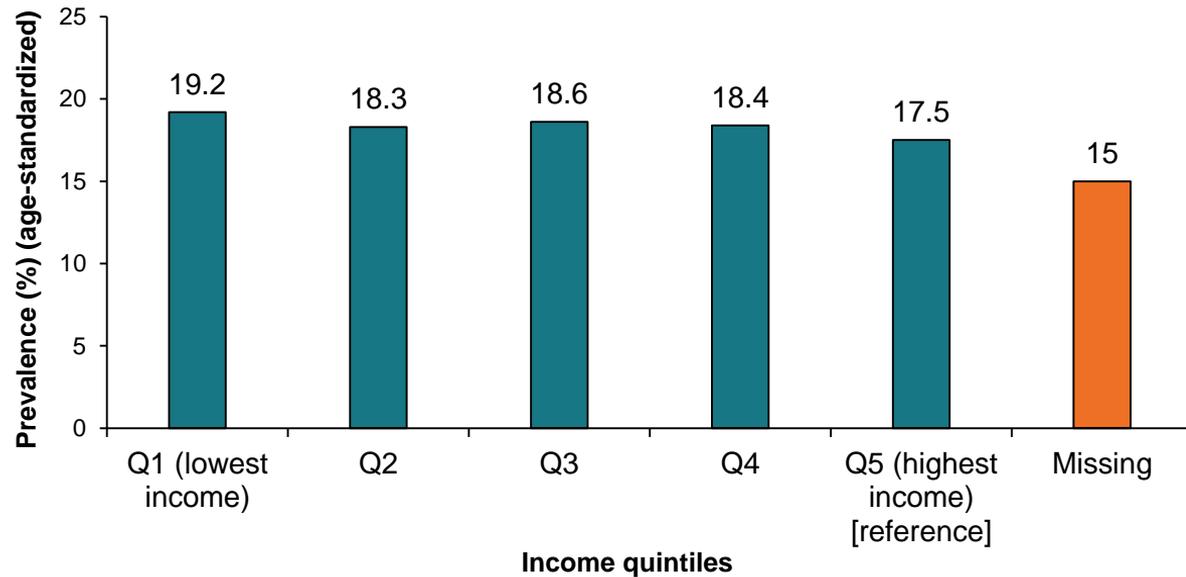
Check for missing data and small numbers

- **Missing data – systematic or high proportion**
 - Can affect the validity of your analysis
 - Can contribute to small numbers
- **Small numbers**
 - Can affect whether you can report on your findings due to suppression rules or privacy concerns
 - Can affect the need to interpret results with caution

Addressing missing data - solutions

- **High percentage of missing**
 - Report missing as its own population subgroup
- **Impute values for missing data**

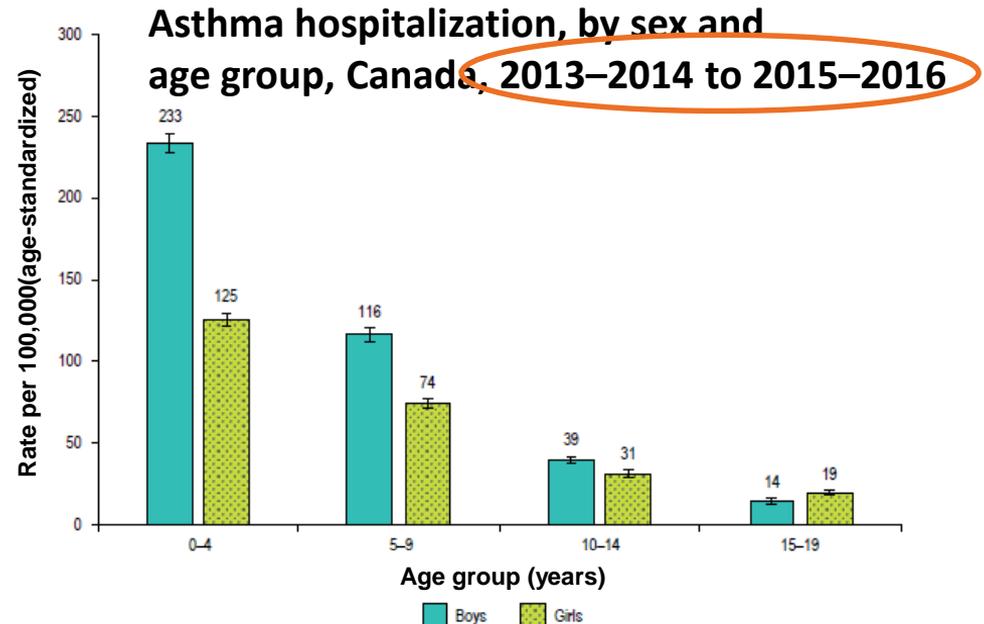
Obesity (self-reported; 18+ years), by income quintile, Canada



Addressing small numbers - solution 1

- Combine data over multiple years
 - This may be a preferred approach
 - Need to ensure that the indicator was measured consistently over all years

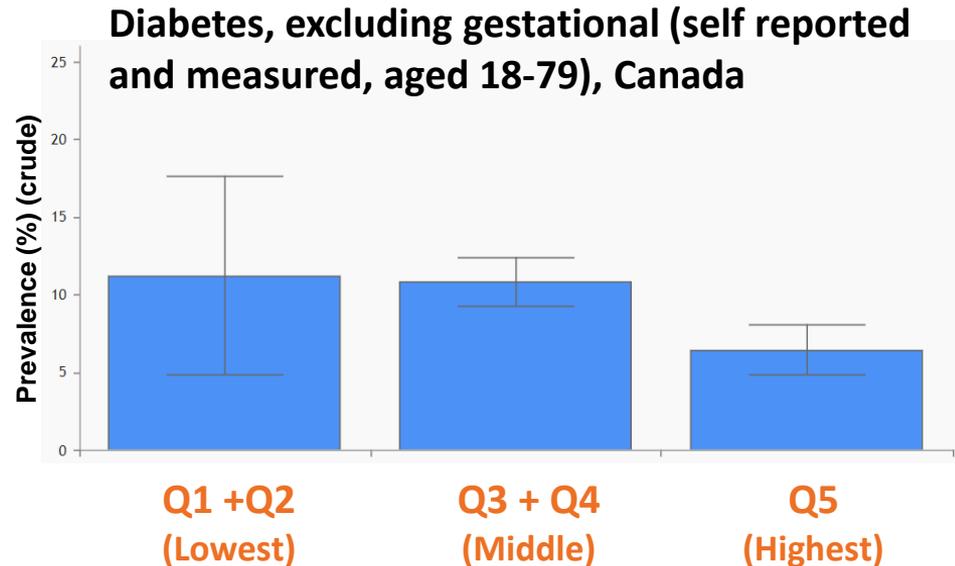
- Example – 3 years pooled data



Addressing small numbers – solution 2

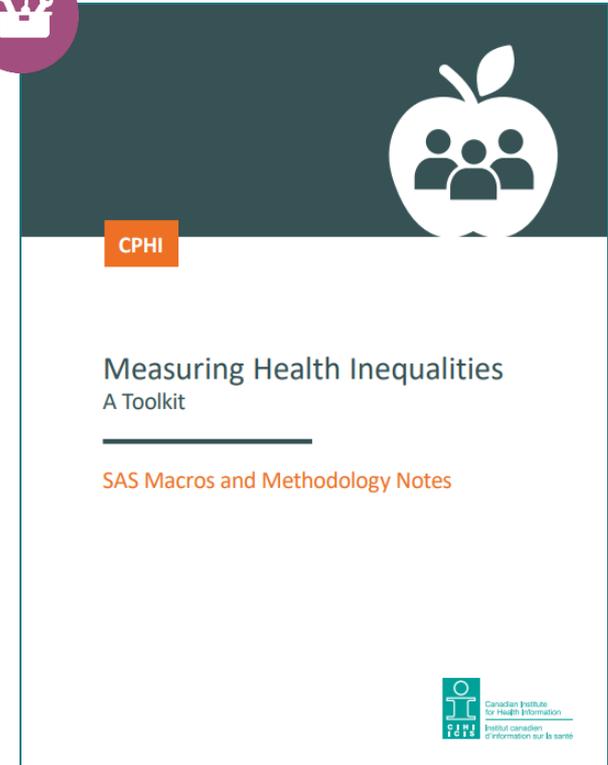
- **Combine population subgroups**
 - Best applied when combining similar population subgroups
 - A limitation - can mask inequalities between subgroups

- **Example – combine income quintiles**



Calculate stratified indicator rates

- Calculate indicator rates, as well as variance estimates, stratified by income and geographic location
- Key resource – SAS macros and methodology notes



Step 2. Quantify inequalities using summary measures

- **Select the reference group for each of the equity stratifiers**
- **Calculate simple measures of inequality such as the rate ratio (RR) and rate difference (RD)**
- **Consider complex measures of inequality**
- **Adapt the calculation or interpretation of measures of inequality**

Why use summary measures to quantify inequalities?

- **Metric that compares the indicator rates between population subgroups**
- **Useful for:**
 - Quantifying the magnitude of inequality between population subgroups
 - Comparing inequalities between jurisdictions and changes over time

Summary measures of inequality

Simple measures of inequality:
compares the rates between 2
population subgroups

Rate ratio (RR)

Rate difference (RD)

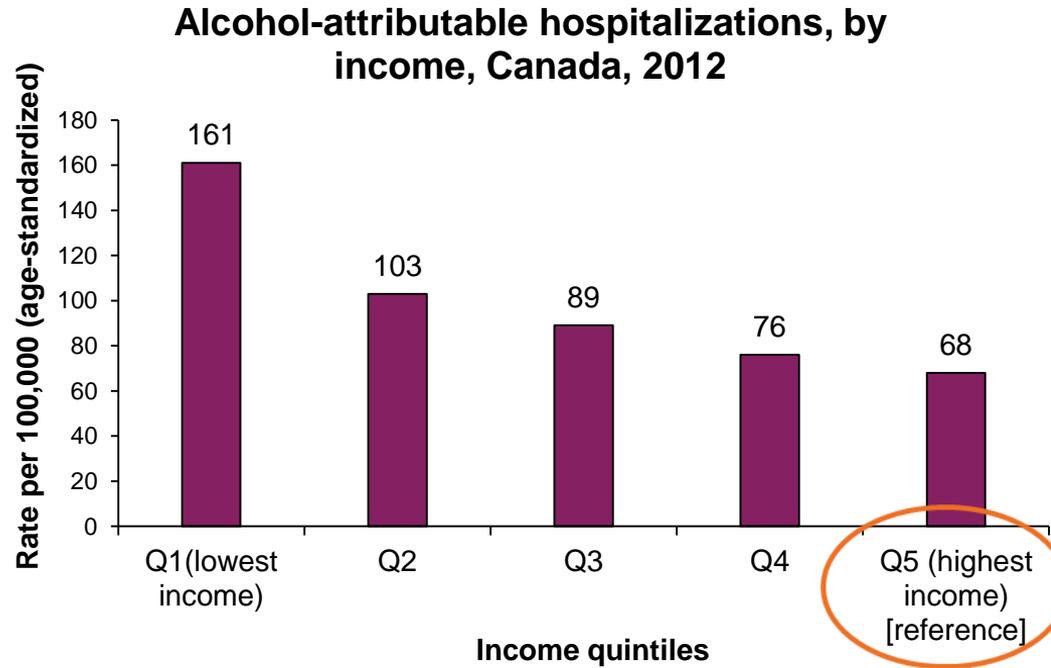
Complex measures of inequality:
captures inequality across multiple
population subgroups

Potential rate
reduction (PRR)

Population impact
number (PIN)

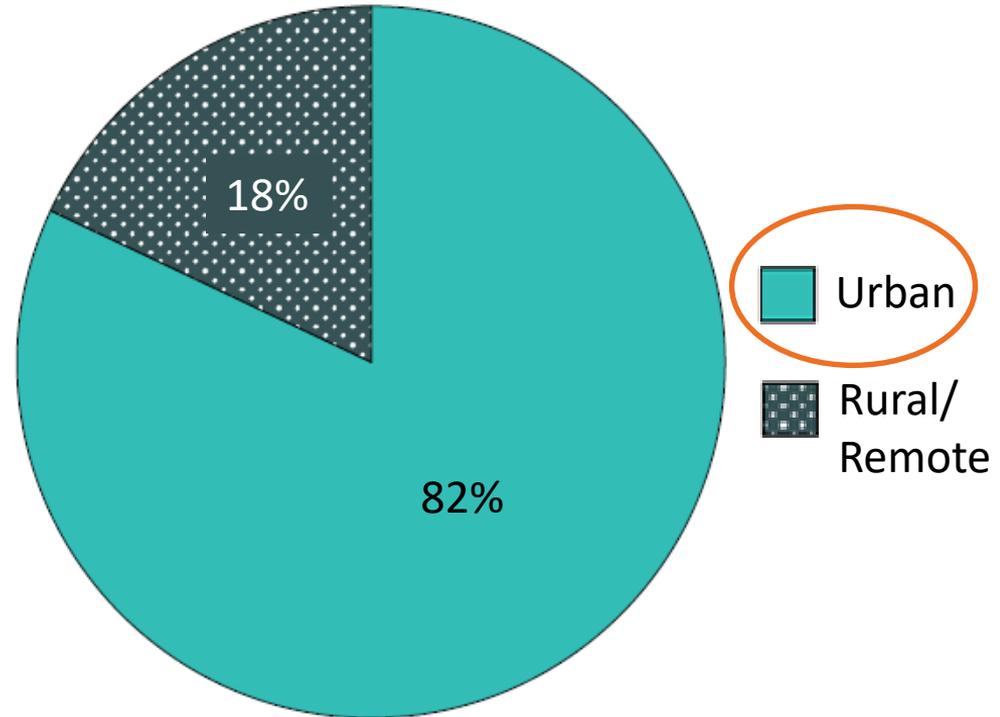
Select the reference group – (1)

- Select the subgroup with the most desirable rate
 - For ordered stratifiers, the highest ranked group is usually selected.



Select the reference group – (2)

- **Select the majority subgroup**
 - More commonly used for non-ordered stratifiers
 - Ensures that the reference group is sufficiently large



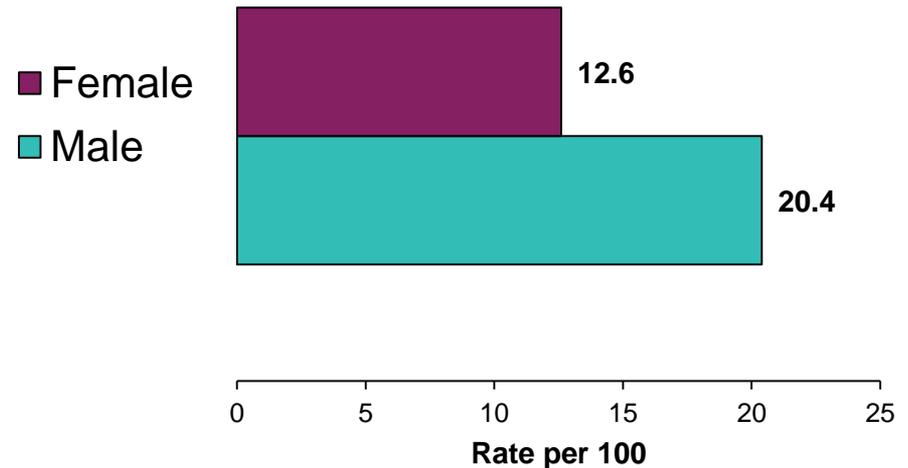
Polling question: Select the reference group

Which group would you use as the reference group?

Option A: Female

Option B: Male

Percentage of Population Without a Regular Health Care Provider



Calculate simple measures of inequality

- Use both absolute (difference-based) and relative (ratio-based)
- At a minimum, include rate ratio (RR) and rate difference (RD)
 - Simple to communicate and calculate
 - RR captures relative inequality
 - RD captures absolute inequality



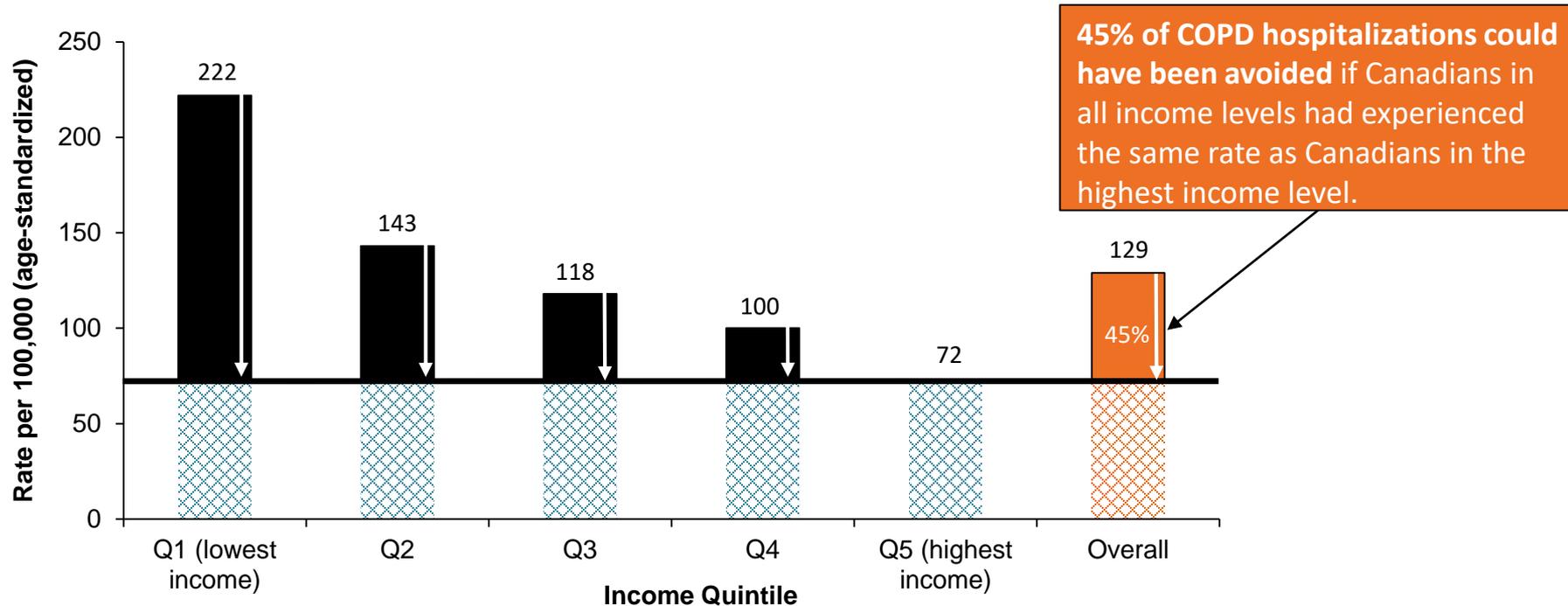
<https://youtu.be/XF1MagncBJc>

Consider complex measures of inequality: Potential Rate Reduction (PRR)

- Many complex measures to choose from
- PRR commonly used at CIHI; Captures inequality across multiple population subgroups
 - Captures the potential reduction in a health indicator rate that would occur in the **hypothetical** scenario that each population subgroup experienced the same low rate as the subgroup with the most desirable rate.
 - Also known as the “population-attributable fraction”
 - For indicators where higher rates are desirable, this would be the Potential Rate Improvement (PRI)

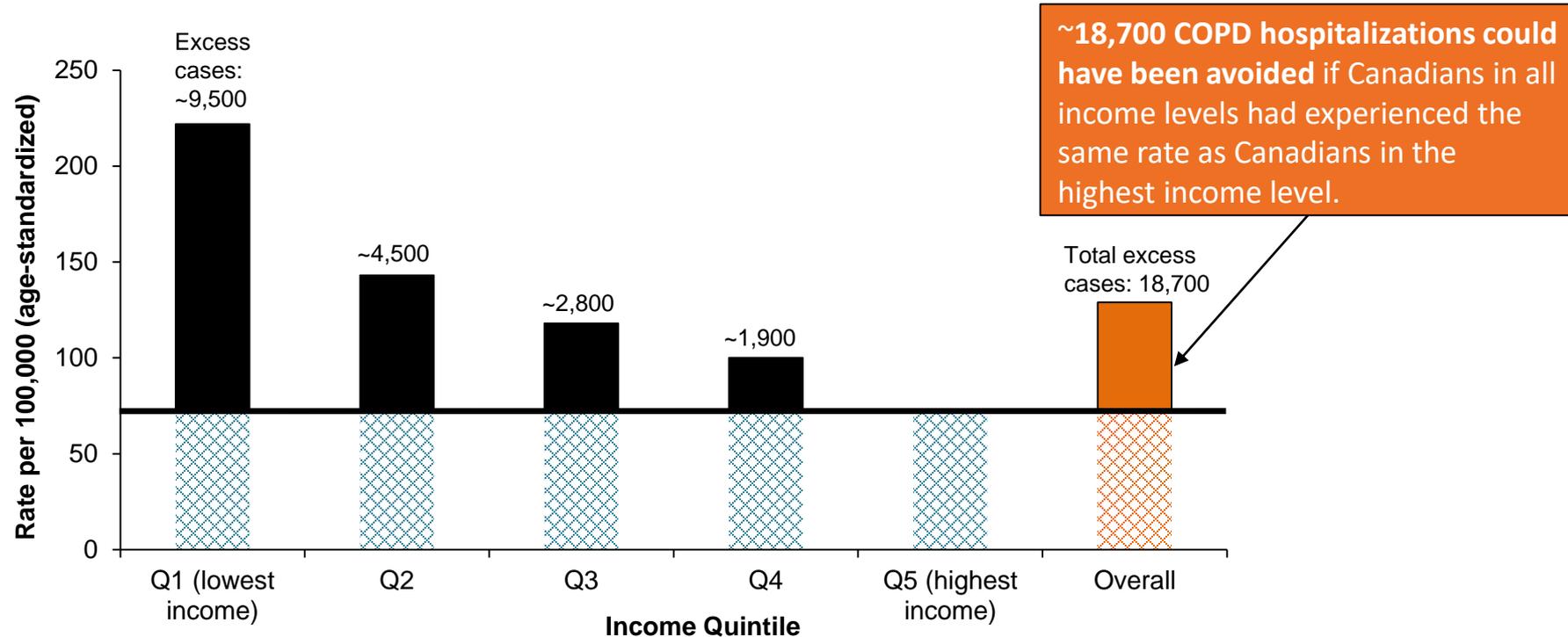
Potential Rate Reduction (PRR): Example

COPD hospitalization rates for Canadians younger than 75, by income, Canada, 2012



Population Impact Number (PIN): Example

COPD hospitalization rates for Canadians younger than 75, by income, Canada, 2012



Adapt the calculation or interpretation of measures of inequality

- Indicator direction can impact your rates and summary measures
- There is often a trade-off!
- In general, where lower-indicator rates are desirable:
 - **Easier to interpret** summary measures like rate ratios
 - More likely to **require suppression** or caution when interpreting rates due to small numbers



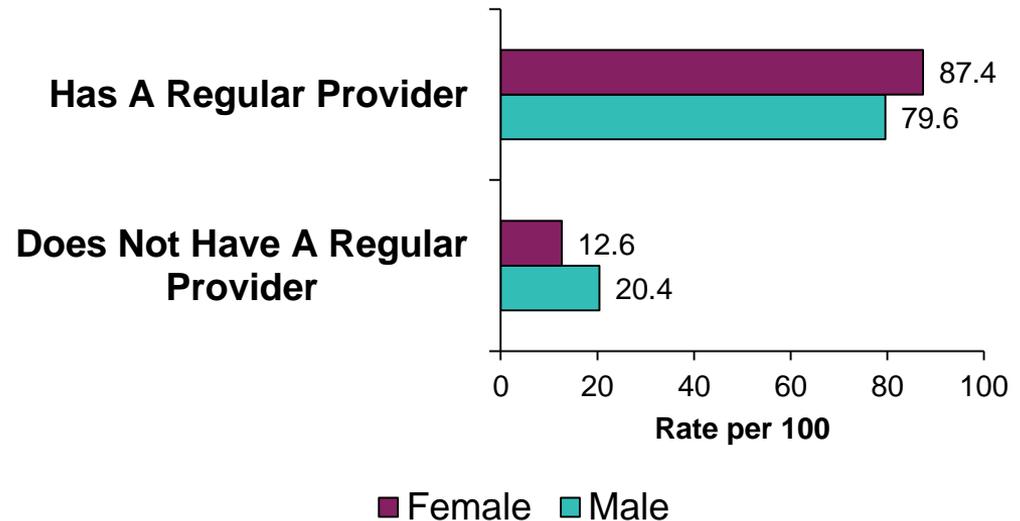
Adapt summary measures based on desired direction of indicator

Rate ratio: 0.91

Rate ratio: 1.60

Proportion not having a provider is **1.6x higher** for males...

Percentage of Population With a Regular Health Care Provider

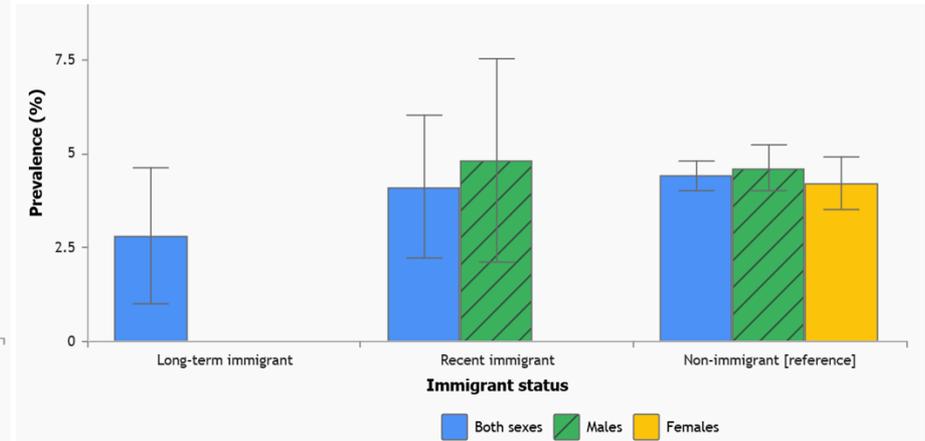
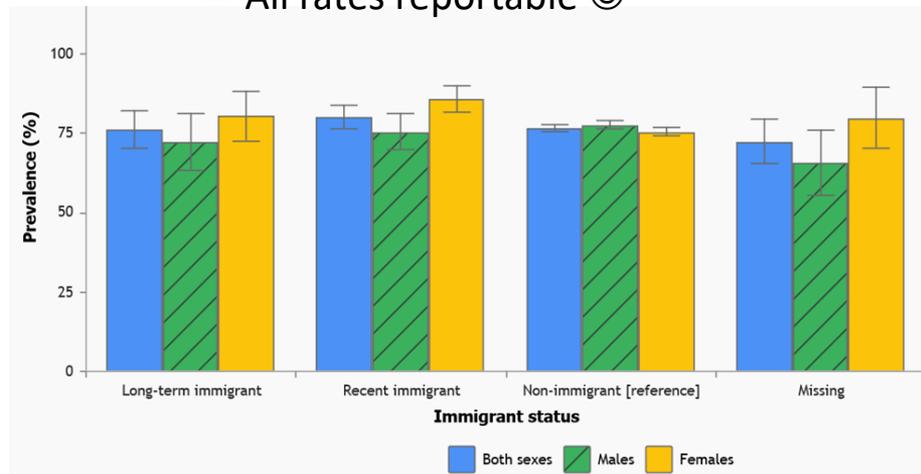


Suppression of rates based on desired direction of indicator

Perceived mental health defined 2 ways, stratified by immigrant status and sex, aged 12-17 years

- % Excellent or very good
- Higher rates are desirable
- All rates reportable 😊

- % Fair or poor
- Lower rates are desirable
- Many estimates suppressed 😞



By the end of the analyzing phase, you'll have:

- ✓ Calculated stratified indicator rates
- ✓ Quantified inequalities using summary measures



Report your findings

1. Interpret results for key findings
2. Present findings to your audience

Step 1. Interpret results for key findings

- **Review your summary measures of inequality alongside the underlying indicator rates**
 - Interpret the magnitude of the inequality
 - Reveal patterns of inequality across population subgroups
 - Consider statistical significance to identify key findings
- **Apply data visualization and dashboards to organize your results**

Interpret magnitude of inequality



**Consider
indicator rates**

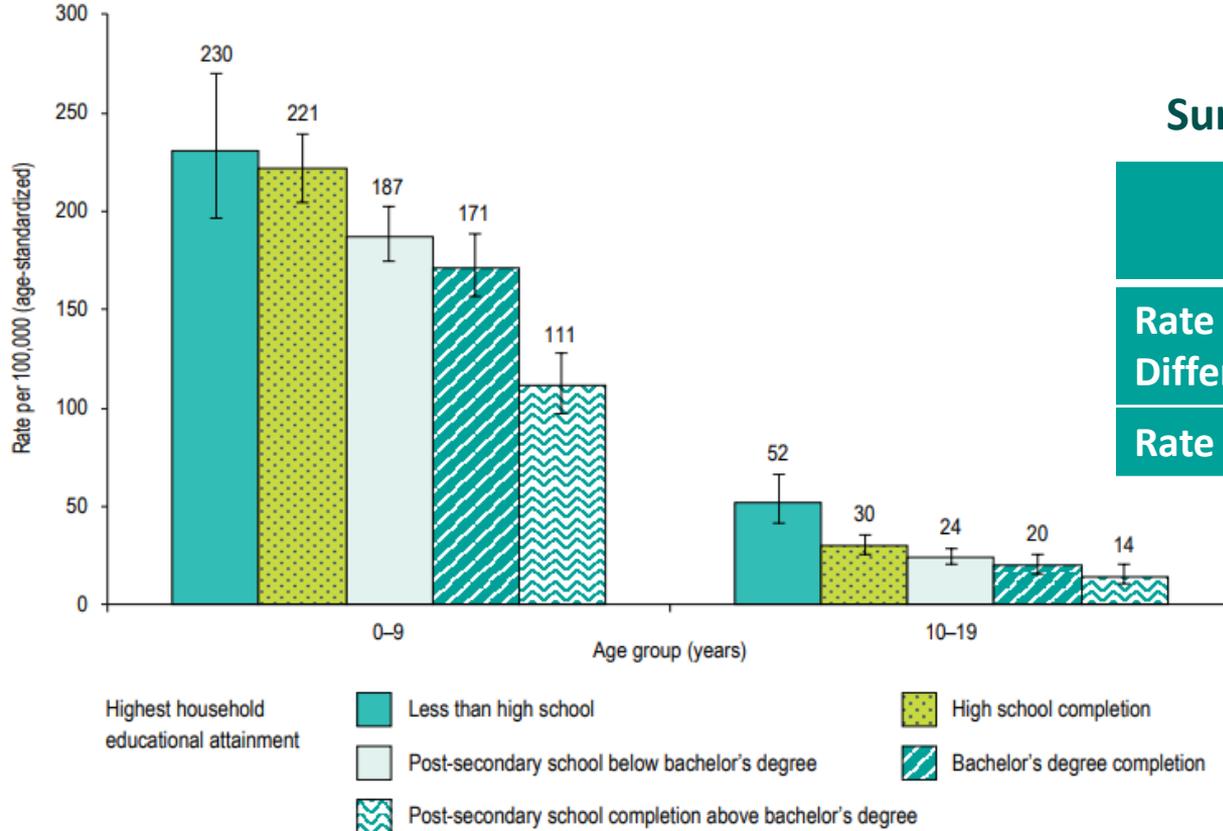


**Consider absolute and
relative summary
measures of inequality**



**More comprehensive
story of inequality**

Interpret the magnitude of inequality



Summary measures of inequality

	0-9 years	10-19 years
Rate Difference	119 per 100,000	38 per 100,000
Rate Ratio	2.1	3.7

Interpret the magnitude of inequality – key messages

0 to 9 years:

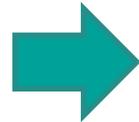
hospitalization rates
2.1 times higher
(or 119 additional
cases per 100,000)



higher absolute
inequality due
to higher rates

10 to 19 years:

hospitalization rates
3.7 times higher
(or 38 additional
cases per 100,000)



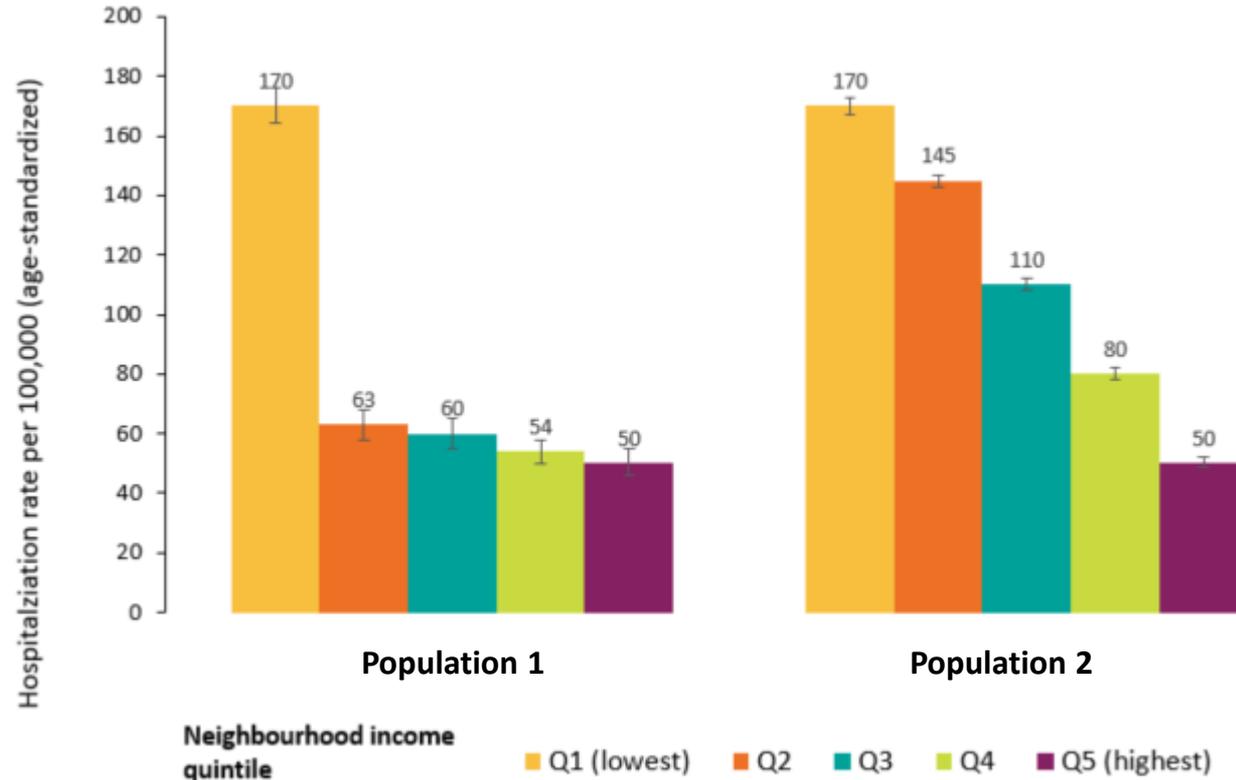
higher relative
inequality due
to lower rates

Key message



**Education-related inequalities
were observed in both
age groups.**

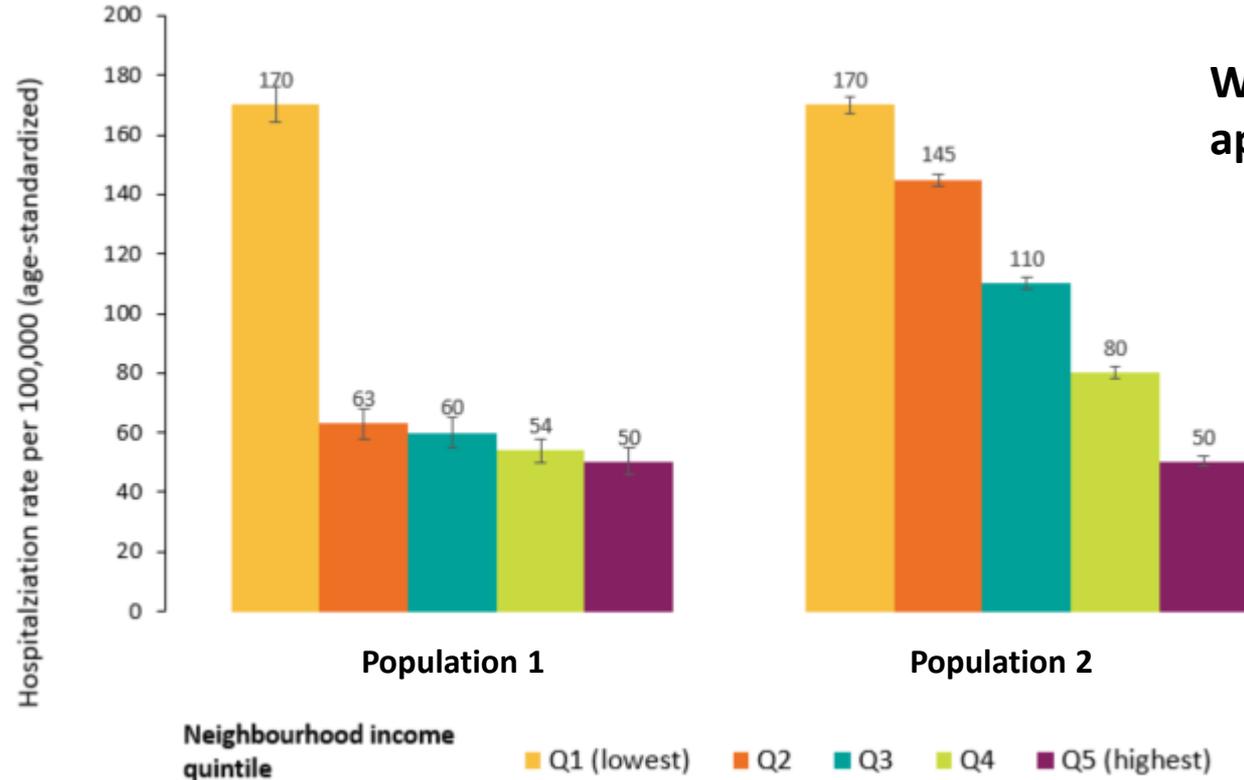
Patterns of inequality across population subgroups



For both populations:

- Rate Ratio: 3.4 times higher
- Rate Difference: 120 per 100,000

Polling question: Patterns of inequality



Which intervention would be most appropriate for **Population 1**?

- Option A** – A universal intervention that reaches the whole population and reduces inequalities along the income gradient
- Option B** – An intervention that targets the lowest income group

Statistical significance to identify key messages

- A common approach used at CIHI to determine statistical significance is to consider 95% confidence intervals (CI)
 - Using 95% CIs can be a more conservative approach for identifying statistical significance compared to using a statistical test

Measure	Statistically significant if 95% CI...	Example
Rate difference	Does not include 0	2.5 percentage points (0.90 to 4.9)
Rate ratio	Does not include 1	1.15 (1.11 to 1.18)

Use caution when considering statistical significance to identify key findings



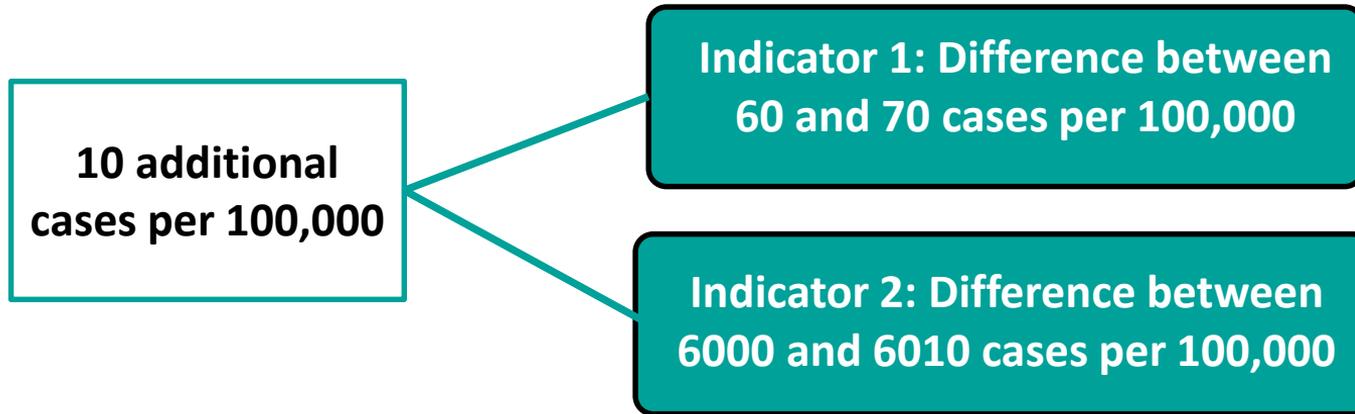
Estimates derived from very large populations will often be statistically significant but **may not be practically or clinically meaningful.**



Estimates derived from very small populations or based on survey samples **may still be clinically or practically meaningful** even though they are not statistically significant.

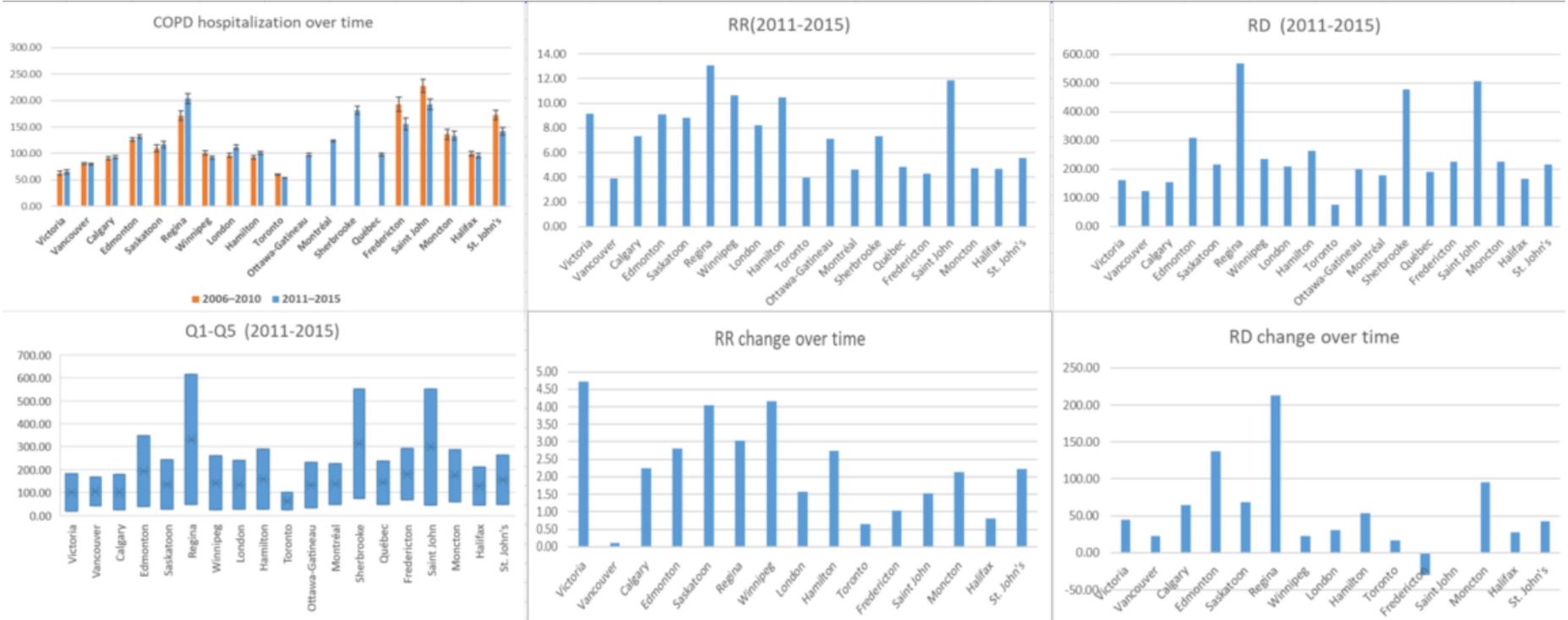
Use caution when comparing inequalities between indicators

- Indicators vary in terms of scale and frequency and this may influence what's considered a meaningful level of inequality



- Indicators capture different health issues and what constitutes a meaningful level of inequality varies by indicator

Use data visualizations and dashboards

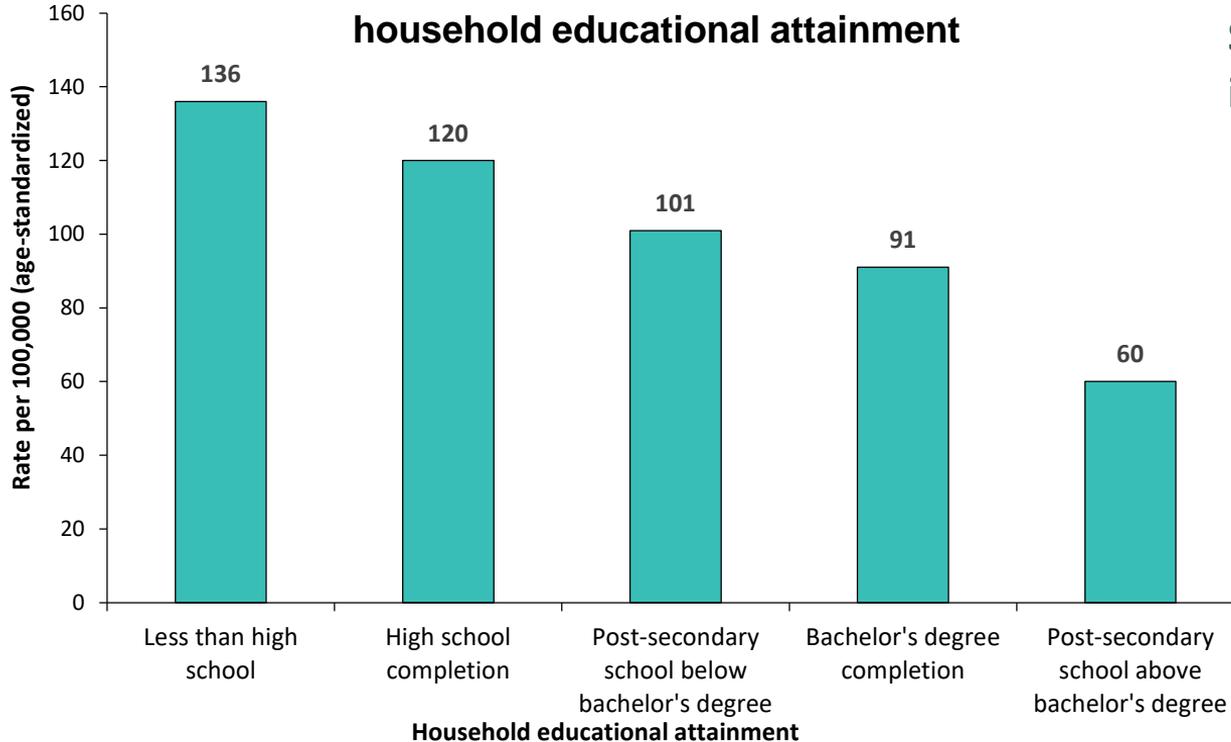


Step 2. Present your findings

- **Review the literature and data to describe the context and impact of your findings, including:**
 - Population subgroups that you analyzed
 - Impact of your health inequalities findings
 - Opportunities, such as policies and programs, for reducing the inequalities suggested by your key findings
- **Tailor your message and visualizations to your audience**

Population subgroups that you analyzed

Asthma hospitalizations (0 to 19 years) by household educational attainment

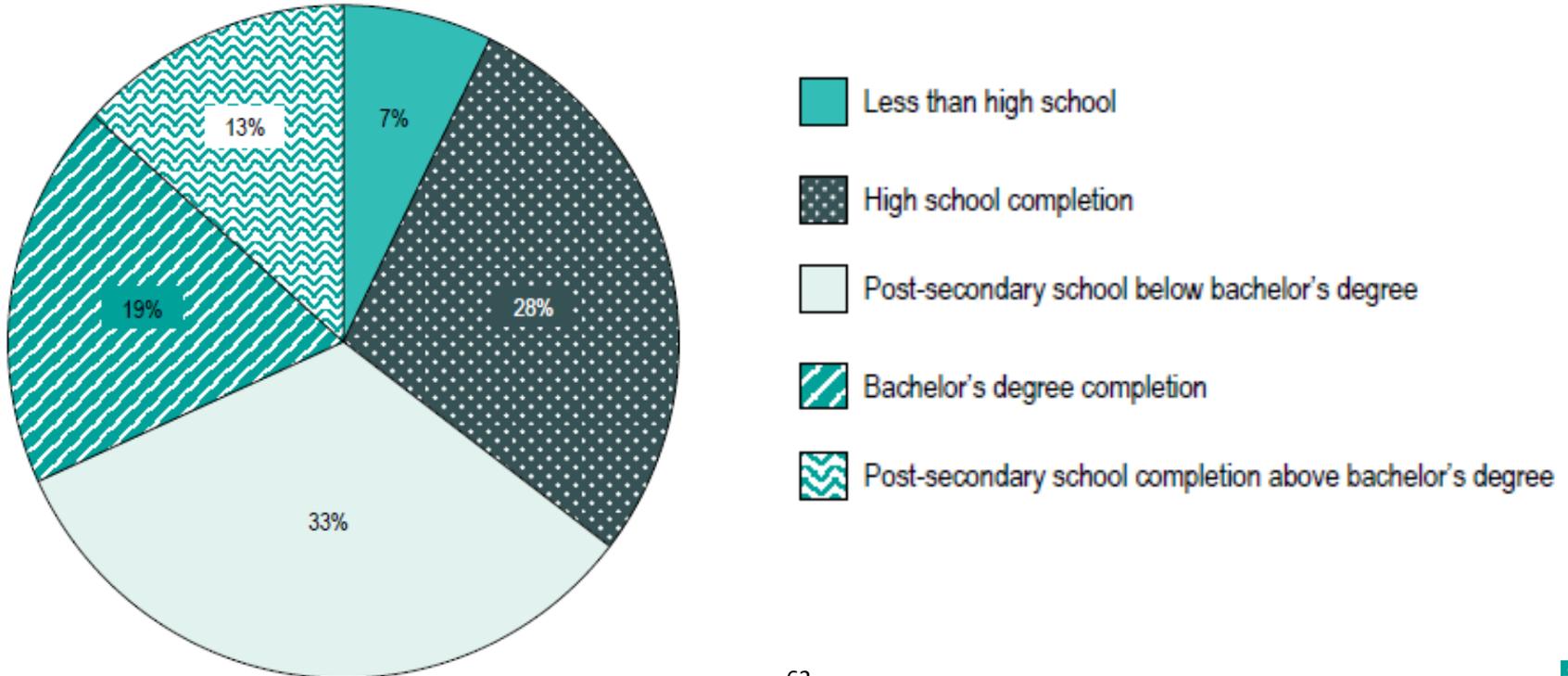


Summary measures of inequality:

- Rate Ratio: 2.3 times higher
- Rate Difference: 76 per 100,000

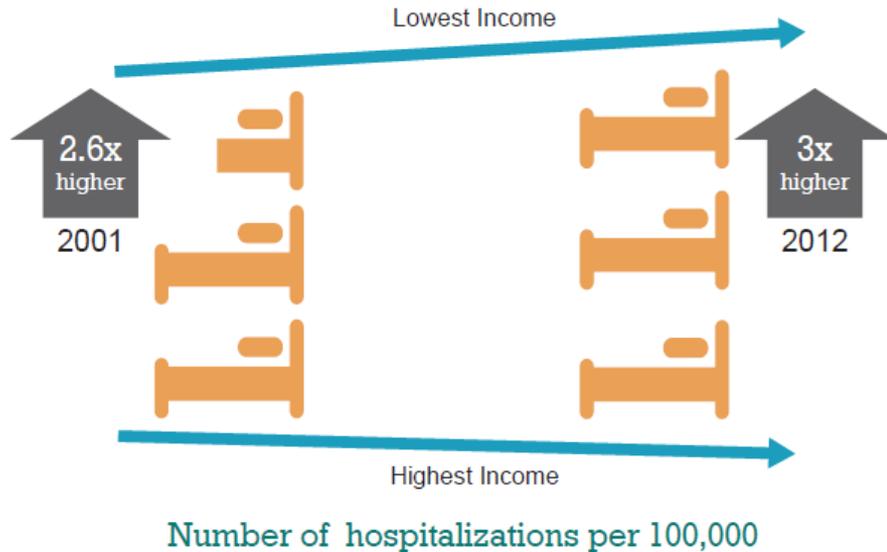
Population subgroups that you analyzed

Distribution of household educational attainment
(age 0 to 19), Canada (excluding Quebec)



Impact of health inequalities findings

COPD Hospitalization gap by income has widened over time



If all Canadians younger than age 75 had the same low rate of hospitalizations for this chronic lung disease as those in the highest income level, in 2012 **there would have been about**

\$150 million less in health-sector spending.

Opportunities for reducing the inequalities

- **Consider a range of interventions**
 - health sector vs. intersectoral
 - universal, targeted, or a combination
- **Intervention scan guide:**
 - Defining a search strategy
 - Assessing effectiveness
 - Synthesizing the evidence
- **Template to help organize your search results and synthesis**

Step 2: Document your search results

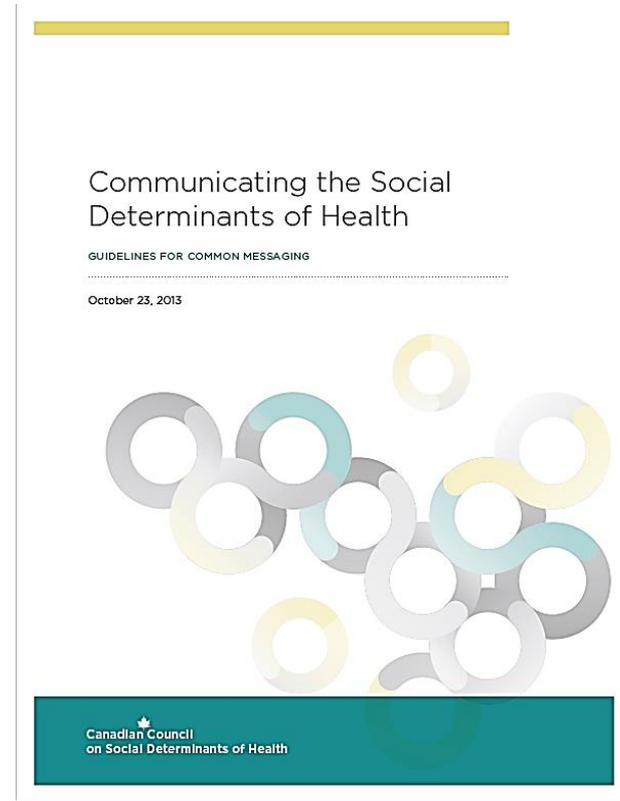
Table 3 Search results template

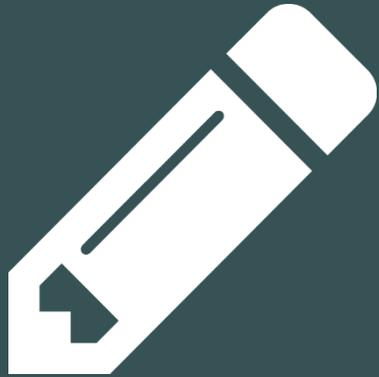
Intervention description			
Intervention name	Intervention description	Intervention type (i.e., universal, targeted, proportionate universal)	Study design (e.g., randomized control trial, program evaluation)



Tailor your key messages and visualizations to your audience

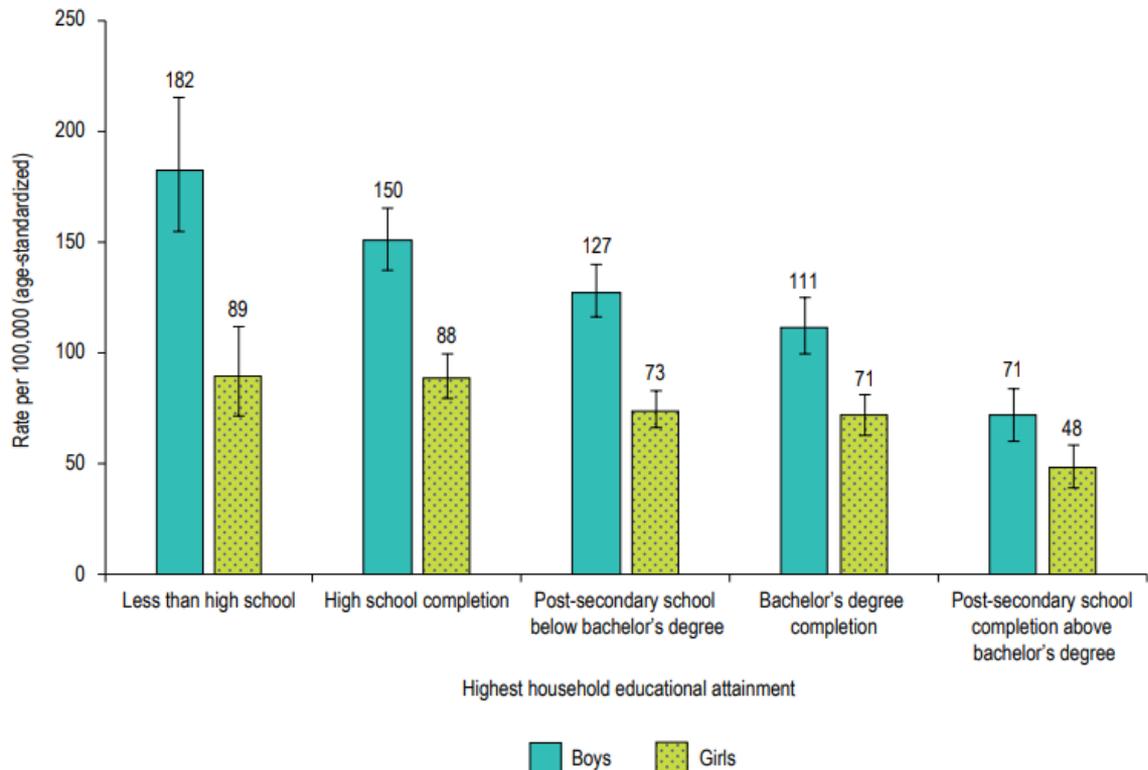
- Engage stakeholders and subject matter experts
- Identify your target audience
- Identify how best to deliver your key message
- Use plain language to communicate your findings
- Use visualizations to highlight your findings





Activity 2: Quantify
inequalities using
summary measures
and present findings
to your audience

BONUS – Asthma Hospitalization in Children and Youth, by Education and Sex



Canada (excluding Quebec)

	Boys	Girls
RR	2.6	1.9
RD	111 per 100,000	41 per 100,000



Moving forward

Next Steps

- **Toolkit**

- Update to include new information
- Develop additional equity stratifier definitions (e.g., racial group)
- Monitor and evaluate impact and use

- **eLearning**

- Remaining course in bundle of 4 eLearning courses (available June 2019)





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