



URBAN PUBLIC HEALTH NETWORK

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Measuring Trends in Health Inequalities in Cities: Self-Reported Indicator Results- Technical Notes

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About the Urban Public Health Network

The Urban Public Health Network (UPHN) is a network of Medical Health Officers working to address public health issues in urban populations in Canada. Its members are responsible for overseeing and administering public health systems and services in the largest urban centres in each province. Altogether, their combined jurisdiction spans more than half of the Canadian population. The network augments their efforts by partnering and collaborating with a variety of common cause governmental and non-governmental organizations.

Acknowledgements

This document was completed together with the Canadian Institute for Health Information (CIHI). This UPHN document covers the technical information pertaining to the self-reported indicators used in the Measuring Trends in Health Inequalities (MTHIC) project. We thank CIHI for their ongoing support of the UPHN, in particular the MTHIC project. CIHI has produced a version of this technical document, covering the hospitalization data.¹

¹ <https://www.cihi.ca/en/health-inequalities>.

Table of Contents

About the Urban Public Health Network	1
Acknowledgements	2
Table of Contents	3
Project Background	3
IndicatorsSelf-reported indicators in CCHS	4
Methodology	11
Geography definitions (Statistics Canada)	11
Determining CMAs for inclusion	11
Determining CSDs for inclusion/exclusion	12
CCHS inclusion criteria	Error! Bookmark not defined.
Pooled Numerators	13
Pooled Denominator	Error! Bookmark not defined.
Numerators and denominators in CCHS	Error! Bookmark not defined.
Defining Neighbourhood Income Quintile and Geographical Assignment	13
Construction of Income Quintile for Dissemination Areas in the PCCF+	13
Crude rates	Error! Bookmark not defined.
Crude percentage	14
Age-standardized rates	14
Variance in survey data	15
Calculation of indicator rates by neighbourhood income quintile	15
Inequality summary measures	15
Suppression and Cautionary Notes for Results	16
CCHS suppression criteria	Error! Bookmark not defined.

Project Background

The Urban Public Health Network (UPHN) is working with health information partners — Statistics Canada and CIHI to calculate current health inequalities in Canada’s major cities. The

UPHN staff calculated inequalities in self-reported indicators drawn from survey data. This document provides details on how these estimates were calculated.

CIHI has analyzed the following hospitalization and day surgery indicators that were prioritized by the UPHN membership for inclusion in the project. Hospitalizations for:

- ambulatory care sensitive conditions,
- opioid poisonings,
- conditions entirely caused by alcohol,
- heart attacks,
- stroke,
- injury,
- self-injury, and
- day surgery for childhood dental caries

Further information pertaining to the estimations of hospitalization indicators can be found in the technical notes prepared by CIHI.

UPHN staff have analyzed self-reported:

- excellent or very good health self-reported health,
- excellent or very good health self-reported mental health,
- physical inactivity during leisure activities,
- BMI of 25 or greater (classified as overweight or obese),
- daily or occasional smoker,
- alcohol binging (having 5 or more drinks on one occasion, at least once a month),
- presence of at least 3 chronic disease risk factors (self-reported physical inactivity, overweight or obese, current smoker or alcohol binging),
- sometimes or often limited in the participation in activities due to a chronic condition,
- current influenza immunization (received flu shot within the last year),
- diagnosed with diabetes,
- diagnosed with asthma,
- self reported not at all or not very stressful days for age 15 and over, and
- diagnosed with a mood disorder.

using data collected by Statistics Canada in their Canadian Community Health Survey (CCHS) accessed through their Research Data Centres program.

For the analysis, 5 years of data were pooled and indicator results were calculated at the Census Metropolitan Area (CMA, e.g. Greater Toronto Area) and Census Subdivision (CSD, e.g. City of Toronto) for participating members of the UPHN and where the data is available.

Indicators

Indicators were selected in order to quantify health inequalities in Canada using self-reported variables in the CCHS. Indicators were identified for inclusion from three sources: the self-reported variables utilized in CIHI's 2015 "Reducing Gaps in Health" report, variables identified as "very important" or "important" by UPHN members in a 2017 consultation, and additional

variables that researchers found interesting. Variables were measured in a consistent way over 15 years. From 2001 until 2005, Statistics Canada collected the CCHS in two year increments. The data, then, captures the years 2000/2001, 2003, 2005, 2007-2015. All of the indicators in CCHS represent self-reported outcomes.

CCHS Indicator Name	Indicator Information
<i>Self-Rated Health</i>	<p>Description This indicator describes self-rated health in dichotomous form. Good self-rated health indicates that the respondent report having excellent or very good health.</p> <p>Note</p> <p>Interpretation Good health is desirable.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2000/2001, 2003, 2005, 2007-2015</p> <p>Geographic coverage All provinces/territories.</p>
<i>Physical Inactivity</i>	<p>Description This indicator describes self-reported physical activity in dichotomous form. Physical inactivity indicates that the respondent was categorized as inactive based on their daily energy expenditure during leisure physical activities. It was derived from calculations of the frequency and duration of respondents self-reported leisure activities in the last three months. An individual was considered inactive if their average daily energy expenditure was under 1.5 kcal/kg. The indicator as derived from the question “Have you done any of the following in the past 3 months?” with 21 leisure activity options including “any other” and no physical activity options. This question was followed with “In the past 3 months, now many times did you participate in _____?” and “About how much time did you spend on each occasion?”</p> <p>Note This variable was not available in the 2015 cycle.</p> <p>Interpretation Physical Inactivity is undesirable.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2000/2001, 2003, 2005, 2007-2014</p>

	<p>Geographic coverage All provinces/territories.</p>
Smoking	<p>Description This indicator describes self-reported smoking status in dichotomous form. Smoking indicates that the respondent reported smoking daily or occasionally when asked “At the present time do you smoke cigarettes daily, occasionally or not at all?”</p> <p>Interpretation Smoking is undesirable.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2000/2001, 2003, 2005, 2007-2015</p> <p>Geographic coverage All provinces/territories.</p>
Alcohol Binge	<p>Description This indicator describes self-reported alcohol bingeing in dichotomous form. Alcohol Binge indicates that the respondent reported having 5 or more drinks on one occasion. Respondents were considered to participate in alcohol binge drinking if they selected one of the responses indicating a frequency of once or month or greater to the question “How often in the past 12 months have you had 5 or more drinks on one occasion?”</p> <p>Note In 2013-2015, the CCHS criteria for alcohol binge for females changed from 5 or more to 4 or more drinks on one occasion. From 2013-2015, if the respondent was female, she would be asked “How often in the past 12 months have you had 4 or more drinks on one occasion?”</p> <p>Interpretation Alcohol Binging is undesirable.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2000/2001, 2003, 2005, 2007-2015</p> <p>Geographic coverage All provinces/territories.</p>
Overweight or Obesity	<p>Description This indicator describes self-reported Body Mass Index (BMI) in dichotomous form. BMI was calculated based using self-reported height and weight. Overweight or Obesity was indicated by a BMI of 25 or greater.</p>

	<p>Interpretation Overweight or Obesity is undesirable.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2000/2001, 2003, 2005, 2007-2015</p> <p>Geographic coverage All provinces/territories.</p>
<i>Risk factor</i>	<p>Description This dichotomous variables describes having at least three of the following risk factors: physical inactivity, overweight or obesity, a current smoker, and alcohol binge.</p> <p>Note This derived variable was not constructed by Statistics Canada in any cycles of the CCHS, but was derived from the dichotomous variables physical inactivity, overweight or obesity, alcohol binge and smoking described above.</p> <p>Interpretation Risk factors are undesirable.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2000/2001, 2003, 2005, 2007-2015</p> <p>Geographic coverage All provinces/territories.</p>
<i>Lack of Influenza Immunization</i>	<p>Description This indicator describes the population who reported not receiving the flu shot within the past year.</p> <p>Note The question wording slightly changes in 2010, from “Have you ever had the flu shot” to “Have you ever had a seasonal flu shot?” and then again in 2015 to “Have you ever had a seasonal flu shot, excluding the H1N1 flu shot?”</p> <p>Interpretation Not receiving the influenza immunization is undesirable.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2000/2001, 2003, 2005, 2007-2015</p> <p>Geographic coverage</p>

	All provinces/territories.
<p>Participation and Activity Limitation</p>	<p>Description This indicator describes the population who reported being limited in “hearing, seeing, communication, walking, climbing stairs, bending, leaning or similar activities” or being limited in the activities they were able to do at home, school, work or other activities because of a chronic condition.</p> <p>This variable was derived from questions asking respondents about their difficulties with activities or reduction in ability to perform activities: “Do you have any difficulty hearing, seeing, communicating, walking climbing stairs, bending, learning or doing similar activities?” or “Does a long-term physical condition or mental condition or health problem, reduce the kind of activity you can do at [home, school, work, other activities]?” A respondent was considered to have activity limitation if they selected sometimes or often to any of the questions.</p> <p>Interpretation Activity limitation is undesirable.</p> <p>Note In cycle 1.1- cycle 3.1, the derived variable representing “participation and activity limitation” was not available. For these three cycles, the variable was manually derived using the same 5 variables and methods as in subsequent years. The exception was in cycle 1.1, two variables, describing limitations at school and work, which subsequently were asked in separate questions were combined into one variable. As the same information was combined to derive the final variable, it is unlikely that this would impact the final dichotomous outcome.</p> <p>The derived variable, or any of its component variables, were unavailable in the 2015 survey.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2000/2001, 2003, 2005, 2007-2010, 20122014</p> <p>Geographic coverage All provinces/territories.</p>
<p>Self-Rated Mental Health</p>	<p>Description This indicator describes self-rated mental health in dichotomous form. Good self-rated mental health indicates that the respondent report having excellent or very good mental health to the question “In general, would you say your mental health is: excellent, very good, good, fair or poor?”</p> <p>Note This question was added to the CCHS in cycle 2.1.</p> <p>Interpretation Good mental health is desirable.</p> <p>Data Sources</p>

	<p>Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2003, 2005, 2007-2015</p> <p>Geographic coverage All provinces/territories.</p>
<i>Perceived Life Stress</i>	<p>Description This indicator describes perceived life stress in dichotomous form. The respondents were asked “Thinking about the amount of stress in your life, would you say that most days are: not at all stressful, not very stressful, a bit stressful, quite a bit stressful, or extremely stressful?” The presence of life stress was indicated by participants reporting that they found most days were a bit, quite a bit, or extremely stressful.</p> <p>Note From cycle 2.1 to the 2008 cycle, and in the 2010-2012 cycles this question was only asked of respondents aged 15 and over. In the 2009 cycle, and from 2013 onwards cycle, the question was asked of all respondents. This question was added to the CCHS in cycle 2.1.</p> <p>Interpretation Good mental health is desirable.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2000/2001, 2003, 2005, 2007-2015</p> <p>Geographic coverage All provinces/territories.</p>
<i>Diabetes</i>	<p>Description This indicator describes the presence of self-reported chronic diabetes that was diagnosed by a health professional.</p> <p>Note The way the question is phrased changes slightly among cycles of the CCHS. It always ends with “Do you have diabetes” but is preceded by “Remember, we are interested in conditions diagnosed by a health professional.” in cycles 2007- 2010 and by “Remember, we’re interested in conditions diagnosed by a health professional and are expected to last or have already lasted 6 months or more.” From 2011- 2015.</p> <p>Interpretation Diabetes is undesirable.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years</p>

	<p>2000/2001, 2003, 2005, 2007-2015</p> <p>Geographic coverage All provinces/territories.</p>
Mood Disorder	<p>Description This indicator describes the presence of self-reported chronic mood disorder that was diagnosed by a health professional. Mood disorders were described as depression, bipolar disorder, mania or dysthymia.</p> <p>Note The way the question is phrased changes slightly among cycles of the CCHS. It always ends with “Do you have a mood disorder such as depression, bipolar disorder, mania or dysthymia” but is preceded by “Remember, we are interested in conditions diagnosed by a health professional.” in cycles 2005- 2010 and by “Remember, we’re interested in conditions diagnosed by a health professional and are expected to last or have already lasted 6 months or more.” From 2011- 2015.</p> <p>This question was added to the CCHS in cycle 2.1.</p> <p>Interpretation Mood disorders are undesirable.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2003, 2005, 2007-2015</p> <p>Geographic coverage All provinces/territories.</p>
Asthma	<p>Description This indicator describes the presence of self-reported asthma. Participants were asked “Do you have asthma?”</p> <p>Interpretation Asthma is undesirable.</p> <p>Data Sources Canadian Community Health Survey (CCHS)</p> <p>Available Data Years 2000/2001, 2003, 2005, 2007-2015</p> <p>Geographic coverage All provinces/territories.</p>

Methodology

Geography definitions ([Statistics Canada](#))

Dissemination blocks (DB) are an area bounded on all sides by roads and/or boundaries of standard geographic areas. The dissemination block is the smallest geographic area for which population and dwelling counts are disseminated in Census data by Statistics Canada.

Dissemination area (DA) is a small, relatively stable geographic unit composed of one or more adjacent dissemination blocks. It is the smallest standard geographic area for which all census data are disseminated. Income quintile assignments are assigned at the DA level.

Census Subdivision (CSD) defines the general term for municipalities (as determined by provincial/territorial legislation, such as cities and towns) or areas treated as municipal equivalents for statistical purposes (e.g., Indian reserves, Indian settlements and unorganized territories).

Census agglomeration (CA) is an area consisting of one or more neighbouring municipalities situated around a core. A census agglomeration must have a core population of at least 10,000. Areas that do not qualify for the definition of CMA (see below) are often classified as a CA. For example, Fredericton was classified as a CA prior to 2016 but is now a CMA due to population growth.

Census Metropolitan area (CMA) is an area consisting of one or more neighbouring municipalities situated around a core. A census metropolitan area must have a total population of at least 100,000 of which 50,000 or more live in the core.

Determining CMAs for inclusion

The following 19 CMAs, (CMA as of the 2016 Statistics Canada Census and members of the UPHN), were included in this project.

- Victoria, Vancouver
- Calgary, Edmonton
- Saskatoon, Regina
- Winnipeg
- London, Hamilton, Toronto, Ottawa-Gatineau
- Montréal, Québec, Sherbrook
- Halifax
- Moncton, Saint John, Fredericton
- St. John's

Statistical area classification codes group together CSDs based on whether they are part of a CMA, a CA, a CMA- or CA-influenced zone or the territories. CSDs outside a CMA are identified as one of four zones according to the degree of influence the CMA has upon it. The degree of influence is determined by the percentage of those residents working in the urban core of a

CMA. DAs found within the following geographical boundaries and zones were excluded from the analyses, as these were not CMAs:

- 000= Territories;
- 996 = Strongly influenced zone (over 30% work in a CMA);
- 997= Moderately influenced zone (5% to 30% working a CMA);
- 998 = Weakly influenced zone (0% to 5% work in a CMA); and
- 999 = No influenced zone (fewer than 40 or none of the residents work in a CMA).

In addition, those with missing statistical area classification codes are also excluded.

Statistical Area Classification type (SACtype) identifies the type of statistical area classification in which the census subdivision (CSD) is located. CSDs with the following population centre/rural area type were included in the analysis:

- Census subdivision within census metropolitan area (type 1)
- Census subdivision within census agglomeration with at least one census tract (type 2)

In a parallel geographical coding system, DAs can be considered to be comprised of Dissemination Blocks (DB). DBs are categorized by population density. DA areas that had at least one person that was living in a DB that were not considered rural based on population density were included in the analysis. Urban was therefore considered to be a small, medium or large population centre according to the following classification system:

- 1= Rural Areas
- 2= Small Population Centres
- 3= Medium Population Centres
- 4= Large Urban population Centres

Note about Cities in Quebec

Between 2000 and 2006, several cities in Quebec underwent an amalgamation followed by a partial deamalgamation. In our analysis, we treat CSD that retain the same name as representing a continuous series over time even though their geographical boundaries have changed. Some differences in outcomes between the 2001-2005 and 2006-2010 in amalgamated and deamalgamated cities may be the results of these discrepancies.

Determining CSDs for inclusion/exclusion

The CCHS is a stratified random survey that in recent years has been collected annually by Statistics Canada and every other year in the early 2000s. Some municipalities were too small to be sufficiently represented in the survey for us to calculate statistically generalizable findings for them. Back of the envelope calculations led us to drop cities whose populations were less than 80,000 citizens. A handful of additional cities were dropped because they had too few residents in either low- or high-income neighbourhoods.

Defining Neighbourhood Income Quintile and Geographical Assignment

Analyzing the data by neighbourhood income quintile was chosen for this project as a starting point for this work, but it is recognized that other factors and indexes may also provide important information about health inequalities in Canada. Further information regarding the use of relative income quintiles can be found in the report "[In pursuit of health equity: Defining stratifiers for measuring health inequality](#)".

Statistics Canada's Postal Code Conversion File Plus (PCCF+ Version 6D) software was used to link the 6-character postal code on patients' records to standard Canadian census geographic area (such as DA, CSD, and CMA) and neighbourhood income quintile information based on before-tax income. The postal code of the patient's place of residence at the time of hospitalization was mapped to the corresponding DA (smallest geographical unit available for analysis) of the closest census year and the neighbourhood income quintile, CSD, and CMA of that DA were assigned to the patient's record.

Construction of Income Quintile for Dissemination Areas in the PCCF+

Neighbourhood income quintiles available from the PCCF+ were based on the average income per single-person equivalent in a DA obtained from the 2006 (for 2006-2010 results) and the 2016 (for 2011-2015 results) Census (2011 Census does not contain income information). This measure uses the person weights implicit in the Statistics Canada low-income cut-offs to derive "single-person equivalent" multipliers for each household size. For example, a single-person household received a multiplier of 1.0, a 2-person household received a multiplier of 1.24 and a 3-person household received a multiplier of 1.53. To calculate average income per single-person equivalent for each DA, total income of the DA was divided by the total number of single-person equivalents. Income quintile for DAs with a household population of less than 250 was imputed based on the neighbouring DAs (where possible), because census data on income for these DAs was suppressed. For more information, please visit <http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5234&dis=1#a2>

Next, quintiles of population by neighbourhood income were constructed separately for each CMA, census agglomeration or residual area within each province. DAs within each such area were ranked from the lowest average income per single-person equivalent to the highest, and DAs were assigned to 5 groups, such that each group contained approximately one-fifth of the total non-institutional population of each area.

The quintile data were then pooled across the areas. Quintiles were constructed within each area before aggregating to the national or provincial level to minimize the potential effect of the differences in income, housing and other living costs across different areas in the country. Quintile 1 refers to the least affluent neighbourhoods, while quintile 5 refers to the most affluent neighbourhoods. Less than 2.5% of records had missing income information for the indicators.

Pooled estimates

Since the city-level is a relatively small unit of analysis for health inequalities, data was pooled across five-year intervals between census years: 2001-2005 (not available in hospitalization

data), 2006-2010, 2011-2015. Crude self-reported estimates or percentages were calculated using the CCHS were tabulated using the weights provided in the survey. Standardized estimates were tabulated using weights that had been adjusted to reflect the compositions of the reference population. RDC disclosure guidelines greatly restrict the release of count information, weighted or unweighted.

Crude percentage

$$\text{Crude percentage} = \frac{\text{Numerator}}{\text{Denominator}} \times 100$$

Rates and percentages are indicated in the data by the scale variable.

Age-standardized rates

Crude indicator rates are age-standardized by the direct method of standardization, using the 2011 population (from the 2011 Census). For CSD-specific rates, age-standardization is done to the CMA standard population that the CSD belongs to (“CMA-specific standard population (2011)”). For CMA-based rates, the standardization is done to the Canadian population from the 2011 Census (“2011 National population”) to enable comparison across the nation. Standardization is based on 5-year age groupings.

$$\text{Age Standardized Rate} = \frac{\text{Numerator}}{\text{Denominator}} \times \text{Standard Population}$$

Age categories (in years)	
0–4	50–54
5–9	55–59
10–14	60–64
15–19	65–69
20–24	70–74
25–29	75–79
30–34	80–84
35–39	85–89
40–44	90+
45–49	--

Calculation of indicator rates by neighbourhood income quintile

The income analysis is carried out using neighbourhood income quintiles. This approach builds on previous analyses of income-related health inequalities reported on by CIHI ([Trends in Income-related Health Inequalities in Canada 2015](#)) and other health organizations across Canada.

Inequality summary measures

Rate Ratio (RR) is calculated by dividing the rate of the least affluent group by the rate of most affluent group. This measures *relative* inequality.

Example: Measuring income-related inequalities, where Q1 is the lowest income quintile, and Q5 is the highest income quintile

$$Q1 \div Q5 = 10 \div 5 = 2.00$$

Interpretation: The rate of condition X is 2 times higher for Canadians in the lowest income quintile than for Canadians in the highest income quintile.

Rate Difference (RD) is calculated by subtracting the rate of the most affluent group from the least affluent group. This measures *absolute* inequality.

Example: $Q1 - Q5 = 10 - 5 = 5$

Interpretation: 5 more Canadians have condition X in the lowest income quintile than in the highest income quintile.

Variance in survey data

Variance was estimated for self-reported estimates using bootstrapping in accordance with Statistics Canada's guidelines for working with the CCHS. 500 iterations were used.

Comparing rates and inequalities between cities and over time

Indicator rates and inequalities for individual cities were compared to the overall rate for all UPHN cities. If a city's rate was significantly higher than the overall rate, then the city's rate was considered greater than the overall rate. If its rate was significantly lower, then the city's rate was considered lower than the overall rate. RR and RDs for indicators for individual cities were also compared to the overall RR and RD for the same indicator. If both the RR and RD for a city was significantly higher than the overall RR and RD for an indicator, the inequality was considered greater than the overall inequality for that indicator. If both the RR and RD for a city were significantly below the overall RR and RD for an indicator, the inequality was considered lower than the overall inequality for that indicator. Indicator rates and RD for individual cities (2011-2015) were compared in the same ways to their rates at an earlier time point.

All comparisons were made using two-sample t-tests and evaluated at the 95% confidence level. For these tests, the log of the RR was compared in order to avoid statistical non-normality issues that arise when two ratios are compared.

Suppression and Cautionary Notes for Results

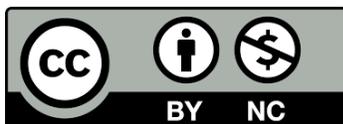
Data was accessed through Statistics Canada's RDC program. In order for estimates to be released, cell counts had to be sufficiently large so as to guard against the risk of disclosure. Findings based on outcomes in which the numerator or denominator had fewer than five observations were suppressed. This prevented the release of some results for some small municipalities and municipalities with few individuals in low or high income neighbourhoods.

In addition, in accordance with Statistics Canada's guidelines for working with small level geographies, all estimates were calculated using weighted numerator and denominator counts that had been rounded to base 50. Given our population cut-offs, this had a negligible impact on released estimates.

Data users should be cautious when working with estimates with large confidence intervals.

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