

TECHNICAL NOTES

Potentially Avoidable Mortality Health Equity Snapshot

Updated: February 2024

Introduction

Health equity is created when all people (individuals, groups, and communities) have a fair opportunity to reach their fullest health potential.¹ Health inequities are driven by the political, cultural, economic, and social structures that create inequitable distribution of power, privilege, and resources, including capitalism, systemic racism, and colonialism. These social and structural determinants influence the conditions that people are born into, grow up in, live, and work. They have impacts on access to high-quality health and social services, experiences within the healthcare system, and health outcomes.²

This Health Equity Snapshot reports on health inequities by summarizing how rates of potentially avoidable mortality vary across levels of marginalization for the province, public health units (PHUs), and Local Health Integration Networks (LHINs) (for historical purposes). Data are reported by two year intervals for the years 2008-2009 to 2020-2021 based on year of death. This Snapshot contains seven summary measures of socioeconomic inequality which are used to quantify the relationship between potentially avoidable mortality and marginalization.

Ontario Marginalization Index

Rates of potentially avoidable mortality are measured across quintiles of neighbourhood marginalization using the [Ontario Marginalization Index \(ON-Marg\)](#).³ ON-Marg was created by combining Canadian census data across a number of indicators into four distinct dimensions of marginalization.⁴ The differences in health status between quintiles of ON-Marg reported in this Snapshot reflect different pathways in which social and structural determinants of health impact health and wellbeing:

- The **material resources** dimension is closely connected to poverty and refers to the inability for individuals and communities to access and attain basic material needs relating to housing, food, clothing, and education. The differences reported in this Snapshot may be reflecting the pervasive impact that socioeconomic position has on a person's access to necessities for good health, exposure to unhealthy stress and instability, and support for healthy behaviours.
- The **racialized and newcomer populations** dimension measures the proportion of newcomers and/or nonwhite, non-Indigenous populations, and relates to the impacts of racialization and xenophobia. The differences reported in this Snapshot may be the result of interpersonal and structural racism, and not necessarily the result of individual-level causal factors.⁵ While newcomers to Canada often have better overall health outcomes than Canadian-born counterparts, a phenomenon commonly known as the "healthy immigrant effect," many newcomers may experience declining health linked to the adoption of a Western lifestyle (e.g., sedentary lifestyle and diet) and the cumulative exposure to stress associated with racism and discrimination, and systemic barriers to employment, housing, and health care.⁶

- The **households and dwellings** dimension relates to family and neighbourhood stability and cohesiveness, and is based on measures of the types and density of residential accommodations and family structure characteristics. The differences reported in this Snapshot may reflect the impact socially supportive environments have on mental health and overall wellbeing.
- The **age and labour force** dimension relates to the impacts of disability and dependence. It refers to area-level concentrations of people who do not have income from employment, including older adults (age 65+), children, adults whose work is not compensated and/or those unable to work due to disability. The differences reported in this Snapshot may reflect the impact of age and disability on communities, including the obstacles to health due to discrimination (e.g., ageism), social exclusion, and difficulty accessing quality health care.

Indicator Definition

Description

Age standardized rate per 100,000 population of number of individuals who died under the age of 75 from causes that could be avoided by preventing the onset of disease, or preventing or delaying death once a disease or condition has developed. Rates are reported across five levels of marginalization for each of the four dimensions of ON-Marg, and summarized using socioeconomic measures of inequality. This indicator definition was adapted from the [APHEO Potentially Avoidable Mortality Indicator](#).⁷

Numerator

- Number of individuals captured in Ontario Mortality Data who died between the ages 0 and 74 with a condition considered to be preventable or treatable. The list of [preventable](#) and [treatable](#) causes of deaths and ICD-10 codes are found in [Appendix 1](#).

Denominator

- Census population of individuals age 0 to 74

Exclusions

- Records with invalid or missing postal codes
- Records with invalid age
- Non-Ontario residents
- Cases geocoded to Dissemination areas that are not assigned ON-Marg quintile values

Summary Measures of Socioeconomic Inequality

Seven summary measures of socioeconomic inequality are provided which quantify the association between marginalization and health status. For more information, please see [Summary Measures of Socioeconomic Inequalities in Health](#).⁸

Rate Difference

The absolute difference in rates of the health outcome between the most marginalized and least marginalized (Quintile 5 - Quintile 1). The rate difference is zero when there is no inequity, while higher values indicate that the burden of poor health is higher among the most marginalized, and negative values indicate that the burden is highest among the least marginalized.

Rate Ratio

The relative difference obtained by dividing the rate of the most marginalized by the rate of the least marginalized group (Quintile 5/Quintile 1). The rate ratio is one when there is no inequity. The rate ratio can only assume positive values. Values of greater than one indicate that the burden of poor health is higher among the most marginalized, and values less than one indicate that the burden is highest among the least marginalized.

The Slope Index of Inequality (SII)

An absolute summary measure of inequality which represents the slope of the linear regression line across all quintiles of marginalization. Values of zero indicate no inequities across quintiles, while positive values indicate a social gradient where health status decreases as the population becomes more marginalized. Negative values indicate a social gradient where health status improves with increasing marginalization. The SII is zero when there is no inequity, while higher values indicate that the burden of poor health is higher among the most marginalized, and negative values indicate that the burden is highest among the least marginalized.

The Relative Index of Inequality (RII) (ratio)

A relative summary measure of inequality which represents the slope of a log-linear Poisson regression model across all quintiles of marginalization, as outlined in Moreno-Betancur et al. (2015).⁹ Can be interpreted as the predicted value of the health outcome in the hypothetical least marginalized individual divided by the predicted value of the hypothetical most marginalized individual. The RII is one when there is no inequity. The RII can only assume positive values. Values of greater than one indicate that the burden of poor health is higher among the most marginalized, and values less than one indicate that the burden is highest among the least marginalized.

The Relative Index of Inequality (RII) (mean)

A relative summary measure of inequality, calculated by dividing the slope index of inequality by the mean rate of the health outcome in the population. Values of zero indicate no inequities across quintiles, while positive values indicate a social gradient where health status decreases as the population becomes more marginalized, while negative values indicate a social gradient where health status improves with increasing marginalization. The RII mean is zero when there is no inequity, while higher values indicate that the burden of poor health is higher among the most marginalized, and negative values indicate that the burden is highest among the least marginalized.

Population Attributable Fraction (PAF)

The projected reduction, in relative terms, in the rate of a health indicator if each quintile of marginalization experienced the rate of the least marginalized quintile (quintile 1), expressed as a percentage of the total health outcome. The larger the value of PAF, the larger the level of inequity. PAF is zero if no further improvement can be achieved (i.e., if all quintiles have reached the same level of health status as the least marginalized quintile). Negative values represent the percent increase in additional cases that would result if each quintile experienced the rate of the least marginalized group.

Population Impact Number (PIN)

The projected reduction, in absolute terms, in the number of cases of a health indicator if each quintile of marginalization experienced the rate of the least marginalized quintile group (quintile 1), expressed as a count. The larger the value of PIN, the larger the level of inequity. PIN is zero if no further improvement can be achieved (i.e., if all quintiles have reached the same level of health status as the least marginalized quintile). Negative values represent the number of additional cases that would result if each quintile experienced the rate of the least marginalized group.

Metrics

- Age-standardized rates per 100,000 (by quintile of ON-Marg, from quintile 1 (low marginalization) to quintile 5 (high marginalization)).
- Summary measure of socioeconomic inequality. No results are provided for geographies that contain quintiles with zero cases.
- Statistically significant summary measure of socioeconomic inequality.
- Statistical significance of summary measure of socioeconomic inequality compared to Ontario (values are considered statistically significantly different if 95% confidence intervals do not overlap).
- Case counts by quintile and population denominators are available in the download data file.

Methods

The analytic approach taken to calculate the results presented in this Snapshot is as follows:

1. Assign cases to a level of marginalization
2. Calculate age-standardized quintile-specific rates of health status
3. Calculate summary measures of socioeconomic inequality

Assign Cases to a Level of Marginalization

Individuals who appear in administrative health data are assigned to a quintile of ON-Marg based on the dissemination area (DA) of residence. A DA is a standard census geographic unit with a population of 400 to 700 persons. Quintiles are ordered from 1 to 5, with quintile 1 neighbourhoods having the lowest level of marginalization and quintile 5 neighbourhoods having the highest level of marginalization. Two different methods of creating quintiles are used in this analysis:

- **Local cutoffs:** With this method, quintiles are weighted specifically for each individual PHU or LHIN. Each quintile will contain 20% of all dissemination areas within a given PHU or LHIN. This option should be selected by users who are interested in defining the level of marginalization based on the local population characteristics, rather than population characteristics of Ontario.
- **Ontario cutoffs:** With this method, quintiles are weighted provincially, so that each quintile contains 20% of all Ontario dissemination areas. This means that the distribution of quintiles across sub-provincial geographies such as PHUs and LHINs will not necessarily be equal. This option should be selected by users who are interested in making comparisons between groups defined by a level of marginalization based on the entire province, or for making comparisons between geographies using provincially comparable measures of marginalization.

The Statistics Canada Postal Code Conversion File Plus (PCCF+) is used to geocode cases to DAs based on their postal code. Once cases have been assigned to DAs, ON-Marg is used to assign cases to a level of marginalization for each of the four dimensions, for both local and Ontario cutoffs. To account for changing levels of marginalization over time, health status data are assigned to the closest version of ON-Marg (e.g., 2018 cases are assigned to quintiles using the 2016 version of ON-Marg, while 2019 cases are assigned to quintiles using the 2021 ON-Marg).

Calculate Age Standardized Rates

Numerators were created by aggregating health status data by ON-Marg quintiles. Denominators for each ON-Marg quintile were created by aggregating DA-level age-group specific counts for the 2006, 2011, 2016 and 2021 censuses. Numerators were assigned denominator data of the closest census year. For example, 2016 census counts are used as the denominator for 2014-2018 health status data.

Rates were directly age-standardized to the 2011 Canadian population using 15-year age groups to account for potential differences in the age structure of each quintile, and to account for changes in age structure over time. Fifteen year age-groups (0 to 14, 15 to 29, 30 to 44, 45 to 59, 60 to 74, 75 and older) were used for more stable population estimates. Two years of data were combined for analysis to provide more stable rates. Age-standardized rates and associated variances have been calculated using methodology described on [the APHEO website](#).¹⁰

Calculate Summary Measures of Inequality

Summary measures of socioeconomic inequality were calculated in SAS to summarize differences in health status across the five quintiles of marginalization. Seven summary measures were calculated for each of the four ON-Marg dimensions using the local and Ontario quintile cutoffs, and for each two year grouping of analysis.

Suppression

Due to the replacement of the 2011 long-form census with the National Household Survey, the 2011 version of ON-Marg was derived using alternative administrative data sources.¹¹ The use of these data sources in 2011 may impact the ability of ON-Marg to analyze trends over time for some sub-provincial geographies. Health equity analysis results have been suppressed for the years 2009-13 for some public health units and Local Health Integration Networks.

Suppression was applied to only those dimensions, geographies and years susceptible to potential impact from the use of 2011 alternative data sources. The use of these data sources may have changed the quintile of marginalization of some DAs more than expected. DAs that have similar measures of marginalization in both 2006 and 2016, but have divergent measurements in 2011, are considered outliers that may impact trends over time. Health equity analysis results for those geographies and dimensions with a large number of outlier DAs relative to the total number of DAs per geography, weighted by the magnitude of the difference, have been suppressed for the years 2009-13.

Considerations

- Minor differences were identified in total deaths extracted using a PHO-defined report compared to counts obtained using the IntelliHealth standard mortality report (i.e., 1.2 PHU deaths x ICD10 chap). The data in this Snapshot were extracted using the PHO-defined report and contain an additional 128 deaths distributed across 24 PHUs in 2021, and one additional death in each of two PHUs in 2018. PHO and the IntelliHealth Support Team are investigating the discrepancies.

Data Sources

Numerator: Mortality Data

- Ontario mortality data, 2008-2021 [data file]. Thunder Bay, ON: Ontario Office of Registrar General [original source]; Toronto, ON: Ontario Ministry of Health, Intellihealth Ontario [distributor]; [date extracted 2023 Dec 13].

Denominator: Census Population

- Statistics Canada as extracted by Ontario Agency for Health Protection and Promotion (Public Health Ontario). 2006 census of population – dissemination area: profile of age and sex for Canada, provinces, territories, census divisions, census subdivisions and dissemination areas, 2006 census [Internet]. Ottawa, ON: Statistics Canada; 2007 Aug 14 [extracted 2017 Feb 20]. Available from: <http://www12.statcan.gc.ca/global/URLRedirect.cfm?lang=E&ips=94-575-XCB2006002>
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How to Cite This Snapshot

Generic Citation Format:

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Potentially avoidable mortality health equity measure in sentence case [Internet]. Toronto, ON: King's Printer for Ontario; cYYYY [modified YYYY Mon DD; cited YYYY Mon DD]. Available from: <https://www.publichealthontario.ca/en/Data-and-Analysis/Health-Equity/Avoidable-Mortality-Health-Inequities>

Example:

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Potentially avoidable mortality health equity: relative risk [Internet]. Toronto, ON: King's Printer for Ontario; c2024 [modified 2024 Feb 8; cited 2024 Feb 9]. Available from: <https://www.publichealthontario.ca/en/Data-and-Analysis/Health-Equity/Avoidable-Mortality-Health-Inequities>

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Appendix 1: Preventable and treatable causes of deaths and associated ICD-10 Codes

Table 1: Preventable causes of deaths and associated ICD-10 Codes

Category	Cause of Death	ICD-10 Codes	Notes
Infections	Enteritis and other diarrhoeal disease	A00–A09	
Infections	Vaccine-preventable diseases	A35–A37, A39, A40.3, A41.3, A49.2, A80, B01, B05, B06, J09–J11, J13, J14, G00.0, G00.1	
Infections	Sexually transmitted infections, except HIV/AIDS	A50–A60, A63, A64	
Infections	Viral hepatitis	B15–B19	
Infections	HIV/AIDS	B20–B24	
Neoplasms	Lip, oral cavity and pharynx cancer	C00–C14	
Neoplasms	Esophageal cancer	C15	
Neoplasms	Stomach cancer	C16	
Neoplasms	Liver cancer	C22	
Neoplasms	Lung cancer	C33, C34	
Neoplasms	Melanoma skin cancer	C43	
Neoplasms	Non-melanoma skin cancer	C44	
Diseases of the Circulatory System	Rheumatic heart disease	I01, I02, I05–I09	
Diseases of the Circulatory System	Cerebrovascular diseases	I60–I62, I63–I64, I67, I69	50% of the deaths
Diseases of the Circulatory System	Ischaemic heart disease	I20–I25	50% of the deaths
Diseases of the Circulatory System	Other atherosclerosis	I70, I73.9	50% of the deaths

Category	Cause of Death	ICD-10 Codes	Notes
Diseases of the Circulatory System	Aortic aneurysm	I71	
Diseases of the Circulatory System	Venous thromboembolism	I26, I80, I82.9	
Diseases of the Respiratory System	Chronic obstructive pulmonary disorders	J40–J44	
Diseases of the Respiratory System	Lung diseases due to external agents	C45, J60–J64, J66–J70, J82, J92	
Diseases of the Digestive System	Chronic liver disease (excluding alcohol- related disease)	K73, K74.0,1,2,6	
Infant and Maternal Causes	Complications of perinatal period	A33	
Unintentional Injuries	Transport accidents	V01–V99	
Unintentional Injuries	Falls	W00–W19	
Unintentional Injuries	Other external causes of accidental injury	W20–W64, W75–W99, X10–X39, X50–X59	
Unintentional Injuries	Drowning	W65–W74	
Unintentional Injuries	Fires and flames	X00–X09	
Unintentional Injuries	Accidental poisonings	X40–X49	
Injuries of Undetermined Intent	Injuries of undetermined intent	Y10–Y34	
Intentional Injuries	Suicide and self-inflicted injuries	X60–X84, Y87.0	
Intentional Injuries	Assault	X85–X99, Y00–Y09, Y87.1	
Alcohol and Drug Use Disorders	Alcohol-related diseases, excluding external causes	F10, G31.2, G62.1, I42.6, K29.2, K70, K85.2, K86.0	
Alcohol and Drug Use Disorders	Drug use disorders	F11–F16, F18, F19	

Category	Cause of Death	ICD-10 Codes	Notes
Nutritional, Endocrine and Metabolic Disorders	Nutritional deficiency anaemia	D50–D53	
Nutritional, Endocrine and Metabolic Disorders	Diabetes mellitus	E10–E14	50% of the deaths
Adverse Effects of Medical and Surgical Care	Drugs, medicaments and biological substances causing adverse effects in therapeutic use	Y40–Y59	
Adverse Effects of Medical and Surgical Care	Misadventures to patients during surgical and medical care	Y60–Y66, Y69	
Adverse Effects of Medical and Surgical Care	Medical devices associated with adverse incidents in diagnostic and therapeutic use	Y70–Y82	
Adverse Effects of Medical and Surgical Care	Surgical and other medical procedures as the cause of abnormal reaction	Y83, Y84	

Note: For those diseases where only 50% of the deaths were considered preventable, deaths in the dataset were weighted as 0.5 (compared to 1.0 for all other deaths).

Table 2: Treatable causes of deaths and associated ICD-10 Codes

Category	Cause of Death	ICD-10 Codes	Notes
Infections	Tuberculosis	A16–A19, B90, J65	
Infections	Selected invasive bacterial infections	A38, A48.1, A49.1	
Infections	Sepsis	A40 (except A40.3), A41 (except A41.3)	
Infections	Malaria	B50–B54	
Infections	Meningitis	G00.2,3,8,9	
Infections	Cellulitis	A46, L03	
Infections	Pneumonia	J12, J15, J16, J18	
Neoplasms	Colorectal cancer	C18–C21	
Neoplasms	Malignant neoplasm of breast	C50	Female only
Neoplasms	Cervical cancer	C53	
Neoplasms	Uterus cancer	C54, C55	
Neoplasms	Testicular cancer	C62	
Neoplasms	Bladder cancer	C67	
Neoplasms	Thyroid cancer	C73	
Neoplasms	Hodgkin’s disease	C81	
Neoplasms	Leukemia	C91.0, C91.1, C92.1	Age less than 45
Neoplasms	Benign neoplasms	D10–D36	
Diseases of the Circulatory System	Hypertensive diseases	I10, I11–I13, I15	
Diseases of the Circulatory System	Cerebrovascular diseases	I60–I62, I63–I64, I67, I69	50% of the deaths
Diseases of the Circulatory System	Ischaemic heart disease	I20–I25	50% of the deaths

Category	Cause of Death	ICD-10 Codes	Notes
Diseases of the Circulatory System	Other atherosclerosis	I70, I73.9	50% of the deaths
Diseases of the Respiratory System	Asthma and bronchiectasis	J45, J46, J47	Updated, see Summary of Revisions
Diseases of the Respiratory System	Acute lower respiratory infections	J20, J22	
Diseases of the Respiratory System	Upper respiratory infections	J00–J06, J30–J39	
Diseases of the Respiratory System	Adult respiratory distress syndrome	J80	
Diseases of the Respiratory System	Pulmonary oedema	J81	
Diseases of the Respiratory System	Abscess of lung and mediastinum; pyothorax	J85, J86	
Diseases of the Respiratory System	Other pleural disorders	J90, J93, J94	
Diseases of the Respiratory System	Other respiratory disorders	J98	
Diseases of the Digestive System	Peptic ulcer disease	K25–K28	
Diseases of the Digestive System	Diseases of appendix; hernia; disorders of gallbladder, biliary tract and pancreas	K35–K38, K40–K46, K80–K83, K85.0,1,3,8,9, K86.1,2,3,8,9	
Diseases of the Genitourinary System	Nephritis and nephrosis	N00–N07	
Diseases of the Genitourinary System	Renal failure	N17–N19	
Diseases of the Genitourinary System	Obstructive uropathy, urolithiasis and prostatic hyperplasia	N13, N20, N21, N23, N35, N40	
Diseases of the Genitourinary System	Inflammatory diseases of genitourinary system	N34.1, N70–N73, N75.0, N75.1, N76.4, N76.6	

Category	Cause of Death	ICD-10 Codes	Notes
Diseases of the Genitourinary System	Disorders resulting from impaired renal tubular function	N25	
Infant and Maternal Causes:	Complications of perinatal period	H31.1, P00–P96	
Infant and Maternal Causes:	Congenital malformations, deformations and chromosomal anomalies	Q00–Q99	
Infant and Maternal Causes:	Pregnancy, childbirth and the puerperium	O00–O99	
Nutritional, Endocrine and Metabolic Disorders	Thyroid disorders	E00–E07	
Nutritional, Endocrine and Metabolic Disorders	Diabetes mellitus	E10–E14	50% of the deaths
Nutritional, Endocrine and Metabolic Disorders	Adrenal disorders	E24, E25, E27	
Nutritional, Endocrine and Metabolic Disorders	Congenital metabolic disorders	E74.0, E74.2	
Neurological Disorders	Epilepsy	G40, G41	
Disorders of Musculoskeletal System	Osteomyelitis	M86	

Note: For those diseases where only 50% of the deaths were considered treatable, deaths in the dataset were weighted as 0.5 (compared to 1.0 for all other deaths)

Summary of Revisions

Description of Changes	Page
Mortality from treatable causes indicator <ul style="list-style-type: none">Added ICD-10 code J46	13

Citation

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