HEALTH SURVEILLANCE INDICATORS:
INFANT MORTALITY

Public Health Relevance

Infant mortality is a good measure of society's health and development. Dramatic decreases in infant mortality rates over the last century in Canada and other countries are attributed to improvements in sanitation, nutrition, and maternal and child health care.

Infant mortality is divided into two time periods: neonatal death (0 to 27 days after birth) and post-neonatal death (28 to 364 days after birth). Causes of neonatal death differ from causes of post-neonatal death. In most developed countries, congenital anomalies and pregnancy-related causes are the leading causes of neonatal death, whereas congenital anomalies and sudden infant death syndrome are the leading causes of post-neonatal death.

Highlights

1. There were no significant changes in the Toronto rates of infant mortality, neonatal mortality, or post-neonatal mortality from 2001 to 2010.
2. Toronto's infant and neonatal mortality rates were significantly higher than the rest of GTA and the rest of Ontario.
3. The majority of infant deaths in Toronto from 2006 to 2010 occurred in the neonatal period. Immaturity-related conditions was the most common cause of neonatal mortality while congenital anomalies was the leading cause of death in the post-neonatal period.
4. Infant and neonatal mortality rates were significantly higher in lower income groups than in the highest income group in Toronto.

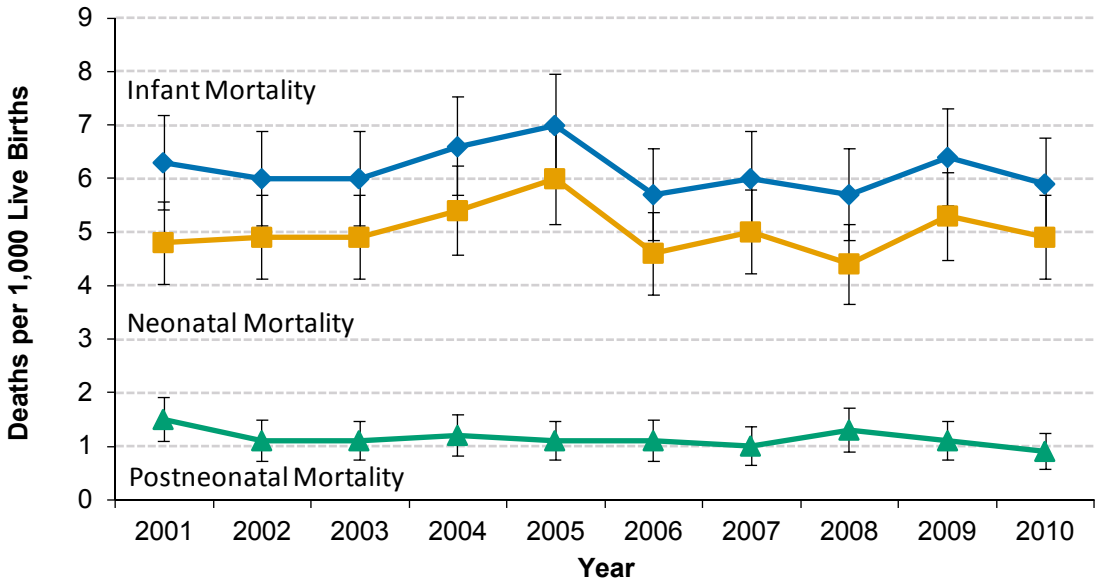
Trends Over Time

There were no significant changes in the Toronto rates of infant mortality, neonatal mortality, or post-neonatal mortality from 2001 to 2010.

Figure 1 shows the number of infant deaths per 1,000 live births in Toronto from 2001 to 2010, overall and separately for the neonatal and post-neonatal periods. Over this period, there were no significant changes in the rates of overall infant mortality, neonatal mortality, or post-neonatal mortality.

For every 1,000 babies born in 2010, there were approximately five infant deaths in the neonatal period and one infant death in the post-neonatal period, corresponding to an overall infant mortality rate of six per 1,000 live births.

Figure 1: Infant Mortality, Neonatal Mortality, and Post-Neonatal Mortality Rates, Toronto, 2001 to 2010



Error bars (I) represent the 95% confidence intervals.

Source: Data Notes.

Regional Comparisons

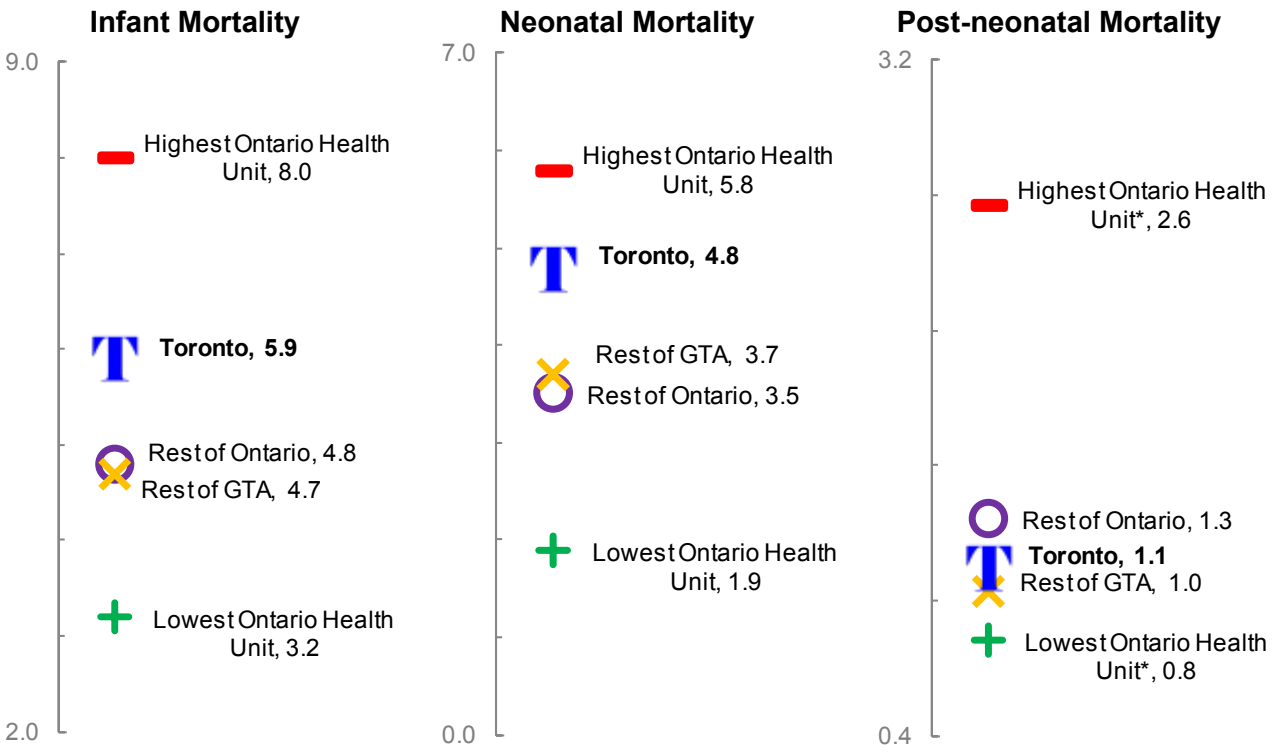
Toronto's infant and neonatal mortality rates were significantly higher than the rest of GTA and the rest of Ontario.

Figure 2 shows the infant, neonatal, and post-neonatal mortality rates for Toronto from 2006 to 2010 combined, compared to the rest of Ontario (Ontario excluding Toronto), the rest of the Greater Toronto Area (GTA excluding Toronto), and the Ontario health units with the highest and lowest rates.

For both infant and neonatal mortality, the Toronto rate was significantly higher than the rest of the GTA and the rest of Ontario. Of the 36 health units, Toronto ranked 6th for infant mortality rate and 3rd for neonatal mortality rate, with the first ranked health units having the highest rates.

Toronto's post-neonatal mortality rate was not significantly different from the rest of the GTA or the rest of Ontario. Toronto ranked 29th of the 36 health units in Ontario with the first ranked health unit having the highest rate.

Figure 2: Infant, Neonatal, and Post-Neonatal Mortality Rates, per 1,000 Live Births, Toronto Compared to Other Selected Regions in Ontario, 2006 to 2010 Combined



* Data for the Ontario health units with the lowest and highest rates are suppressed due to small numbers (i.e., fewer than five deaths). The next lowest and highest rates that can be reported are shown in the graph.

Source: see Data Notes.

Socio-demographics

The majority of infant deaths in Toronto from 2006 to 2010 occurred in the neonatal period. Immaturity-related conditions was the most common cause of neonatal mortality while congenital anomalies was the leading cause of death in the post-neonatal period.

Infant and neonatal mortality rates were significantly higher in lower income groups than in the highest income group in Toronto.

Between 2006 and 2010 there were about 901 infant deaths in Toronto, averaging approximately 180 deaths per year over this five-year period. The majority of these deaths (81%) occurred in the neonatal period. Table 1 shows the distribution of infant deaths by underlying cause, overall and separately for the neonatal and post-neonatal periods.

In the neonatal period, immaturity-related conditions was the most common cause of death, accounting for 42% of cases. This group included a range of maternal conditions associated with preterm birth and conditions in newborns related either to low birth weight, short gestation, or both. The second most common cause was congenital anomalies, accounting for 21% of cases.

In the post-neonatal period, the most common cause of death was congenital anomalies, which included both structural deformities and biochemical abnormalities. These conditions accounted for 25% of post-neonatal deaths. The second most common cause was infection, followed by sudden infant death syndrome (SIDS).

Table 1: Infant, Neonatal, and Post-Neonatal Mortality Counts, by Underlying Cause of Death, Toronto, 2006 to 2010 Combined

Underlying Cause of Death	Neonatal Deaths	Post-Neonatal Deaths	Total Infant Deaths
Immaturity-related conditions	305	15	320
Congenital anomalies	156	42	198
Asphyxia-related conditions	**	*	64
Infection	35	24	59
SIDS	6	21	27
Other unexplained infant death	5	19	24
External causes	**	**	8
Others	166	35	201
All Causes Combined	**734**	**167**	**901**

*Data suppressed to ensure confidentiality when the cell size is less than five.
**Data suppressed to prevent residual disclosure.
Source: see Data Notes.

Table 2, 3, and 4 show the infant mortality, neonatal mortality, and post-neonatal mortality counts and rates by newborn sex for Toronto in 2010. There were no significant differences in these rates between sexes.

Table 2: Infant Mortality, by Sex, Toronto, 2010

Infant's Sex	**Number of Deaths**	**Rate** (per 1,000 live births)
Male	97	6.1
Female	83	5.6
Total	**180**	**5.9**

Source: see Data Notes.

Table 3: Neonatal Mortality, by Sex, Toronto, 2010

Infant's Sex	**Number of Deaths**	**Rate** (per 1,000 Live Births)
Male	78	4.9
Female	73	4.9
Total	**151**	**4.9**

Source: see Data Notes.

Table 4: Post-Neonatal Mortality, by Sex, Toronto, 2010

Infant's Sex	**Number of Deaths**	**Rate per 1,000 Live Births**
Male	19 *	1.2
Female	10 *	0.7
Total	**29**	**0.9**

* Small numbers, interpret with caution.

Source: see Data Notes.

Table 5 shows the infant mortality, neonatal mortality, and post-neonatal mortality rates by income quintile for 2006 to 2010 combined. Quintile 1 contains the areas in Toronto with the highest percent of people living below the low income measure (LIM), making it the lowest income quintile. Quintile 5 contains the areas in Toronto with the lowest percent of people living below the LIM, making it the highest income quintile.

There were significant differences in infant mortality and neonatal mortality rates by income quintile. The overall infant mortality rate was significantly higher in the three lowest income quintiles (Quintiles 1 to 3) than the highest income quintile (Quintile 5). The neonatal mortality rate was significantly higher in two of the lower income quintiles (Quintiles 1 and 3) than the highest income quintile (Quintile 5).There were no significant differences in post-neonatal mortality rates across income quintiles.

Table 5: Infant, Neonatal, and Post-Neonatal Mortality Rates, per 1,000 Live Births, by Income Quintile, Toronto, 2006 to 2010 Combined

Income Quintile	Infant Mortality	Neonatal Mortality	Post-Neonatal Mortality
Quintile 1 (Lower income)	6.5 H	5.3 H	1.2
Quintile 2	6.0 H	4.7	1.3
Quintile 3	6.5 H	5.3 H	1.2
Quintile 4	5.2	4.3	0.9
Quintile 5 (Higher income)	4.3	3.6	0.7

H Significantly higher than Quintile 5, the highest income group, indicating a health inequality and a less favourable result for that group.

Source: see Data Notes.

Data Notes

Notes

- Significant differences were estimated using overlapping confidence intervals. Although this method is conservative ($\alpha < 0.01$) and most appropriate when comparing mutually exclusive groups, it was chosen as an objective means of making conclusions on population-based data. Also note that the multiple comparisons performed in the analysis were not taken into consideration when choosing the level of significance to test.
- Time trend analysis is based on data from the most recent 10-year period. When there are fewer than 10 years of data, analysis begins with the earliest available year of complete and reliable data.
- Toronto is compared to Ontario excluding Toronto and to the Greater Toronto Area (GTA) excluding Toronto rather than to Ontario and the GTA including Toronto because Toronto comprises such a large proportion of these two areas. Excluding Toronto therefore results in more meaningful comparisons.
- Data used for the regional comparisons normally shows the rates for the Ontario health units with the highest and the lowest rates. The purpose of these comparisons is to show the rate for Toronto relative to other areas in Ontario. Where data for a health unit is suppressed due to small numbers, the rate for the next health unit with sufficient numbers is shown instead.
- The income quintile analysis, Table 5, excluded birth and infant death records that could not be linked to a Toronto census tract. Approximately 5% of the infant death records were excluded due to missing census tract information. If the information was not missing at random, the reported quintile-specific mortality rates could be biased.

Definitions

Causes of death are grouped together according to the International Collaborative Effort (ICE) functional classification scheme modified and adapted by the Canadian Perinatal Surveillance System. See "Underlying Causes of Infant Death" below for definitions and classifications.

GTA excluding Toronto means the Greater Toronto Area (GTA) with Toronto removed from the GTA data.

Income Quintiles are five groups, each containing approximately 20% of the population. They were created by ranking Toronto's census tracts based on the percent of residents living below the Statistics Canada after-tax Low Income Measure (LIM), using the 2010 income tax filer data. Quintile 1 includes the census tracts with the highest percent of people living below the LIM and is therefore the lowest income quintile. Quintile 5 includes the census tracts with the lowest percent of people living below the LIM, making it the highest income quintile. LIM is an income level set at 50% of the median family income in Canada in a given year, adjusted for household size.

Infant Mortality Rate is the number of deaths among live-born infants up to 364 days of age per 1,000 live births.

Neonatal Mortality Rate is the number of deaths among live-born infants 27 days of age or younger per 1,000 live births.

Ontario excluding Toronto means Ontario with Toronto removed from the Ontario data.

Post-neonatal Mortality Rate is the number of deaths among live-born infants between 28 days and 364 days of age per 1,000 live births.

Sex defines people based on their biological characteristics, whereas gender is a socially constructed concept. From a social determinants of health perspective, certain health conditions can be associated with gender, and from a biological perspective, health conditions can be associated with sex. Although reporting based on both concepts would be preferable, the data source used here only collects information on sex, and not gender.

Underlying Causes of Infant Death are grouped according to the International Collaborative Effort (ICE) functional classification scheme modified and adapted by the Canadian Perinatal Surveillance System (CPSS). Conditions in the same functional group share common features that require intervention at a specific time for prevention and treatment. The classification scheme was initially developed by Cole, Hartford, BergsjØ and McCarthy (1989) for epidemiological surveillance, and CPSS's modifications were informed by a thorough review of the enhanced version of International Classification of Disease version 9 (ICD-9) and ICD-10 codes for use in Canada. The following ICD-10 codes (extracted from Table A.2.4, Appendix A.2 in the 2008 Canadian Perinatal Health Report) correspond to the cause of death groups found in this report:

Cause of Death	Description	ICD10-Codes
Asphyxia-related conditions	Conditions arising during or shortly before labour and delivery. Also includes birth trauma.	O43.8; O83.4; P01.6–P01.7; P02.0–P02.2; P02.6; P03.0–P04.0; P08.0–P08.2; P10.0–P10.1; P10.3–P21.9; P24.0-P24.9; P52.4–P52.5; P52.8; P90–P91.0; P91.4–P91.5; P91.9
Congenital anomalies	Structural deformities and biochemical abnormalities (e.g., hereditary anemias and other hereditary blood disorders).	Q00-Q99
External causes	Deaths due to accidents, poisoning and violence. Also includes deaths with diagnoses of specified nutritional deficiencies.	E40–E46; E64.0; J69.0–J69.8; J95.8; V01–Y98 (except W75–W77; W81–W84)

Cause of Death	Description	ICD10-Codes
Immaturity-related conditions	Maternal conditions associated with preterm birth and conditions in newborns associated with immaturity related either to low birth weight or short gestation or both.	D58.9; P01.3–P01.5; P01.8–P01.9; P02.7; P05.0–P05.9; P07.0–P07.3; P10.2; P22.0–P22.9; P25.0–P29.2; P29.4–P29.9; P52.0–P52.3; P57.8–P59.9; P77; P78.0; P80.0; P91.1–P91.2; P91.8; P94.1–P94.9; P96.0; P96.3–P96.5
Infections	Diagnoses of infections, regardless of causative organism, whether generalized or localized, both those specific to the perinatal period and others.	A00.0–B19.9; B25.0–B99; D86.0–D86.9; E79.0; G00.0–G09; G36.1; G37.3–G37.4; G92; G93.3–G93.4; G94.8; G96.1; H66.0–H67.8; H75.0; I30.0–I30.9; I32.0–I33.9; I39.8–I41.2; I42.3; I43.0; I52.0–I52.1; I72.9; I88.8; J00–J30.4; J36–J37.1; J39.9–J42; J44.1–J44.8; J65; J85.0–J92.9; J94.0–J94.9; J98.0; J98.4; J99.8; K35.0–K35.9; K37; K52.9; K61.0–K61.4; K65.0–K65.9; K67.0–K67.8; K72.0; K72.9; K76.2; K90.8; K93.0; L08.1; L44.8; L94.6; M02.1; M02.3; M35.2; N10–N13.3; N13.6; N15.1–N16.8; N17.2; N28.8; N29.1; N34.1; O98.0–O98.1; P23.0–P23.9; P35.0–P39.9; R06.5; R09.1; R29.1; R70.0–R71; R73.0–R74.9; R77.0–R78.0; R78.7–R79.9; R89.7; T62.9
Sudden infant death syndrome (SIDS)	All cases of sudden death of unknown cause, and other unknown cases of mortality.	R95
Other unexplained infant death	Unexplained infant deaths not classified as sudden infant death syndrome.	J96.0–J96.9; R09.0; R09.2; R41.8; R45.0; R45.2–R45.6; R45.8–R46.3; R46.5–R46.7; R53; R64; R68.1; R68.8; R69; R96.0–R99; Z71.1; W75–W77; W81–W84
Others	Heterogeneous group which includes all neoplasms, some endocrine disorders, asthma and some others.	Any code not mentioned above

Sources

Income data: Statistics Canada - Table F-18 annual income estimates for census families and individuals (T1 Family File), 2010. Used in:

- Table 5

Live Births and Mortality data, Vital Statistics 2001 to 2010**,** Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO. Date Extracted: March 2013 and March 2015. Used in:

- Figures 1 and 2
- Tables 1, 2, 3, 4, and 5

Health Surveillance Indicator: Infant Mortality

Category: Reproductive Health

Prepared: August, 2017

This indicator report is part of a series that informs the ongoing assessment of Toronto's health status. For a full list of the indicators, please go to: www.toronto.ca/health