Infant mortality and low birthweight, 1975 to 1995

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Abstract

Objectives

This article examines trends in infant mortality and the incidence of low birthweight from 1975 to 1995.

Data sources

The data are from the Canadian Vital Statistics Data Base, compiled from information provided to Statistics Canada by the Vital Statistics Registries in each province and territory.

Analytical techniques

Death rates, stillbirth rates, and the incidence of low birthweight were calculated for Canada, the provinces, and territories from 1975 to 1995. To examine the impact of changes in maternal characteristics during the period, the incidence of low birthweight was standardized by age and marital status of mothers, using the 1985 distributions.

Main results

The pace of decline in infant and perinatal mortality has slowed in recent years. This slowdown may, at least in part, be attributed to the increase in the incidence of low birthweight. In turn, some of the increase in the incidence of low birthweight is explained by the rising proportions of births to women aged 35 and older and to unmarried women.

Key words

fetal death, stillbirths and infant deaths, perinatal mortality, neonatal mortality

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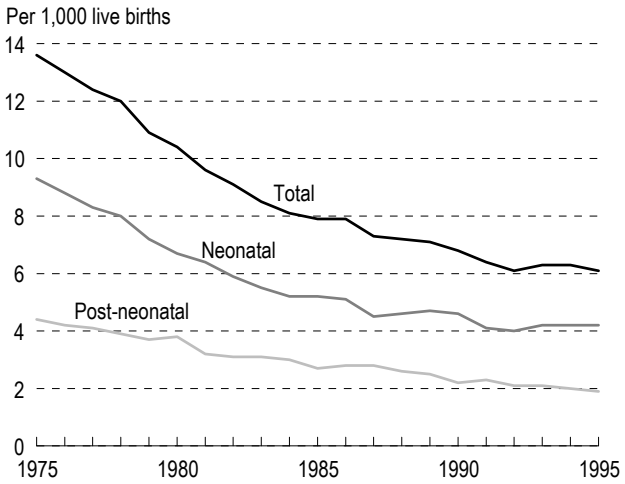
The drastic reduction in infant mortality—deaths of children younger than age one— in Canada and in other industrialized countries is a major medical achievement of this century. With the near-disappearance of infectious diseases among infants, the potential for future reductions in infant mortality lies primarily in improving survival during the first weeks or days of life, and in pre-natal survival. Thus, in low-mortality countries such as Canada, attention has gradually shifted to neonatal mortality (deaths in the first 27 days), or even to perinatal mortality (stillbirths and deaths within the first week).

While infant mortality rates in Canada continue to decline, the pace has slowed during the past decade. This slowdown coincides with an increase in the incidence of low birthweight.

This article describes trends in infant mortality, stillbirths, and the incidence of low birthweight from 1975 to 1995 (see *Methods* and *Definitions*).

Chart 1
Infant mortality rates, Canada, 1975 to 1995



Data source: *Canadian Vital Statistics Data Base*

Infant mortality

The annual number of infant deaths has declined over the past 20 years, but the pace of decline is diminishing (Appendix, Table A and Chart 1). From 4,721 in 1975, the number dropped to 2,982 in 1985 and to 2,321 by 1995.

Between 1975 and 1985, the infant mortality rate fell sharply from 13.6 to 7.9 infant deaths per 1,000 live births. The next ten years saw a comparatively small drop to 6.1. In fact, the infant mortality rate was the same in 1995 as in 1992.

Since 1975, the majority (about 7 in 10) of infant deaths were neonatal, that is, they occurred in the first 27 days of life. Moreover, in 1995, 37% of infant deaths occurred during the first day, and another 19%, during the first week.

Methods

Data sources

Data on live births, stillbirths, deaths, and low birthweight are from the Canadian Vital Statistics Data Base. The data are adapted from information collected by the provincial and territorial registries of vital statistics, which are responsible for the registration of vital events that occur in their jurisdictions.

Analytical techniques

Death rates, stillbirth rates, and the incidence of low birthweight were calculated for Canada, the provinces, and territories. To examine the impact of changes in maternal characteristics, the incidence of low birthweight was standardized by age and marital status of mothers, using the 1985 distributions.

Limitations

Because of legal reporting requirements, the registration of vital events is considered to be virtually complete. However, records received after the "cut-off" date for data release are missing, as are data for Canadians in foreign countries other than the United States. Vital events for non-permanent residents may be excluded if their usual place of residence was not Canada.

There may be some effect of registration practices for very small and immature fetuses. Pregnancy outcomes that were previously registered as spontaneous abortions (if they were registered at all) may now be registered as births, and changes may have occurred in the classification of stillbirth versus live birth. It is noteworthy that between 1985 and 1995, live births of less than 500 grams increased from 4.3 to 8.8 per 10,000, and the proportion of stillbirths that were less than 500 grams increased from 14% to 23% of all stillbirths of known birthweight, even though four provinces do not include stillbirths of less than 500 grams in their statistics.

The small number of stillbirths of unknown weights, which are excluded from all calculations, does not significantly affect the interpretation of trends and interprovincial differences.

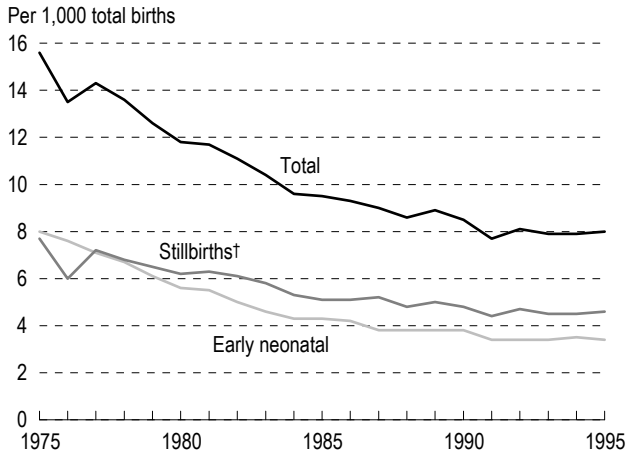
The utility of cause of death and stillbirth statistics depends on how exact and complete they are. Accuracy is governed by factors such as the experience of the certifying physician and the use of post-mortem examination results, when these are performed.

In 1995, the neonatal mortality rate was 4.2 deaths per 1,000 live births. This was a relatively small change from 1985 (5.2), but a considerable drop since 1975 (9.3).

Perinatal mortality

Like infant mortality, perinatal mortality, which comprises stillbirths and early neonatal mortality (less than 7 days), decreased more quickly between 1975 and 1985 than between 1985 and 1995 (Appendix, Table B). In addition, early neonatal deaths declined at a faster pace than stillbirths, so stillbirths represented a growing proportion of perinatal mortality: 49% in 1975; 57% in 1995 (Chart 2). This drop in early neonatal mortality may be indicative of medical advances in caring for very small infants who are born alive.

Chart 2
Perinatal mortality rates, Canada, 1975 to 1995



Data source: *Canadian Vital Statistics Data Base*
† Comprises only stillbirths of at least 500 grams. Stillbirths of unknown weight are excluded.

Causes of death

Causes of infant death differ with the child's age. As well, a substantial share of stillbirths and infant deaths are attributed to unknown causes (Table 1).

In 1995, perinatal complications caused over 85% of stillbirths of known causes and 65% of early neonatal deaths. Perinatal complications comprise respiratory distress syndrome and other respiratory conditions, disorders related to short gestation and low birthweight, maternal complications of pregnancy, and complications of placenta, cord and other membranes. Congenital anomalies caused almost all the remaining stillbirths and early neonatal deaths, and were the main cause of death of infants aged 7 to 27 days. The most common fatal congenital anomalies are anomalies of the circulatory and respiratory systems.

After the first four weeks of life, Sudden Infant Death Syndrome (SIDS) emerges as the leading cause of death, accounting for 34% of post-neonatal deaths of known causes in 1995. Another 25% of post-neonatal deaths were attributed to congenital anomalies, and injuries represented 6%. Five infants died of AIDS that year.

Table 1
Selected causes of stillbirths and infant deaths, Canada, 1995

	Stillbirths		Infant deaths				
		Rate	Total	Early neonatal	Late neonatal	Post-neonatal	Rate
	Number	Per 1,000 total births	Number				Per 1,000 live births
Total (ICD-9)	**1,730**	**4.56**	**2,321**	**1,295**	**289**	**737**	**6.14**
Perinatal complications (760-779)	1,166	3.07	989	839	109	41	2.62
Congenital anomalies (740-759)	181	0.48	684	400	115	169	1.81
SIDS (798.0)	...	...	249	2	17	230	0.66
Injuries (E800-E999)	...	...	54	5	6	43	0.14
All other known causes	3	0.01	269	38	33	198	0.71
Unknown causes, perinatal (779.9)	380	1.00	1	1	0	0	0.00
Unknown causes, general (799.9)	...	...	75	10	9	56	0.20

Data source: *Canadian Vital Statistics Data Base*
... Figures not appropriate

Definitions

Live birth: complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows other evidence of life.

Stillbirth: product of conception which has issued from its mother and did not at any time after birth breathe or show other signs of life. The World Health Organization recommends that "national perinatal statistics (which comprise stillbirths plus early neonatal deaths) should include all fetuses and infants delivered weighing at least 500 grams or, when birthweight is unavailable, the corresponding gestational age (22 weeks) or body length (25 cm crown-heel), whether alive or dead."[1] Three different definitions were in use in Canada in 1995: in Newfoundland, New Brunswick, Quebec, and Saskatchewan, only the 500 grams criterion was considered; in Prince Edward Island, only gestational age was considered (fetuses of at least 20 weeks); in all other provinces and territories, either criterion was considered. In this article, to allow for interprovincial comparisons, only stillbirths of 500 grams or more, which are collected in all provinces, were used.

Infant death: death of child under one year of age.

Neonatal death: death of child under 28 days of age.

Early neonatal death: death of child under 7 days of age.

Late neonatal death: death of child aged from 7 days to less than 28 days.

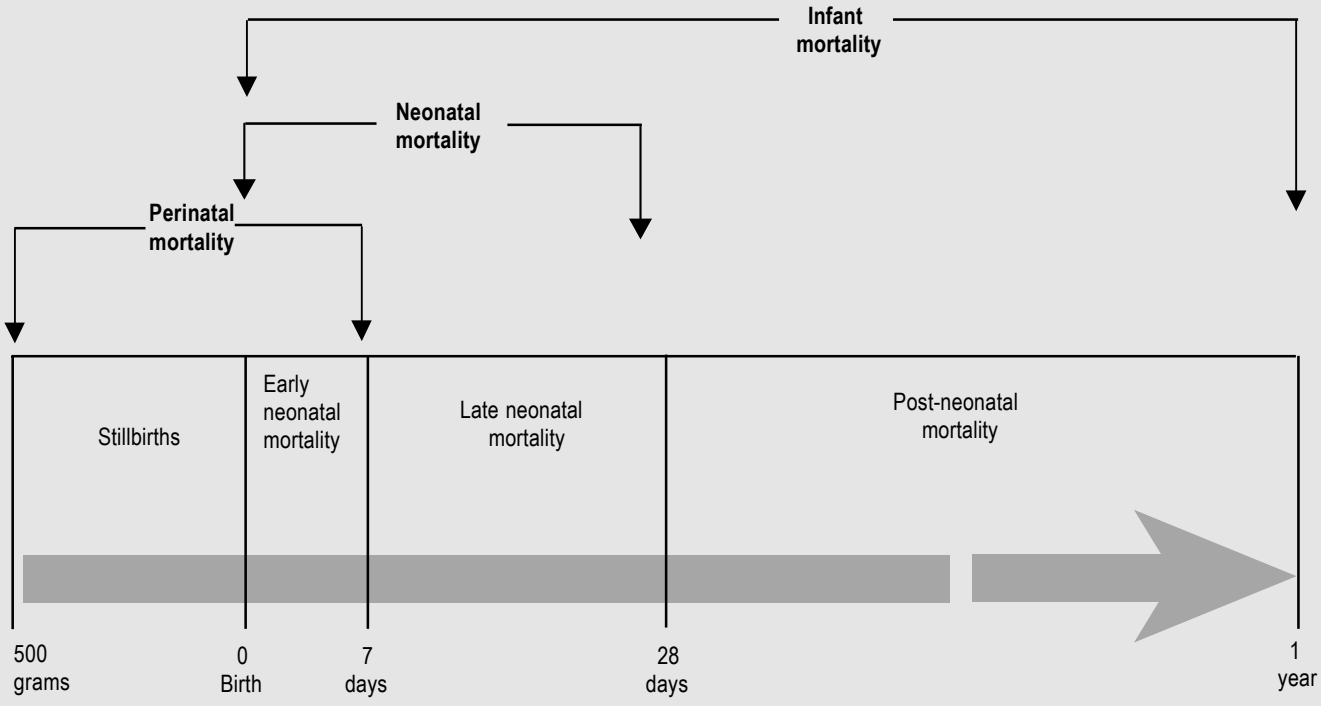
Post-neonatal death: death of child aged from 28 days to less than one year.

The infant, neonatal (early and late), and post-neonatal mortality rates are the number of such deaths per 1,000 live births. The same denominator is used for each rate.

Perinatal mortality rate: number of stillbirths of 500 grams or more and early neonatal deaths per 1,000 total births (live births plus stillbirths).

Stillbirth rate: number of stillbirths of 500 grams or more per 1,000 total births of known weight.

Incidence of low birthweight: live births of 500 to 2,499 grams as a percentage of total live births weighing at least 500 grams (excluding births of unknown weight).



Source: *Statistics Canada (reference 4)*

Low birthweight

Birthweight is generally considered one of the best indicators of a newborn's chances of survival.[2,3] Perinatal and infant mortality are highly correlated with the incidence of low birthweight. Studies that link live births and infant deaths have repeatedly shown extreme differences in survival rates by birthweight.[4-7] From 1975 to 1985, the incidence of low birthweight fell from 6.64% to 5.53%, but by 1995, it had increased to 5.77% (Chart 3).

Characteristics classified as "risk markers" aid in identifying women who may have low birthweight babies.[8,9] These markers include the age and marital status of the mother, length of gestation, and parity (birth order) (Table 2).

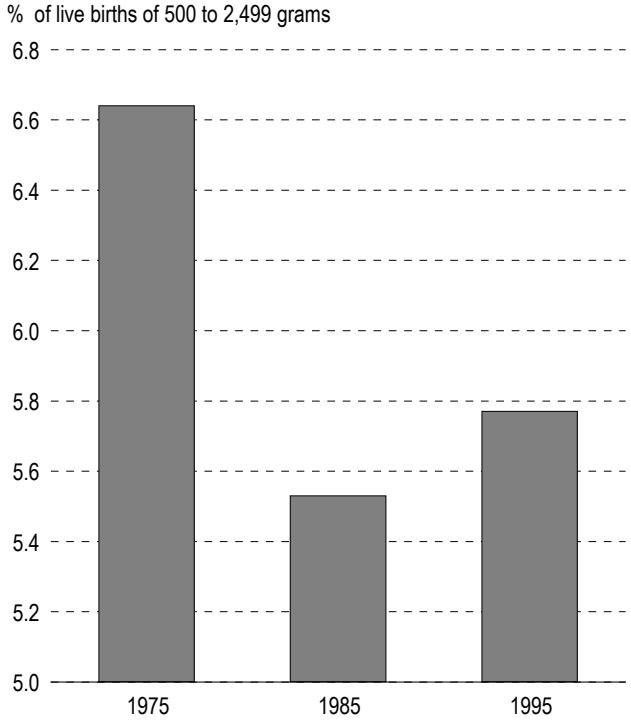
Low birthweight is higher among the youngest and oldest mothers than among those aged 25 to 34.[10] The proportion of low-weight newborns also tends to be higher among unmarried than among married mothers. Therefore, changes since 1985 in the distribution of births by the age and marital status of mothers may explain part of the increase in the incidence of low birthweight. The proportion of births to women aged 35 and over doubled from 6% to 12%, and the proportion of births to unmarried mothers increased from 18% to 30%. If the distribution of births by age and marital status of mothers had remained as it was in 1985, the incidence of low birthweight would have fallen to 5.49% in 1995 instead of rising to 5.77%.

Low birthweight is clearly related to prematurity, as close to half of preterm babies weigh less than 2,500 grams, compared with only about 2% of those born at 37 or more weeks' gestation. As well, low birthweight is more common among first-born children and those that are the mother's fourth or later birth than among second- and third-born children.

Of course, fetal and infant survival depend on the quality and accessibility of health care. Specialized medical centres with intensive care units have much lower neonatal mortality rates than other hospitals.[6,11]

The socioeconomic environment of the mother also plays a role. The importance of socioeconomic conditions is demonstrated by the fact that in urban

Chart 3
Incidence of low birthweight, Canada, 1975, 1985 and 1995



Data source: *Canadian Vital Statistics Data Base*

Table 2
Incidence of low birthweight,† by age of mother and selected characteristics, Canada, 1995

	Age of mother						
	All ages	**<20**	**20-24**	**25-29**	**30-34**	**35-39**	**40+**
				%			
Total	**5.8**	**6.7**	**6.0**	**5.4**	**5.5**	**6.5**	**8.2**
Marital status							
Married	5.1	6.1	5.3	4.8	4.9	5.7	7.4
Not married	6.8	6.7	6.4	6.5	7.2	8.7	10.0
Length of gestation (weeks)							
Less than 37	48.5	50.3	49.2	47.6	48.2	48.8	50.3
37 and over	2.2	2.5	2.4	2.1	2.1	2.4	2.9
Parity							
1	6.1	6.3	5.8	5.5	6.4	7.8	10.5
2	5.1	8.5	5.7	4.6	4.6	5.9	7.6
3	5.9	10.3	7.3	5.8	5.2	6.0	7.4
4+	7.2	11.9	9.9	7.8	6.5	6.8	7.5

Data source: *Canadian Vital Statistics Data Base*
† Live births of 500 to 2,499 grams as a percentage of total live births weighing at least 500 grams

Canada, the incidence of low birthweight and the infant mortality rate are relatively high in the lowest income neighborhoods.[12]

Sex differences

Higher male than female mortality rates, which are observable at all ages, exist even at birth. In 1995, mortality rates were higher among boys than girls: 6.7 versus 5.5 deaths per 1,000 live births for infant mortality, and 8.6 versus 7.3 deaths per 1,000 total births for perinatal mortality. On the other hand, the incidence of low birthweight was higher for girls (6.3%) than for boys (5.4%).

Provincial differences

Among the provinces, Saskatchewan, Newfoundland, and Manitoba had the highest infant mortality rates in 1995 (Table 3). Over the previous decade, infant mortality had declined in all provinces except Prince Edward Island (possibly because of fluctuations due to small numbers). Even so, in 1995, Prince Edward Island had the lowest infant mortality rate. Rates were also low in Nova Scotia and New Brunswick, which had experienced the sharpest declines since 1985.

The highest perinatal mortality rate in 1995 was in Prince Edward Island, followed by Saskatchewan, Newfoundland, and Manitoba. The lowest rates were in New Brunswick, Quebec, and British Columbia. Prince Edward Island was the only province where perinatal mortality had risen during the decade.

Among the most populous provinces, declines in both infant and perinatal mortality since 1985 were greater in Quebec and British Columbia than in Ontario. However, the rates in these three provinces did not differ greatly from one another.

The incidence of low birthweight in 1995 was highest in Ontario, Quebec and Alberta, and lowest in Prince Edward Island, New Brunswick and British Columbia. From 1985 to 1995, the incidence of low birthweight declined in only three provinces: Prince Edward Island, New Brunswick, and Quebec.[a] The increase for Canada overall is mainly attributable to an upturn in Ontario.[13]

[a] Trends in Newfoundland are not known because the incidence of low birthweight was not available before 1990.

Table 3
Infant mortality, perinatal mortality and incidence of low birthweight, Canada, provinces and territories, 1975, 1985 and 1995

	Canada	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Yukon	N.W.T.
Infant mortality†						Per 1,000 live births							
1975	13.1	15.7	19.2	16.2	15.5	13.3	12.8	15.0	17.8	14.9	14.4	24.5	35.7
1985	7.9	10.8	4.0	7.9	9.6	7.3	7.3	9.9	11.0	8.0	8.1	10.8	16.7
1995	6.1	7.9	4.6	4.8	4.8	5.5	5.9	7.6	9.1	7.0	6.0	12.8	13.0
Perinatal mortality‡						Per 1,000 total births							
1975	15.6	8.7	25.6	14.8	20.2	15.4	16.3	17.2	17.0	13.6	17.3	24.3	30.2
1985	9.5	10.3	9.9	10.1	9.2	8.8	9.7	10.4	10.5	8.7	10.0	2.2	11.7
1995	8.0	9.5	10.2	8.1	5.6	7.2	8.2	8.7	9.9	8.5	7.5	8.5	9.2
Low birthweight§						%							
1975	6.64	..	5.04	5.48	5.53	7.51	6.44	6.23	6.26	6.93	6.10	7.18	8.50
1985	5.53	..	4.89	5.20	5.21	6.30	5.40	5.14	5.33	5.46	4.92	6.47	4.61
1995	5.77	5.43	4.63	5.85	4.71	5.90	5.98	5.38	5.51	5.88	5.24	4.06	6.95

Data source: *Canadian Vital Statistics Data Base*
† Deaths of infants less than one year old
‡ Stillbirths and deaths of infants less than seven days old
§ Live births of 500 to 2,499 grams as a percentage of total live births weighing at least 500 grams
.. Not available

In the Yukon and the Northwest Territories, infant and perinatal mortality rates have fallen sharply, but because of the small numbers, some of this decline may be due to random fluctuations. While infant mortality rates in the territories are well above provincial rates, in 1995, only the post-neonatal mortality rates were substantially higher; the neonatal mortality rates were comparable to those of the provinces. It is possible, however, that there may be some under-registration of early deaths in the territories.

Concluding remarks

Paradoxically, progress in perinatal care can cause the infant mortality to rise, as pregnancies that formerly would have ended in miscarriages or stillbirths result in low-weight live births with precarious survival chances. In recent years, the pace of decline in infant and perinatal mortality has slowed. At the same time, the incidence of low birthweight increased. To some extent, this rise in the incidence of low birthweight can be partly attributed to the increasing proportion of births to older and to unmarried mothers.

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Appendix

Table A
Infant deaths and mortality rates, Canada, 1975 to 1995

	Total	Neonatal	Post-neonatal	Total	Neonatal	Post-neonatal
		Number			Per 1,000 live births	
1975	4,721	3,144	1,577	13.1	8.7	4.4
1976	4,682	3,178	1,504	13.0	8.8	4.2
1977	4,475	2,984	1,491	12.4	8.3	4.1
1978	4,289	2,888	1,401	12.0	8.0	3.9
1979	3,994	2,652	1,342	10.9	7.2	3.7
1980	3,868	2,470	1,398	10.4	6.7	3.8
1981	3,562	2,359	1,203	9.6	6.4	3.2
1982	3,385	2,219	1,166	9.1	5.9	3.1
1983	3,182	2,040	1,142	8.5	5.5	3.1
1984	3,058	1,942	1,116	8.1	5.2	3.0
1985	2,982	1,954	1,028	7.9	5.2	2.7
1986	2,938	1,909	1,029	7.9	5.1	2.8
1987	2,706	1,679	1,027	7.3	4.5	2.8
1988	2,705	1,719	986	7.2	4.6	2.6
1989	2,795	1,828	967	7.1	4.7	2.5
1990	2,766	1,869	897	6.8	4.6	2.2
1991	2,573	1,638	935	6.4	4.1	2.3
1992	2,431	1,579	852	6.1	4.0	2.1
1993	2,448	1,613	835	6.3	4.2	2.1
1994	2,418	1,634	784	6.3	4.2	2.0
1995	2,321	1,584	737	6.1	4.2	1.9

Data source: *Canadian Vital Statistics Data Base*

Table B
Perinatal deaths and mortality rates, Canada, 1975 to 1995

	Total	Stillbirths†	Early neo-natal	Total	Stillbirths	Early neo-natal
		Number			Per 1,000 total births	
1975	5,664	2,771	2,893	15.6	7.7	8.0
1976	4,903	2,161	2,742	13.5	6.0	7.6
1977	5,214	2,624	2,590	14.3	7.2	7.1
1978	4,905	2,470	2,435	13.6	6.8	6.7
1979	4,641	2,397	2,244	12.6	6.5	6.1
1980	4,394	2,302	2,092	11.8	6.2	5.6
1981	4,381	2,344	2,037	11.7	6.3	5.5
1982	4,175	2,302	1,873	11.1	6.1	5.0
1983	3,927	2,187	1,740	10.4	5.8	4.6
1984	3,635	2,006	1,629	9.6	5.3	4.3
1985	3,582	1,941	1,641	9.5	5.1	4.3
1986	3,504	1,927	1,577	9.3	5.1	4.2
1987	3,333	1,930	1,403	9.0	5.2	3.8
1988	3,255	1,815	1,440	8.6	4.8	3.8
1989	3,498	1,989	1,509	8.9	5.0	3.8
1990	3,473	1,943	1,530	8.5	4.8	3.8
1991	3,131	1,770	1,361	7.7	4.4	3.4
1992	3,225	1,883	1,342	8.1	4.7	3.4
1993	3,085	1,753	1,332	7.9	4.5	3.4
1994	3,070	1,723	1,347	7.9	4.5	3.5
1995	3,025	1,730	1,295	8.0	4.6	3.4

Data source: *Canadian Vital Statistics Data Base*

† Comprises only stillbirths of at least 500 grams. Stillbirths of unknown weight are excluded.