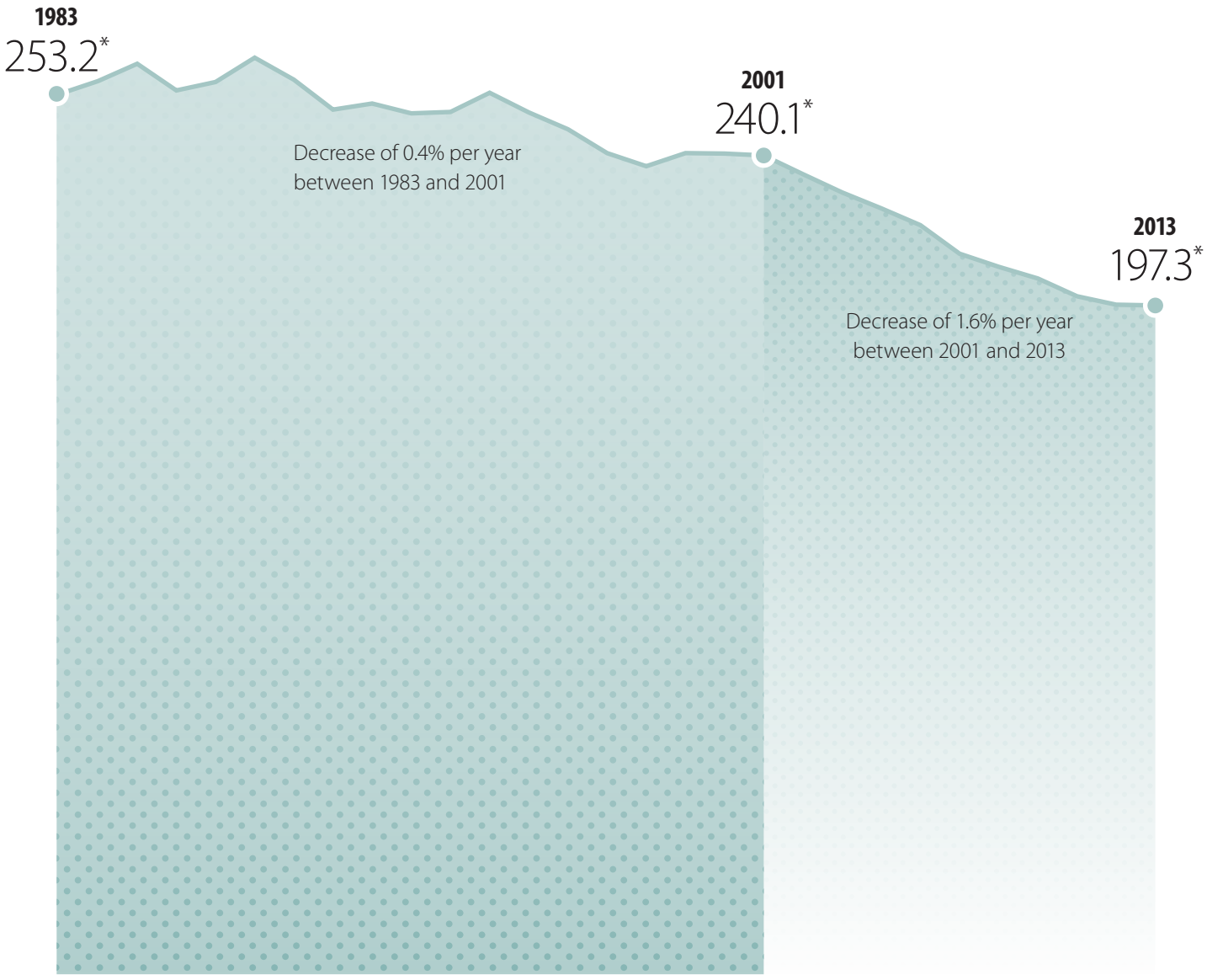
Chapter 5

Cancer mortality rates and trends

Mortality measures the number of deaths caused by cancer. This chapter presents cancer mortality rates and trends over time.

Age-standardized mortality rates

"Cancer mortality in Ontario has been declining over the past three decades with the rate of decrease accelerating after 2001."



* per 100,000 persons

Cancer as a leading cause of death

In 2013, 29.6% of all deaths in Ontario were attributable to cancer, making it the province's leading cause of death (Figure 5.1).[1] Cancer caused almost as many deaths as the next three leading causes of death combined: cardiovascular disease, cerebrovascular disease and accidents.

From 2000 to 2013, the number of deaths caused by cancer increased by nearly 19% (Figure 5.2). In comparison, the number of deaths caused by cardiovascular disease and cerebrovascular disease—the next two leading causes of death in 2013—decreased over the same time period, by 11.1% and 19.7% respectively.

In 2013, 29.6% of all deaths in Ontario were attributable to cancer, making it the province's leading cause of death.

Distribution of deaths for selected cancers, 2013

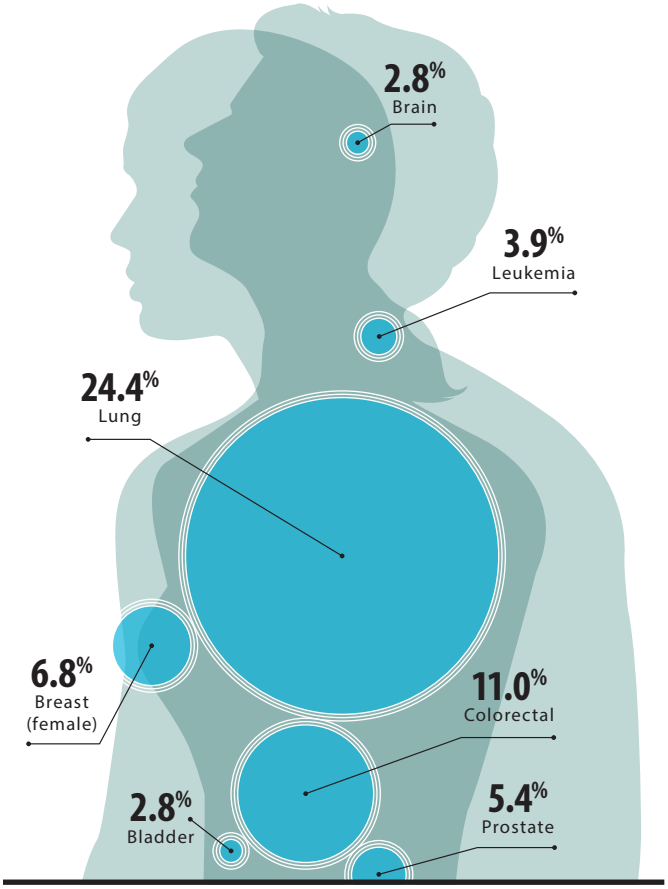
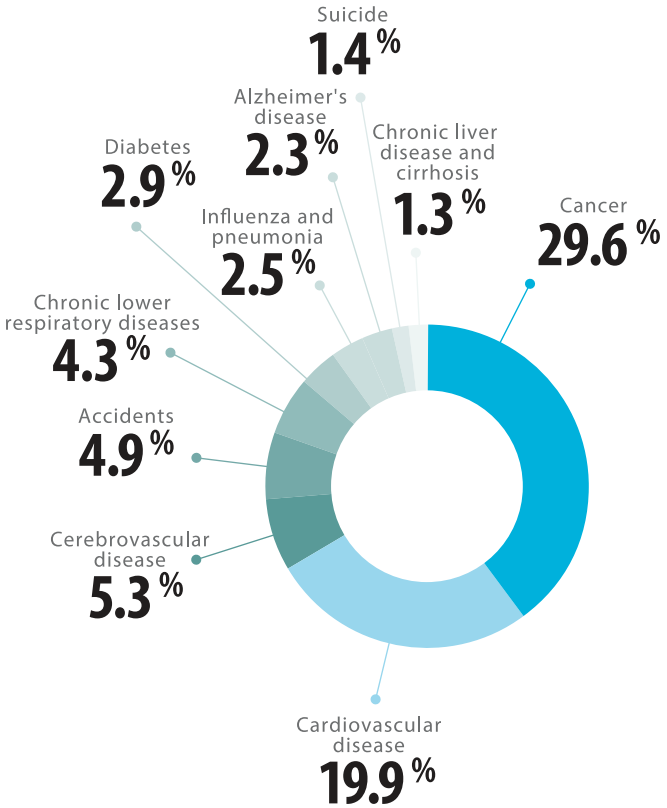


Figure 5.1 Leading* causes of death, Ontario, 2013



*As this figure only highlights the leading causes of death and not all causes of death, the numbers will not add up to 100%
Analysis by: Surveillance, Analytics and Informatics, CCO
Data source: Statistics Canada. Table 102-0564 - Leading causes of death, total population, by sex, Canada, provinces and territories (age standardization using 2011 population), annual, CANSIM (database).

Change in the percentage of deaths caused, from 2000 to 2013:

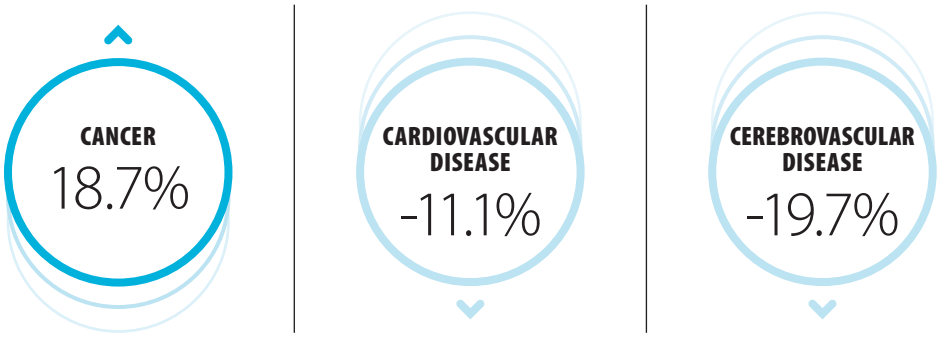
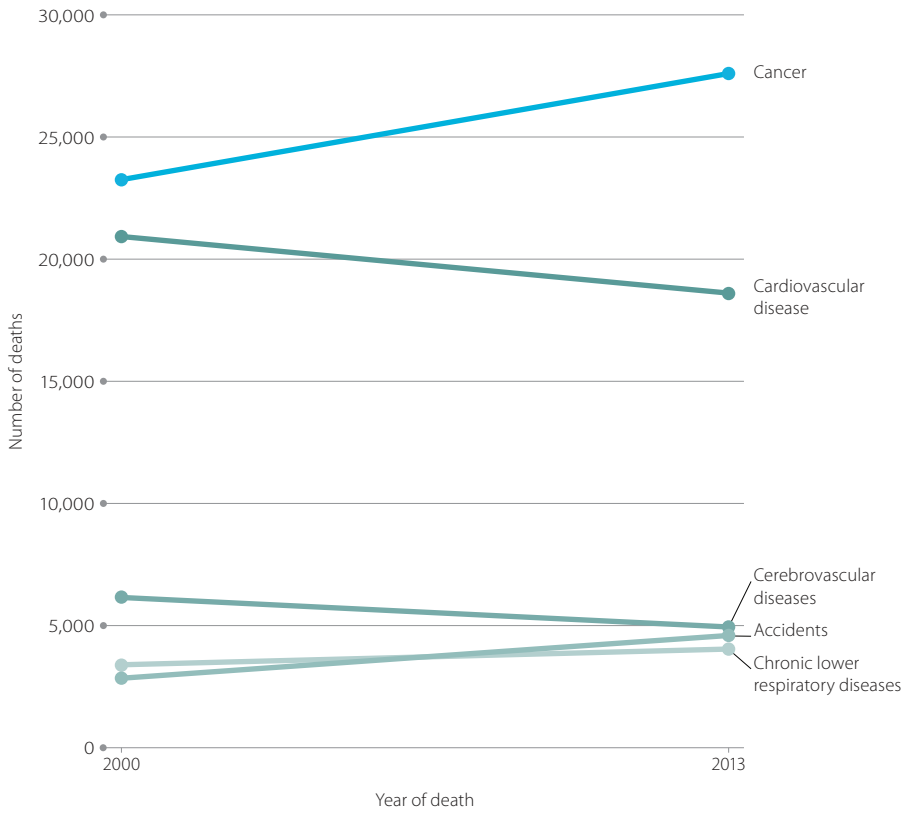


Figure 5.2 **Changes in the leading causes of death, Ontario, 2000 and 2013**



Analysis by: Surveillance, Analytics and Informatics, CCO
Data source: Statistics Canada. Table 102-0564 - Leading causes of death, total population, by sex, Canada, provinces and territories (age standardization using 2011 population), annual, CANSIM (database).

Probability of dying from cancer

The probability of dying from cancer represents the average chance of dying from cancer. This probability depends on many factors, including the population's characteristics (e.g., demographics), the prevalence of risk factors (e.g., smoking, obesity), current life expectancy and the treatment options available. Further, these probabilities reflect the average risks for the overall population and do not take into account personal risk. In other words, an individual's risk may be higher or lower than the numbers reported here.

In Ontario, the probability of dying of cancer for the time period 2009–2012 was 1 in 3.8 (26.0%).[2] The probability was slightly higher for males at 1 in 3.5 than females at 1 in 4.2.

The probability of dying from cancer, for the time period 2010–2013, increased with age—from being virtually non-existent under the age of 15 to 26.0% at age 85 (Table 5.1). The probability was equal between the sexes until age 35, when the probability becomes higher for females. This continues until the age of 60, when the probability becomes higher for males.

Table 5.1 Cumulative probability of dying from cancer by age group and sex, Ontario, 2010–2013

Age group (years)	Both sexes	Male	Female
0–4	0.0%	0.0%	0.0%
5–9	0.0%	0.0%	0.0%
10–14	0.0%	0.0%	0.0%
15–19	0.1%	0.1%	0.0%
20–24	0.1%	0.1%	0.1%
25–29	0.1%	0.1%	0.1%
30–34	0.2%	0.2%	0.2%
35–39	0.2%	0.2%	0.3%
40–44	0.4%	0.4%	0.5%
45–49	0.7%	0.7%	0.8%
50–54	1.4%	1.3%	1.4%
55–59	2.4%	2.4%	2.4%
60–64	4.0%	4.1%	3.8%
65–69	6.3%	6.7%	5.9%
70–74	9.5%	10.3%	8.7%
75–79	13.5%	14.8%	12.2%
80–84	17.9%	19.9%	16.1%
85+	26.0%	28.5%	24.0%

Analysis by: Surveillance, Analytics and Informatics, CCO
Data sources: Ontario Cancer Registry (January 2017), CCO; Statistics Canada. Table 102-0564 - Leading causes of death, total population, by sex, Canada, provinces and territories (age standardization using 2011 population), annual, CANSIM (database); Statistics Canada. Table 051-0001 - Estimates of population, by age group and sex for July 1, Canada, provinces and territories, annual (persons unless otherwise noted), CANSIM (database).

Mortality by sex and cancer type

In 2013, there were 27,634 cancer deaths in Ontario, resulting in an age-standardized mortality rate (ASMR) of 197.3 per 100,000 (Table 5.2). The highest ASMR, for both sexes combined, were for lung (48.1 per 100,000), female breast (24.5 per 100,000) and colorectal (21.6 per 100,000) cancers.

The four most commonly diagnosed cancers (lung, colorectal, breast and prostate) were responsible for almost 50% of all cancer mortality in 2013. However, some of the less commonly diagnosed cancers made a relatively large contribution to mortality due to their poor prognosis and low survival rates. For example, pancreatic cancer accounted for 6.2% of all cancer deaths in 2013 — more than prostate cancer and almost as much as breast cancer.

The ASMR for all cancers combined was significantly higher for males (236.7 per 100,000) than females (169.5 per 100,000). Among males, the highest ASMR were for lung (57.7 per 100,000), prostate (26.3 per 100,000) and colorectal (26.0 per 100,000) cancers. For females, the highest ASMR were for lung (41.1 per 100,000), breast (24.5 per 100,000) and colorectal (18.2 per 100,000) cancers.

Males had a consistently higher mortality rate than females for each type of cancer. The exception was thyroid cancer, for which the mortality rates between the sexes were equal.

The greatest disparities between male and female mortality were seen in:

- laryngeal cancer, for which the male rate was almost six times the female rate;
- esophageal cancer, for which the male rate was four times the female rate;
- bladder cancer, for which the male rate was nearly four times the female rate; and
- oral cavity & pharynx cancer, for which the male rate was close to three times the female rate.

Tobacco use is a major risk factor for all of these cancers. As such, the higher mortality rates observed in males are likely the result of historically higher rates of tobacco use among males.[3]

The four most commonly diagnosed cancers (lung, colorectal, breast and prostate) were responsible for almost 50% of all cancer mortality in 2013.

Table 5.2 Cancer mortality counts and rates by cancer type and sex, Ontario, 2013

Both sexes					
Cancer type	Deaths	% of deaths	Crude rate	ASMR†	ASMR 95% CI
All cancers	**27,634**	**100.0%**	**203.9**	**197.3**	**195.0–199.7**
Bladder	764	2.8%	5.6	5.4	5.0–5.8
Brain	771	2.8%	5.7	5.6	5.2–6.0
Breast (female)	1,870	6.8%	27.1	24.5	23.4–25.6
Cervix	144	0.5%	2.1	2.0	1.7–2.3
Colorectal	3,030	11.0%	22.4	21.6	20.8–22.4
Esophagus	768	2.8%	5.7	5.5	5.1–5.9
Hodgkin lymphoma	49	0.2%	0.4	0.4	0.3–0.5
Kidney	628	2.3%	4.6	4.5	4.1–4.8
Larynx	133	0.5%	1.0	1.0	0.8–1.1
Leukemia	1,086	3.9%	8.0	7.7	7.3–8.2
Liver	1,051	3.8%	7.8	7.5	7.1–8.0
Lung	6,736	24.4%	49.7	48.1	47.0–49.3
Melanoma	519	1.9%	3.8	3.7	3.4–4.1
Myeloma	545	2.0%	4.0	3.9	3.6–4.2
Non-Hodgkin lymphoma	1,025	3.7%	7.6	7.3	6.9–7.8
Oral cavity & pharynx	558	2.0%	4.1	4.0	3.7–4.4
Ovary	655	2.4%	9.5	8.6	8.0–9.3
Pancreas	1,711	6.2%	12.6	12.2	11.6–12.8
Prostate	1,499	5.4%	22.5	26.3	25.0–27.7
Stomach	719	2.6%	5.3	5.1	4.8–5.5
Testis	13	0.0%	0.2	0.2	0.1–0.3
Thyroid	81	0.3%	0.6	0.6	0.5–0.7
Uterus	441	1.6%	6.4	5.7	5.2–6.3

Table 5.2 *(Cont'd)* **Cancer mortality counts and rates by cancer type and sex, Ontario, 2013**

Males					
Cancer type	Deaths	% of deaths	Crude rate	ASMR[†]	ASMR 95% CI
All cancers	**14,465**	**100.0%**	**217.3**	**236.7**	**232.8–240.6**
Bladder	559	3.9%	8.4	9.6	8.8–10.4
Brain	440	3.0%	6.6	6.9	6.2–7.5
Colorectal	1,572	10.9%	23.6	26.0	24.7–27.4
Esophagus	587	4.1%	8.8	9.2	8.5–10
Hodgkin lymphoma	30	0.2%	0.5	0.5	0.3–0.7
Kidney	401	2.8%	6.0	6.6	5.9–7.2
Larynx	109	0.8%	1.6	1.7	1.4–2.1
Leukemia	653	4.5%	9.8	10.9	10.0–11.7
Liver	640	4.4%	9.6	10.2	9.4–11.1
Lung	3,589	24.8%	53.9	57.7	55.8–59.6
Melanoma	341	2.4%	5.1	5.5	5.0–6.2
Myeloma	311	2.2%	4.7	5.1	4.5–5.7
Non-Hodgkin lymphoma	569	3.9%	8.5	9.3	8.6–10.1
Oral cavity & pharynx	391	2.7%	5.9	6.1	5.5–6.8
Pancreas	874	6.0%	13.1	14.0	13.1–14.9
Prostate	1,499	10.4%	22.5	26.3	25.0–27.7
Stomach	415	2.9%	6.2	6.7	6.1–7.4
Testis	13	0.1%	0.2	0.2	0.1–0.3
Thyroid	35	0.2%	0.5	0.6	0.4–0.8

Table 5.2 *(Cont'd)* **Cancer mortality counts and rates by cancer type and sex, Ontario, 2013**

Females					
Cancer type	Deaths	% of deaths	Crude rate	ASMR†	ASMR 95% CI
All cancers	**13,169**	**100.0%**	**191.0**	**169.5**	**166.6–172.5**
Bladder	205	1.6%	3.0	2.5	2.2–2.9
Brain	331	2.5%	4.8	4.5	4.0–5.0
Breast	1,870	14.2%	27.1	24.5	23.4–25.6
Cervix	144	1.1%	2.1	2.0	1.7–2.3
Colorectal	1,458	11.1%	21.1	18.2	17.3–19.2
Esophagus	181	1.4%	2.6	2.3	2.0–2.7
Hodgkin lymphoma	19	0.1%	0.3	0.3	0.2–0.4
Kidney	227	1.7%	3.3	2.8	2.5–3.2
Larynx	24	0.2%	0.3	0.3	0.2–0.5
Leukemia	433	3.3%	6.3	5.5	5.0–6.1
Liver	411	3.1%	6.0	5.2	4.7–5.8
Lung	3,147	23.9%	45.6	41.1	39.6–42.5
Melanoma	178	1.4%	2.6	2.3	2.0–2.7
Myeloma	234	1.8%	3.4	3.0	2.6–3.4
Non-Hodgkin lymphoma	456	3.5%	6.6	5.8	5.2–6.3
Oral cavity & pharynx	167	1.3%	2.4	2.2	1.9–2.5
Ovary	655	5.0%	9.5	8.6	8.0–9.3
Pancreas	837	6.4%	12.1	10.7	10.0–11.4
Stomach	304	2.3%	4.4	3.9	3.5–4.4
Thyroid	46	0.3%	0.7	0.6	0.4–0.8
Uterus	441	3.3%	6.4	5.7	5.2–6.3

ASMR=Age-standardized mortality rate
CI=Confidence interval
†Rates standardized to the 2011 Canadian population
Note: Rates are per 100,000.
Analysis by: Surveillance, Analytics and Informatics, CCO
Data source: Ontario Cancer Registry (November 2016), CCO

Mortality by age

In 2013, more than 80% of all cancer deaths in Ontario occurred in people 60 years of age or older (Table 5.3). Mortality was distributed by age group as follows:

- 34.7% of all cancer deaths occurred in people 80 years of age or older (compared to 19.1% of all new cases), with lung and colorectal cancers the leading causes;
- 49.1% of all cancer deaths occurred in people 60 to 79 years of age (compared to 50.8% of all new cases), with lung and colorectal cancers the leading causes;
- 14.6% of all cancer deaths occurred in people 40 to 59 years of age (compared to 25.1% of all new cases), with breast and lung cancers the leading causes; and
- 1.5% of all cancer deaths occurred in people younger than 40 years of age (compared to 5.0% of all new cases), with brain cancer and leukemia the leading causes.

The greatest proportion of cancer deaths in 2013 occurred in people ages 60 to 79 for all but four of the 23 types of cancer examined. The greatest proportion of deaths from breast (42.9%), colorectal (45.2%) and lung (58.2%) cancers occurred in this age group. While prostate cancer was diagnosed most frequently in males ages 60 to 79, most deaths caused by prostate cancer occurred in males 80 years or older, reflecting the often slow progression of the disease and the higher frequency of later stage cancers in older males.

Cancer mortality increased significantly with age—from a rate of 6.0 per 100,000 in those ages 39 or younger to a rate of 1,729.3 per 100,000 in those ages 80 or older. Mortality rates for:

- cancers of the bladder, brain, breast, colorectum, kidney, larynx, liver, ovary, prostate, stomach and thyroid, as well as leukemia, melanoma, myeloma and non-Hodgkin lymphoma, all increased significantly with age;
- cancers of the cervix, esophagus, lung, oral cavity & pharynx, pancreas and uterus increased non-significantly with age;
- Hodgkin lymphoma were the same for those ages 60 to 79 and 80 or older; and
- testicular cancer were highest in those under the age of 40.

Distribution of cancer deaths by age group

80 YEARS OF AGE OR OLDER
34.7%

60–79 YEARS OF AGE
49.1%

40–59 YEARS OF AGE
14.6%

UNDER THE AGE OF 40
1.5%

Table 5.3 Mortality counts and age-specific rates by cancer type and age group, Ontario, 2013

Cancer type	Age group (years)					
	0–39			40–59		
	Count	Age-specific rate	95% CI	Count	Age-specific rate	95% CI
All cancers*	**407**	**6.0**	**5.5–6.7**	**4,045**	**101.9**	**98.8–105.1**
Bladder*	**	**	**	41	1.0	0.7 – 1.4
Brain*	79	1.2	0.9–1.5	225	5.7	5.0 – 6.5
Breast (female)*	43	1.3	0.9-1.7	451	22.5	20.5 – 24.7
Cervix	8	0.2	0.1–0.5	63	3.1	2.4 – 4.0
Colorectal*	22	0.3	0.2–0.5	356	9.0	8.1–10.0
Esophagus	**	**	**	180	4.5	3.9–5.2
Hodgkin lymphoma	**	**	**	14	0.4	0.2–0.6
Kidney*	**	**	**	94	2.4	1.9–2.9
Larynx*	**	**	**	23	0.6	0.4 – 0.9
Leukemia*	51	0.8	0.6–1.0	111	2.8	2.3–3.4
Liver*	13	0.2	0.1–0.3	168	4.2	3.6–4.9
Lung	24	0.4	0.2–0.5	876	22.1	20.6 – 23.6
Melanoma*	20	0.3	0.2–0.5	101	2.5	2.1 – 3.1
Myeloma*	**	**	**	68	1.7	1.3–2.2
Non-Hodgkin lymphoma*	16	0.2	0.1–0.4	141	3.6	3.0 – 4.2
Oral cavity & pharynx	**	**	**	143	3.6	3.0 – 4.2
Ovary*	7	0.2	0.1–0.4	139	6.9	5.8 – 8.2
Pancreas	9	0.1	0.1–0.3	239	6.0	5.3 – 6.8
Prostate*	**	**	**	59	3.0	2.3 – 3.9
Stomach*	11	0.2	0.1–0.3	121	3.0	2.5–3.6
Testis	8	0.2	0.1–0.5	**	**	**
Thyroid*	**	**	**	13	0.3	0.2–0.6
Uterus	**	**	**	52	2.6	1.9–3.4

Table 5.3 *(Cont'd)* **Mortality counts and age-specific rates by cancer type and age group, Ontario, 2013**

Cancer type	Age group (years)					
	60–79			80+		
	Count	Age-specific rate	95% CI	Count	Age-specific rate	95% CI
All cancers*	**13,582**	**592.2**	**582.3–602.2**	**9,600**	**1,729.3**	**1,694.9–1,764.3**
Bladder*	333	14.5	13.0 – 16.2	388	69.9	63.1 – 77.2
Brain*	349	15.2	13.7–16.9	118	21.3	17.6–25.5
Breast (female)*	803	66.7	62.2–71.5	573	166.9	153.5 – 181.1
Cervix	51	4.2	3.2–5.6	22	6.4	4.0–9.7
Colorectal*	1,371	59.8	56.7–63.0	1,281	230.8	218.3–243.7
Esophagus	407	17.7	16.1–19.6	176	31.7	27.2–36.7
Hodgkin lymphoma	24	1.0	0.7–1.6	6	1.1	0.4–2.4
Kidney*	282	12.3	10.9–13.8	249	44.9	39.5–50.8
Larynx*	72	3.1	2.5–4.0	37	6.7	4.7–9.2
Leukemia*	481	21.0	19.1–22.9	443	79.8	72.5–87.6
Liver*	548	23.9	21.9–26.0	322	58.0	51.8–64.7
Lung	3,918	170.8	165.5–176.3	1,918	345.5	330.2–361.3
Melanoma*	246	10.7	9.4–12.2	152	27.4	23.2–32.1
Myeloma*	268	11.7	10.3–13.2	208	37.5	32.5–42.9
Non-Hodgkin lymphoma*	472	20.6	18.8–22.5	396	71.3	64.5–78.7
Oral cavity & pharynx	280	12.2	10.8–13.7	131	23.6	19.7–28.0
Ovary*	329	27.3	24.4 – 30.4	180	52.4	45.0 – 60.7
Pancreas	924	40.3	37.7–43.0	539	97.1	89.1–105 .6
Prostate*	556	51.0	46.9 – 55.5	884	417.5	390.4 – 446.0
Stomach*	334	14.6	13.0–16.2	253	45.6	40.1–51.6
Testis	**	**	**	**	**	**
Thyroid*	37	1.6	1.1–2.2	30	5.4	3.6–7.7
Uterus	243	20.2	17.7 – 22.9	143	41.6	35.1 – 49.1

CI=Confidence interval
*Significant increasing trend in age-specific rate with increasing age
**Suppressed due to small cell count (n<6)
Note: The table excludes cases of unknown age.
Analysis by: Surveillance, Analytics and Informatics, CCO
Data source: Ontario Cancer Registry (November 2016), CCO

Mortality trends by cancer type

The cancer mortality rate for all cancers combined in Ontario has been decreasing over the past few decades, with the decline accelerating in recent years. From 1983 to 2001, the ASMR decreased by 0.4% per year and fell a further 1.6% per year from 2001 to 2013 (Table 5.4).

From 1983 to 1988, male mortality was stable while female mortality declined. Since 1988, the declines in mortality have been greater for males than females. For males, the mortality rate declined by 0.9% per year from 1988 to 2001 and then by 1.8% per year from 2001 to 2013. For females, the rate declined by 0.2% per year from 1983 to 2002 and then declined by 1.6% per year from 2002 to 2013.

The cancer mortality rate for all cancers combined in Ontario has been decreasing over the past few decades, with the decline accelerating in recent years.

Among the four cancer types with the highest mortality rates, the following changes in trend were observed:

BREAST

The ASMR for breast cancer has been declining since the early 1980s. From 1983 to 1994, it decreased by 0.6% per year. The decrease accelerated to 2.6% per year from 1994 to 2013.

This decrease in the mortality rate is likely due to greater regular participation in mammography screening, especially after the introduction of Ontario's organized breast screening program.[4, 5] In addition, improved treatment and the use of more effective therapies following breast cancer surgery likely also contributed to the improvement in the mortality rate.[6, 7]

COLORECTAL

The colorectal cancer ASMR has consistently declined in both sexes since 1983. In males, the mortality rate decreased by 1.4% per year from 1983 to 2005, followed by an accelerated decline of 3.5% per year from 2005 to 2013. The rate decreased similarly among females: from 1983 to 2004, it fell by 1.7% per year and then by 2.7% per year from 2004 onward.

These strong declines may be due to changes in risk and protective factors, earlier diagnosis due to greater uptake of screening and improvements in treatment.[8]

LUNG

In males, the ASMR for lung cancer began to level off in the late 1980s, followed by a decline of 2.2% per year from 1989 to 2013. Among females, the mortality rate continued to increase throughout the 1980s and 1990s by 2.1% per year; it peaked in 2000 before beginning to decrease by 0.5% per year onward.

Decreases in lung cancer mortality are largely attributable to decreased tobacco use, which began to decline in the late 1950s for males and in the mid-1970s for females.[3, 9] This approximately 15-year gap in peak smoking rates between males and females corresponds to the gap in the stabilization of lung cancer mortality rates between the sexes.

PROSTATE

The prostate cancer ASMR increased by 1.6% per year from 1983 to 1994 and then decreased by 2.8% per year from 1994 to 2013. Evidence indicates that the cause of the decline is likely due to improved treatment,[10,11] with early detection through screening potentially playing a role.[12, 13]

Notable changes in trend were also observed for the following cancers:

LIVER

The liver cancer ASMR has been increasing significantly since 1983. From 1983 to 1994, it increased by 5.2% per year, slowing to 1.7% per year from 1994 to 2007 and then increasing more rapidly at 4.6% per year from 2007 onward. This increase was probably at least partially driven by the rise in the incidence rate over the same time period.

OVARIAN

In contrast to liver cancer, the ASMR for ovarian cancer has decreased significantly in recent years. The mortality rates declined gradually from 1983 to 2003 at 0.4% per year and then more rapidly at 2.2% per year from 2003 onward. This parallels the decrease in the ovarian cancer incidence rate since 2002.

Declines in ovarian cancer incidence and mortality are likely due to changes in exposure to risk factors including the use of oral contraceptives.[14] Declines in mortality may also be a reflection of increasing survival due to improvements in treatment.[15]

STOMACH

From 1983 to 2013, the stomach cancer ASMR decreased by 2.7% per year. This decline has been attributed to decreased exposure to *Helicobacter pylori (H.pylori)* infection, improvements in food preservation and refrigeration, lifestyle changes and better treatment.[16]

Changes in mortality rates from 1983 to 2013 for other cancer types are provided in Table 5.4.

Annual percent change in the lung cancer age-standardized mortality rate from 1983 to 2013

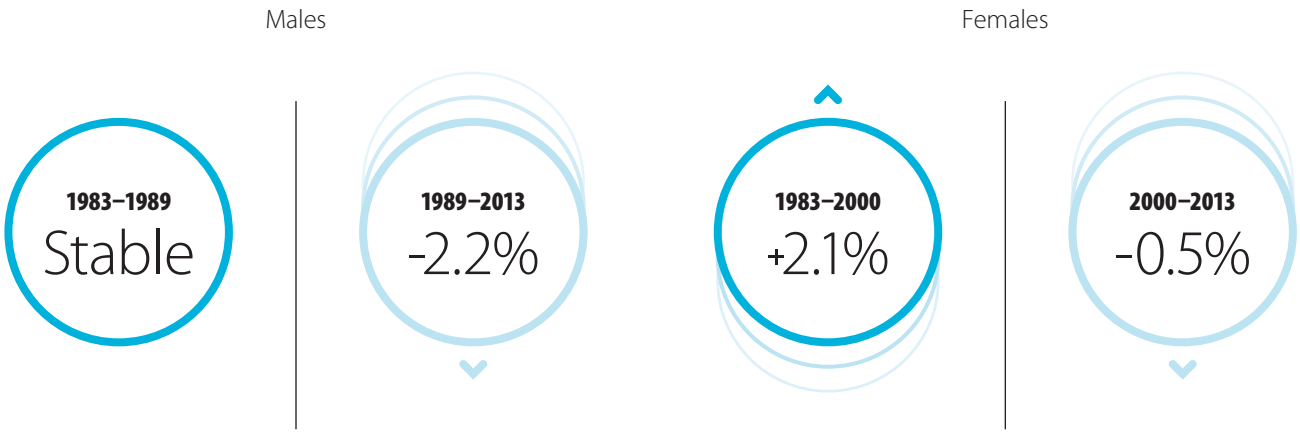


Table 5.4 Annual percent change in age-standardized mortality rates by cancer type and sex, Ontario, 1983–2013

Cancer type	Both Sexes			Males			Females		
	Period	APC (%)		Period	APC (%)		Period	APC (%)	
All cancers	**1983–2001**	**–0.4**	↓	**1983–1988**	**0.3**		**1983–2002**	**–0.2**	↓
	2001–2013	**–1.7**	↓	**1988–2001**	**–0.9**	↓	**2002–2013**	**–1.6**	↓
				2001–2013	**–1.8**	↓			
Bladder	1983–2013	–0.5	↓	1983–2013	–0.7	↓	1983–2013	–0.4	↓
Brain	1983–2006	–1.1	↓	1983–1997	–1.7	↓	1983–2006	–1.2	↓
	2006–2009	6.0		1997–2013	0.7	↑	2006–2013	3.0	↑
	2009–2013	–0.8							
Breast (female)							1983–1994	–0.6	↓
							1994–2013	–2.6	↓
Cervix							1983–2013	–3.0	↓
Colorectal	1983–2005	–1.5	↓	1983–2005	–1.4	↓	1983–2004	–1.7	↓
	2005–2013	–3.1	↓	2005–2013	–3.5	↓	2004–2013	–2.7	↓
Esophagus	1983–2013	0.0		1983–2013	0.2		1983–2013	–0.8	↓
Hodgkin lymphoma	1983–1987	–11.9	↓	1983–2013	–3.9	↓	1983–2013	–3.2	↓
	1987–2013	–2.9	↓						
Kidney	1983–2013	–0.3	↓	1983–2013	–0.4	↓	1983–2013	–0.4	↓
Larynx	1983–1988	5.9		1983–1988	6.0		1983–2013	–2.6	↓
	1988–2013	–3.3	↓	1988–2013	–3.4	↓			
Leukemia	1983–2013	–0.8	↓	1983–1987	3.0		1983–2013	–1.0	↓
				1987–2013	–0.9	↓			
Liver	1983–1994	5.2	↑	1983–2013	2.9	↑	1983–1991	6.2	↑
	1994–2007	1.7	↑				1991–2008	1.4	↑
	2007–2013	4.6	↑				2008–2013	7.2	↑
Lung	1983–1993	0.2		1983–1989	–0.3		1983–2000	2.1	↑
	1993–2013	–1.1	↓	1989–2013	–2.2	↓	2000–2013	–0.5	↓
Melanoma	1983–2013	1.0	↑	1983–2013	1.3	↑	1983–2013	0.5	↑

Table 5.4 *(Cont'd)* **Annual percent change in age-standardized mortality rates by cancer type and sex, Ontario, 1983–2013**

Cancer type	Both Sexes			Males			Females		
	Period	APC (%)		Period	APC (%)		Period	APC (%)	
Myeloma	1983–1999	0.4		1983–2013	−0.5	↓	1983–1999	0.5	
	1999–2013	−1.4	↓				1999–2013	−1.9	↓
Non-Hodgkin lymphoma	1983–2000	1.8	↑	1983–2000	1.9	↑	1983–1998	2.2	↑
	2000–2013	−2.5	↓	2000–2013	−2.3	↓	1998–2013	−2.3	↓
Oral cavity and pharynx	1983–2013	−1.6	↓	1983–2009	−2.2	↓	1983–2013	−1.4	↓
				2009–2013	3.6				
Ovary							1983–2003	−0.4	↓
							2003–2013	−2.2	↓
Pancreas	1983–2006	−0.7	↓	1983–2005	−1.2	↓	1983–2013	−0.1	
	2006–2013	1.0	↑	2005–2013	1.0				
Prostate				1983–1994	1.6	↑			
				1994–2013	−2.8	↓			
Stomach	1983–2013	−2.7	↓	1983–2013	−2.9	↓	1983–2013	−2.5	↓
Testis				1983–2013	−2.9	↓			
Thyroid	1983–2013	−0.5		1983–2013	0.4		1983–2013	−1.0	↓
Uterus							1983–1988	−6.0	↓
							1988–2013	0.9	↑

APC=Annual percent change
Notes: 1. Statistically significant changes in trend and their direction are indicated by corresponding arrows.
2. Rates are standardized to the 2011 Canadian population.
Analysis by: Surveillance, Analytics and Informatics, CCO
Data source: Ontario Cancer Registry (November 2016), CCO

Thirty-year trend in mortality

Over the most recent 30-year period — 1983 to 2013 (Figure 5.3) — the average annual percent change (AAPC) in the ASMR for males:

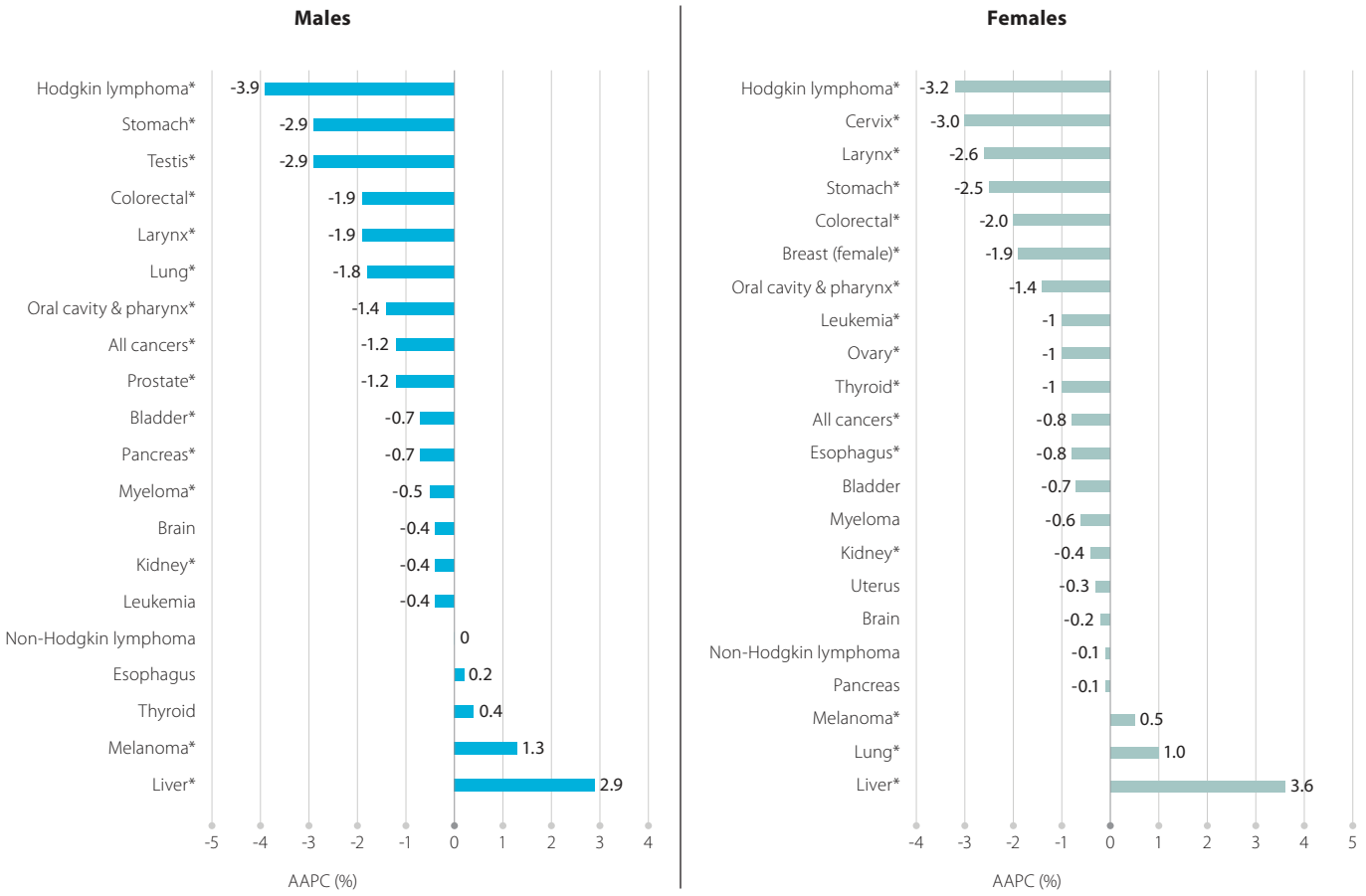
- decreased for most types of cancer, including Hodgkin lymphoma (3.9% per year), stomach cancer (2.9%) and testicular cancer (2.9%);
- increased for liver cancer (2.9%) and melanoma (1.3%); and
- was stable for thyroid, brain and esophageal cancers as well as non-Hodgkin lymphoma and leukemia.

Over the same period, the AAPC in the ASMR for females:

- decreased for most cancer types, including Hodgkin lymphoma (3.2% per year) as well as cervical (3.0%) and laryngeal (2.6%) cancers;
- increased for liver (3.6%) and lung (1.0%) cancers as well as melanoma (0.5%); and
- was stable for pancreatic, brain, uterine and bladder cancers as well as non-Hodgkin lymphoma and myeloma.

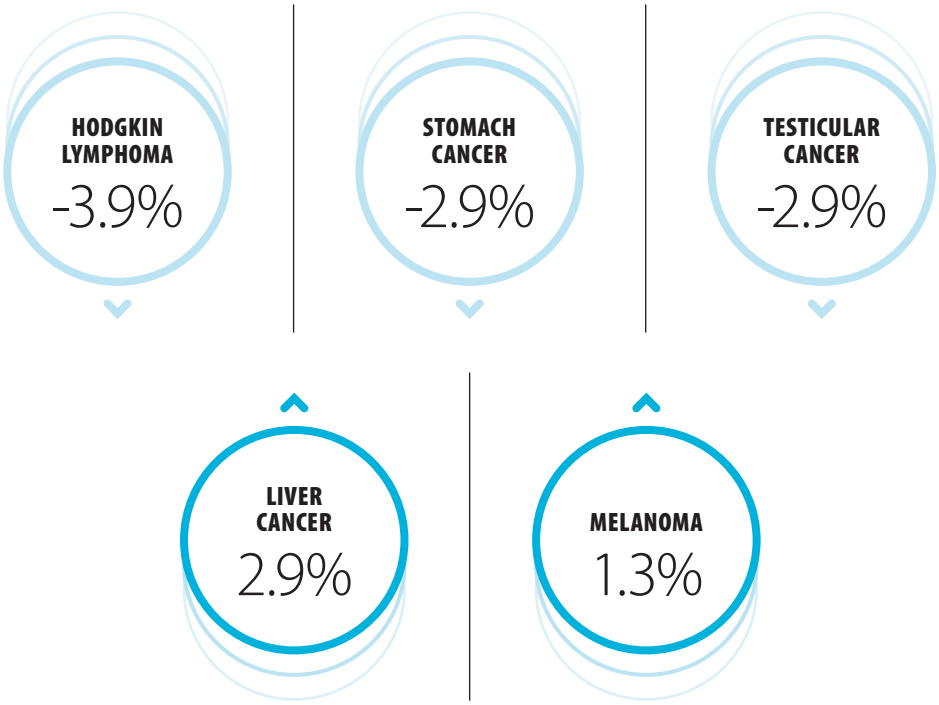
For some cancers, such as liver cancer and melanoma, the increases in mortality rates are likely reflective of increases in incidence rates.

Figure 5.3 **Average annual percent change in age-standardized mortality rates by cancer type and sex, Ontario, 1983–2013**



AAPC=Average annual percent change
*Statistically significant AAPC
Note: Rates are standardized to the 2011 Canadian population.
Analysis by: Surveillance, Analytics and Informatics, CCO
Data source: Ontario Cancer Registry (November 2016), CCO

Largest average annual percent changes in male mortality over the most recent 30-year period (1983 to 2013)



Mortality trends by age

Mortality across all age groups has declined significantly over the last decade. While mortality declines in younger people have been fairly equal between the sexes, the declines among people ages 60 or older have been greater among males (Figure 5.4).

While incidence rates have been increasing among younger people, mortality rates have been falling. Among people under the age of 40, the mortality rate declined by 1.7% per year from 1983 to 2013.

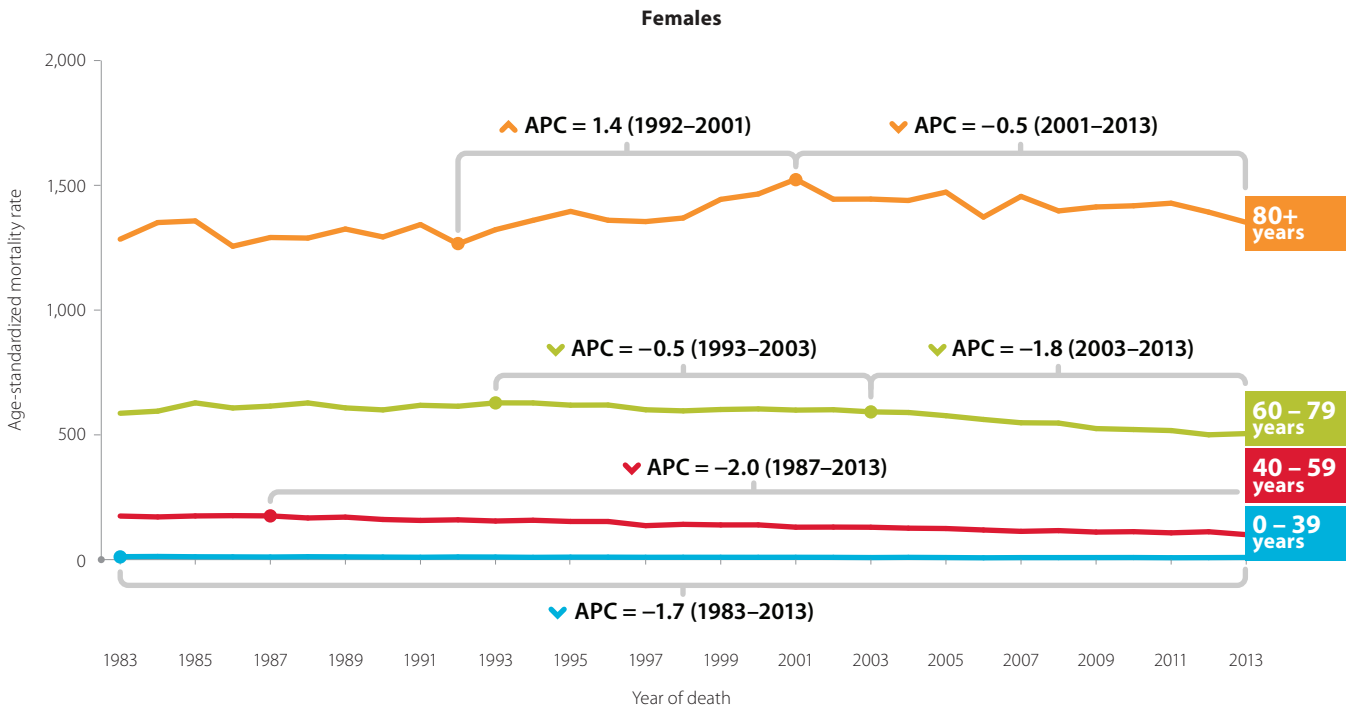
For people ages 40 to 59, the mortality rate was stable until 1987, when it started to decline by 2.1% per year until 2013. Similar trends were seen for males and females separately.

Among those ages 60 to 79, the mortality rate increased until 1988, after which it decreased by 0.8% per year until 2002. From 2002 to 2013, the rate decreased by 2.0% per year. The rate of decrease was greater for males (2.3% per year) than females (1.8% per year).

Similar to people ages 60 to 79, mortality among those 80 or older increased by 0.6% per year between 1983 and 2001, followed by a decrease of 0.6% per year from 2001 to 2013. The decline in mortality was greater for males at 1.2% per year after 2001. Among females, the mortality rate was stable until 1992, after which it increased until 2001 before finally declining by 0.5% per year since.

Figure 5.4 Annual percent change in age-standardized mortality rates by age group and sex for all cancers combined, Ontario, 1983–2013

Figure 5.4 *(Cont'd)* **Annual percent change in age-standardized mortality rates by age group and sex for all cancers combined, Ontario, 1983–2013**



APC=Annual percent change
Note: Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian population.
Analysis by: Surveillance, Analytics and Informatics, CCO
Data source: Ontario Cancer Registry (November 2016), CCO

References

1. Statistics Canada. Table 102-0564 - Leading causes of death, total population, by sex, Canada, provinces and territories (age standardization using 2011 population), annual, CANSIM (database).
2. Cancer Care Ontario. Ontario Cancer Statistics 2016. Toronto: Cancer Care Ontario; 2016.
3. Ferrence RG. Sex differences in cigarette smoking in Canada, 1900-1978: a reconstructed cohort study. Can J Public Health. 1988;79(3):160-5.
4. Coldman A, Phillips N, Wilson C, Decker K, Chiarelli AM, Brisson J, et al. Pan-Canadian study of mammography screening and mortality from breast cancer. J Natl Cancer Inst. 2014;106(11).
5. Nelson HD, Fu R, Cantor A, Pappas M, Daeges M, Humphrey L. Effectiveness of breast cancer screening: systematic review and meta-analysis to update the 2009 U.S. Preventive Services Task Force recommendation. Ann Intern Med. 2016;164(4):244-55.
6. Edwards BK, Brown ML, Wingo PA, Howe HL, Ward E, Ries LA, et al. Annual report to the nation on the status of cancer, 1975-2002, featuring population-based trends in cancer treatment. J Natl Cancer Inst. 2005;97(19):1407-27.
7. Mariotto A, Feuer EJ, Harlan LC, Wun LM, Johnson KA, Abrams J. Trends in use of adjuvant multi-agent chemotherapy and tamoxifen for breast cancer in the United States: 1975-1999. J Natl Cancer Inst. 2002;94(21):1626-34.
8. Edwards BK, Ward E, Kohler BA, Eheman C, Zauber AG, Anderson RN, et al. Annual report to the nation on the status of cancer, 1975-2006, featuring colorectal cancer trends and impact of interventions (risk factors, screening, and treatment) to reduce future rates. Cancer. 2010;116(3):544-73.
9. Holowaty E, Chin Cheong S, Di Cori S, Garcia J, Luk R, Lyons C, et al. Tobacco or health in Ontario: tobacco-attributed cancers and deaths over the past 50 years...and the next 50. . Toronto: Cancer Care Ontario, 2002.
10. Cooperberg MR, Grossfeld GD, Lubeck DP, Carroll PR. National practice patterns and time trends in androgen ablation for localized prostate cancer. J Natl Cancer Inst. 2003;95(13):981–9.
11. Meng MV, Grossfeld GD, Sadetsky N, Mehta SS, Lubeck DP, Carroll PR. Contemporary patterns of androgen deprivation therapy use for newly diagnosed prostate cancer. Urology. 2002;60(3 Suppl 1):7–12.
12. Schoder FH, Hugossen J, Roobol MJ, Tammela T, Ciatto S, Nelen V, et al. Screening and prostate cancer mortality in a randomized European study. N Engl J Med. 2009;360(13):1320-8.
13. Andriole GL, Crawford ED, Grubb RL, Buys SS, Chia D, Church TR, et al. Mortality results from a randomized prostate cancer screening trial. N Engl J Med. 2009;360(13):1310-9.
14. Sopik V, Iqbal J, Rosen B, Narod SA. Why have ovarian cancer mortality rates declined? Part I. Incidence. Gynecol Oncol. 2015;138(3):741-9.
15. Sopik V, Iqbal J, Rosen B, Narod SA. Why have ovarian cancer mortality rates declined? Part II. Case-fatality. Gynecol Oncol. 2015;138(3):750-6.
16. Amiri M, Janssen F, Kunst AE. The decline in stomach cancer mortality: exploration of future trends in seven European countries. Eur J Epidemiol. 2011;26(1):23-8.