



Ontario Cancer Statistics 2022

Ontario Cancer Statistics 2022 is the fourth in a series of reports that provide comprehensive information on the burden of cancer in Ontario. Produced by the **Surveillance Program** (<https://www.cancercareontario.ca/en/cancer-care-ontario/programs/data-research/surveillance>) at Ontario Health (Cancer Care Ontario), the report is organized around 4 main types of indicators: incidence, mortality, survival and prevalence.

The information in this report is intended to support decision-makers, the public health community, healthcare providers, researchers and others involved in planning, investigating, measuring and monitoring population-based cancer control efforts, including cancer screening, prevention and treatment. The report may also be useful for the general public who have an interest in cancer.

A special focus chapter in this edition of Ontario Cancer Statistics explores the estimated future prevalence of cancer in Ontario.

This edition of the report includes data from 1984 to 2018 and projections for 2019 to 2034. **Since the data in this report pre-date the COVID-19 pandemic, the projected statistics do not account for the pandemic's effects. More information about the impact of the COVID-19 pandemic on Ontario's cancer system is available on the Cancer Quality Council of Ontario website** <https://www.csqi.on.ca/en>.

This report also includes statistics about cancer in children (ages 0 to 14), which were provided by the Pediatric Oncology Group of Ontario. See the spotlights on childhood cancer in **Chapter 4 (incidence)** ([/node/72481](#)), **Chapter 5 (mortality)** ([/node/72791](#)) and **Chapter 6 (survival)** ([/node/72796](#)).

CHAPTERS



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ALSO IN THIS SERIES

Ontario Cancer Statistics 2020 (/en/statistical-reports/ontario-cancer-statistics-2020) features a special focus on long-term projections of cancer incidence and mortality, and on the burden of rare cancers in Ontario.

Ontario Cancer Statistics 2018 (/node/51791) features a special focus on the burden of comorbidity among people with cancer and the impact of wait times for surgical treatment on survival for selected cancers. Cancer statistics are also provided by public health unit.

Ontario Cancer Statistics 2016 (/node/32601) includes “in-focus” spotlights featuring statistics on clinically relevant indicators for breast, cervical, colorectal, head and neck, lung and prostate cancers.

RELATED RESOURCES

Ontario Cancer Profiles (/ontariocancerprofiles) is a self-serve, interactive mapping tool that gives users the ability to create custom graphs, maps and tables that show recent provincial and regional statistics on selected cancer burden, risk factor and screening indicators. This customizability allows users to create profiles that support targeted cancer control and prevention efforts.

Ontario Cancer Registry SEER*Stat Package (/en/data-research/accessing-data/seer-stat) is a statistical software package that contains Ontario cancer data files derived from the Ontario Cancer Registry. It helps analysts produce incidence, mortality, survival and prevalence statistics for studying the impact of cancer on the Ontario population.

Cancer System Quality Index  (<https://www.csqi.on.ca/>) highlights where cancer service providers can advance the quality and performance of care. The report includes indicators spanning the continuum of cancer care, along with several measures related to cancer prevention.

Ontario Cancer Facts (/cancerfacts) are short, monthly fact sheets intended to increase knowledge about cancer and its risk modifiers in Ontario. Data typically originate from sources such as the Ontario Cancer Registry, Ontario Health (Cancer Care Ontario) publications, and federal, provincial or regional health surveys. Readers can subscribe to Ontario Cancer Facts, which are disseminated by email.

Prevention System Quality Index (/statistical-reports/prevention-system-quality-index) describes the distribution of cancer risk factors in the Ontario population, and monitors Ontario’s progress on system-level policies and programs that can reduce the prevalence of cancer risk factors in the population.

Cancer Risk Factors in Ontario (/riskfactor) is a series of reports that reviews the epidemiologic evidence linking a broad range of risk factors to various types of cancer in Ontario. These reports serve as a reference and foundation for prevention efforts, especially for planning and reporting on cancer prevention actions.

Pediatric Oncology Group of Ontario  (<https://www.pogo.ca/>) works to ensure that everyone affected by childhood

cancer has access to the best care and support. They partner to achieve the best childhood cancer care system for children, youth, their families and survivors in Ontario and beyond. The Pediatric Oncology Group of Ontario champions childhood cancer care and is the official advisor to Ontario's Ministry of Health on children's cancer control and treatment.

Download a French version of this report at **Statistiques 2022 sur le cancer en Ontario** ([/sites/ccocancercare/files/assets/Statistiques-sur-le-cancer-en-Ontario-2022.pdf](https://sites/ccocancercare/files/assets/Statistiques-sur-le-cancer-en-Ontario-2022.pdf)).



Ontario Cancer Statistics 2022

Key Findings

This report provides projected statistics for 2022 and statistics for past years (2018 and earlier). A special chapter on the Estimated Future Cancer Prevalence provides projected statistics up to 2034. Non-melanoma skin cancers represent the most common type of cancer in most jurisdictions, but are not routinely collected by most cancer registries, including the Ontario Cancer Registry. As a result, this report excludes statistics for non-melanoma skin cancers.

- [Incidence](#) ([#incidence](#))
- [Mortality](#) ([#mortality](#))
- [Survival](#) ([#survival](#))
- [Prevalence](#) ([#prevalence](#))

INCIDENCE

2022 estimates

In 2022, an estimated 95,325 new cancer cases are expected to be diagnosed in Ontario (or about 261 new cancer cases diagnosed every day). (Chapter 1)

- The age-standardized cancer incidence rate is estimated to be 556.3 cases per 100,000 and is higher in males (603.6 per 100,000) than females (521.4 per 100,000).
- The most commonly diagnosed cancers will be breast (12,531), followed by lung (10,639) and prostate (10,578) cancers.
- The greatest number of new cancer cases will occur in people ages 60 to 79, with this age group accounting for more than half (56%) of all cancers.

Trends over time

Cancer incidence rates in recent years stabilized in men after over a decade of decline, and stabilized in women and children (ages 0 to 14) after several years of increase. (Chapter 4)

- The overall incidence rate in adults decreased by 1.4% per year from 2007 to 2014, but stabilized in the following years from 2014 to 2018.
 - The biggest driver for the overall decrease in incidence rate prior to 2014 was the decrease in incidence rate for males (of 2.8% per year from 2007 to 2014), which has since plateaued.

- There were notable changes for specific cancers:
 - The female lung cancer incidence rate showed a statistically significant decrease of 1.0% per year from 2012 to 2018. This decreasing rate reversed a period of increase and is contributing to the recent stable overall incidence rate in females.
 - The decreasing lung cancer incidence trend in females mirrored the decreasing trend seen in males.
 - The male incidence rate showed 2 periods of decline since 1990, with the most recent decrease occurring from 2012 to 2018 (2.9% per year) for all histological subtypes.
 - Following 2 decades of decline, the cervical cancer incidence rate was stable from 2006 to 2018, showing no significant upward or downward trend.
 - Following 3 decades of increase, the thyroid cancer incidence rate has decreased from 2013 to 2018 (4.1% per year), largely due to the declining trend in papillary thyroid cancer.
 - Following 3 decades of stable trends, leukemia incidence rates began decreasing in about 2007, driven largely by a decrease in chronic lymphocytic leukemia. However, other leukemias examined in this report continued their upward trend.
 - A steady increase in all lymphomas plateaued from 2013 to 2018, mirroring the trend in non-Hodgkin lymphoma.
 - Myeloma incidence increased in females at a rate of 2.6% per from 2008 to 2018.
 - The greatest decreases in incidence rates from 1984 to 2018 were in brain, colorectal, esophagus (mainly squamous cell), laryngeal, bladder and stomach cancers.
 - The greatest increases in incidence rates from 1984 to 2018 were in liver, kidney and uterine (mainly endometrial) cancers, as well as melanoma.
- Based on data from the Pediatric Oncology Group of Ontario Networked Information System, the overall trend in childhood cancer incidence rates from 1986 to 2020 was stable, which was helped by stable rates in recent years slowing the previously increasing trend.
 - The childhood cancer incidence rate increased by 1.7% per year from 2002 to 2015, but stabilized from 2015 to 2020.

Notable patterns

Approximately 1 in 2 people in Ontario is expected to be diagnosed with cancer in their lifetime. The probability of developing cancer is similar for males and females. (Chapter 4)

- Among males, the probability is highest for prostate (1 in 9), lung (1 in 17) and colorectal (1 in 20) cancers.
- Among females, the probability is highest for breast (1 in 9), lung (1 in 18) and colorectal (1 in 23) cancers.

Lung, colorectal, breast (female) and prostate cancers were responsible for almost 50% of the 84,816 new cancer cases diagnosed in 2018. (Chapter 4)

In 2018, the median age at cancer diagnosis was slightly higher for males at age 68 than for females at age 66. (Chapter 4)

Since about 2007, incidence rates generally decreased among people age 40 and older while they stabilized in younger people after a long period of increase. (Chapter 4)

- Until 2011, the overall incidence rate in people under age 40 was increasing but has been stable from 2011 to 2018.

- Young women are at higher risk for certain cancers. Among people in Ontario under age 40, females have a higher incidence rate than males for all cancers combined, mainly due to the high incidence of breast and thyroid cancers for females in this age group.

The detection of cancers at an earlier, more favourable stage for treatment has improved over time for some common cancers, but not for others. (Chapter 4)

- The stage distribution for lung cancer improved over time, with a lower proportion of cases seen at stage 4 in 2017 (47%) compared with 2010 (57%), and a higher proportion at stage 1.
- The stage distribution for cervical cancer got worse, with a higher proportion of cases seen at stage 2 than at stage 1 in 2017 (18%) compared with 2010 (9%).

MORTALITY

Current estimates

In 2022, an estimated 31,196 deaths from cancer are expected in Ontario (or about 85 cancer deaths every day). (Chapter 2)

- The age-standardized mortality rate is estimated to be 174.9 deaths per 100,000 and is higher in males (204.0 per 100,000) than females (152.7 per 100,000).
- Almost one-quarter of all cancer deaths will be due to lung cancer (6,908), followed by colorectal (3,226), pancreatic (2,156) and breast cancers (2,114).
- More than half of all cancer deaths in 2022 (52%) are expected to occur in people ages 60 to 79, and more than one-third are expected to occur in people age 80 and older.

Trends over time

Death rates for all cancers combined continued to decrease in Ontario's men, women and children. The decrease in men and women accelerated in recent years. (Chapter 5)

- The overall cancer death rate in Ontario peaked in 1988 and decreased every year up to 2018.
- Among adults, the death rate for males decreased by 1.7% per year and for females by 1.3% per year from 2001 to 2018. These drops were driven largely by lung cancer, but also by other common cancers such as breast, prostate and colorectal.
- Based on data from the Pediatric Oncology Group of Ontario Networked Information System, the childhood cancer mortality rate decreased by an average of 1.2% per year from 1991 to 2019.

Notable patterns

Approximately 1 in 4 people in Ontario is expected to die of cancer. Males have a slightly greater chance of dying (27.4%) than females (23.2%). (Chapter 5)

- Among males, the probability is highest for lung (1 in 16), prostate (1 in 29) and colorectal (1 in 32) cancers.
- Among females, the probability is highest for lung (1 in 19), breast (1 in 31) and colorectal (1 in 38) cancers.

Cancer was responsible for 27.7% of all deaths in Ontario in 2018, making it the province's leading cause of death. (Chapter 5)

- Lung, colorectal, breast and prostate cancers were responsible for 46% of the 29,712 cancer deaths in 2018.
- Although pancreatic cancer is less common, it accounted for 6.4% of cancer deaths.

In 2018, the median age of cancer death was 74 for males and 75 for females. (Chapter 5)

- Of all cancer deaths in Ontario, 86% were in people age 60 or older.

Despite an overall decrease, death rates are on the rise for certain cancers. (Chapter 5)

- In recent years, cancer death rates increased for thyroid cancer (males), oral cavity and pharynx (males), pancreatic (males) and uterine cancers.

SURVIVAL

Recent estimates

The 5-year survival for all cancers combined continued to improve over time. (Chapter 6)

- In people ages 15 to 99, the overall 5-year relative survival ratio was 67.2% for the 2014 to 2018 period, which is higher than previous periods. During this recent period, females experienced a higher 5-year survival than males (69.1% versus 65.3%).
- In general, the 5-year relative survival ratio for all cancers combined decreases with advancing age at diagnosis. During the 2014 to 2018 period, 5-year survival ranged from 88.7% for people diagnosed at ages 15 to 39, to 44.9% for people diagnosed at ages 80 to 99.
- The overall 5-year observed survival proportion for childhood cancer increased by 6.4 percentage points, from 76.9% for the 1990 to 1994 period to 83.3% for the 2015 to 2019 period.

There is large variation in 5-year relative survival by cancer type. (Chapter 6)

- In people ages 15 to 99, thyroid (98.9%), testicular (97.1%) and prostate (94.0%) cancers had the highest survival for the 2014 to 2018 period.
- Over the same period, pancreatic (12.6%), esophageal (17.3%), lung (24.8%) and liver (22.8%) cancers had the lowest survival.

Trends over time

Although survival for all cancers combined improved, the rate of improvement has slowed over time. (Chapter 6)

- A 7.4 percentage point increase in 5-year relative survival for all cancers combined was seen from the 1984 to 1988 period to the 1994 to 1998 period.
- The improvements in survival decreased in subsequent decades, with the 5-year relative survival for all cancers increasing by 6.6 percentage points from the 1994 to 1998 period to the 2004 to 2008 period and by just 2.5 percentage points from the 2004 to 2008 period to the 2014 to 2018 period.

From the 1984 to 1988 period to the 2014 to 2018 period, people diagnosed at ages 40 to 79 showed the greatest improvements in 5-year relative survival. (Chapter 6)

- People diagnosed at age 80 or older were the only age group that showed no significant improvement in 5-year relative survival over the same period.

Notable patterns

Survival improved at a faster pace for certain cancers from 1984 to 2018. (Chapter 6)

- Compared with other cancers, the 5-year relative survival ratio improved the most for hematological cancers from the 1984 to 1988 period to the 2014 to 2018 period. Leukemia survival increased by about 25 percentage points and myeloma by 26 percentage points.
- Kidney cancer also experienced a 25 percentage point increase.
- The 5-year relative survival ratio decreased the most for bladder cancer by about 11 percentage points.

Survival depends on stage at diagnosis. (Chapter 6)

- For the 4 most common cancers, the greatest drop in 5-year survival occurred with the progression from stage 3 to stage 4.
- This drop ranged from a 14.6 percentage point difference for lung cancer to a 56.8 percentage point difference for colorectal cancer.

PREVALENCE

Recent estimates

There are now more cancer survivors in Ontario than ever before. With increasing incidence and improving survival, the prevalence of cancer cases has also increased over time. Prevalent cases include newly diagnosed people with cancer, as well as people who were previously diagnosed with cancer and who are still alive. (Chapter 7)

- At the end of 2018, there were more than a half a million people in Ontario (an estimated 676,509) who had a cancer diagnosed in the previous 30 years and who were still alive. Of those, 411,158 were diagnosed in the last 10 years alone.
- More females than males are long-term survivors of cancer. In particular, females with breast cancer represent the largest group, accounting for 78,182 of prevalent cases diagnosed in the most recent decade, from 2009 to 2018.

Trends over time

The prevalence proportion increased over time for most cancers, but it changed very little or decreased for others. (Chapter 7)

- Among major cancer types, the 10-year prevalence proportion for people diagnosed with Hodgkin lymphoma changed very little from 2008 to 2018.
- From 1998 to 2018, the 10-year prevalence proportion for people diagnosed with larynx, bladder and

cervical cancers decreased.

Future estimates

The number of prevalent cases will continue to increase in the future for many cancers. Prevalent cases include newly diagnosed people with cancer, as well as people who were previously diagnosed with cancer and who are still alive. (Chapter 3)

- The prevalence of cancer is projected to increase by about 50% from an estimated 845,188 people in 2019 to 1,265,216 in 2034.
- While the counts will increase in both males and females, the projected rates will differ between them. The projected prevalence proportion will continue to increase in females, but the rate in males is expected to rise in the short-term before decreasing in the longer-term.
- Given the relative changes in rates, by 2034, thyroid, kidney and uterine cancers are expected to represent a larger proportion of prevalent cancer cases.
- The anticipated change in prevalent cases will vary by age group over time, with the relative proportion of cases increasing most for people age 80 and older and decreasing most for people age 40 to 59.
- Estimating the future prevalence of cancer can help health planners, policy-makers and healthcare service providers anticipate the health system resources and costs that are needed to care for people newly diagnosed with cancer and provide ongoing care to cancer survivors.



Ontario Cancer Statistics 2022

Ch 1: Estimated Current Cancer Incidence

Incidence measures the number of new cancer cases diagnosed in a specific timeframe. This chapter reports projections for 2019 to 2022. The projected statistics do not account for the effects of the COVID-19 pandemic.

INCIDENCE OVERVIEW

The number of new cancer cases diagnosed in Ontario (the incidence) and the incidence rate have increased each year since at least 1984. In general, the incidence of cancer is influenced by:

- socio-demographic factors (e.g., age, place of residence)
- the availability of early detection and screening for cancer
- the prevalence of risk and protective factors

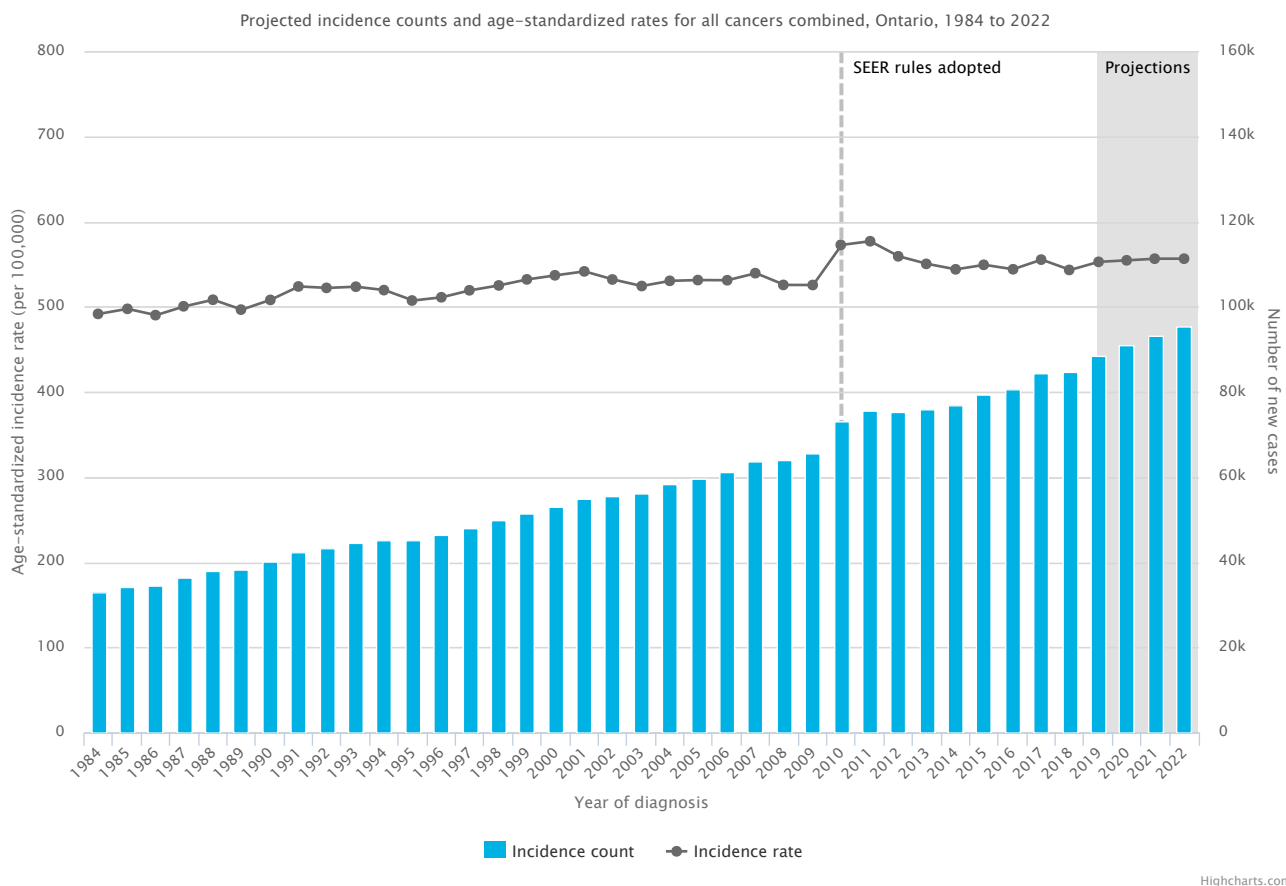
Risk factors can include:

- unhealthy behaviours (e.g., smoking, poor diet, alcohol consumption, physical inactivity)
- previous treatments (e.g., hormone replacement therapy)
- exposure to certain environmental and occupational carcinogens (e.g., radon, fine particulate matter, ultraviolet rays, asbestos, diesel engine exhaust)
- medical conditions and infectious agents (e.g., Crohn's disease, human papillomavirus)
- non-modifiable factors (e.g., age at first menstrual cycle, menopause, family history of cancer)
- genetic predispositions (e.g., BRCA1 and BRCA2 genes)

In 2022, people in Ontario are expected to be diagnosed with an estimated 95,325 new cases of cancer (excluding nonmelanoma skin cancer), which will result in an age-standardized incidence rate of 556.3 cases per 100,000 people (Figure 1.1).

Figure 1.1 shows an abrupt increase in the count and incidence rate in 2010, which is a result of the Ontario Cancer Registry's adoption of the National Cancer Institute's Surveillance, Epidemiology and End Results Program rules for counting multiple primary cancers. These rules were applied to the registry for people diagnosed from 2010 onward, so the higher numbers starting in that year reflect an adoption of the new rules and not a true increase in the cancer incidence (See **Appendix 2: Analysis** ([/node/72821](#))).^[1]

Figure 1.1

**Notes:**

1. Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.
2. Observed incidence rates are based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward. Direct comparisons between rates for 2010 onward and prior years should generally not be made. The years before 2010 are shown to highlight the impact on new cases and rates from the change in counting standards for multiple primary cancers.
3. The shaded area indicates projected data for the years 2019 onward.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)**Data source:** Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 1.1 Projected incidence counts and age-standardized rates for all cancers combined, Ontario, 1984 to 2022

YEAR OF DIAGNOSIS	INCIDENCE COUNT	INCIDENCE RATE
1984	33004	491.5
1985	34266	497.4
1986	34660	490
1987	36469	500.4
1988	38053	508.1

1989	38269	496.5
1990	40264	507.9
1991	42461	523.7
1992	43421	522
1993	44446	523.4
1994	45169	519.4
1995	45023	507.2
1996	46387	511
1997	48108	519.2
1998	49759	524.9
1999	51481	532
2000	53133	536.8
2001	54795	541.4
2002	55443	531.9
2003	56057	524.2
2004	58268	530.3
2005	59740	531.2
2006	61284	531
2007	63806	539.3
2008	63890	525.5
2009	65522	525.4
2010	73245	572.5
2011	75669	576.8
2012	75251	559.1
2013	76047	550.2
2014	76940	543.8
2015	79422	549.1
2016	80602	543.9
2017	84536	555.2
2018	84816	543.1
2019	88566	552.6

2020	91025	554.4
2021	93224	556.3
2022	95325	556.3

Notes:

1. Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.
2. Observed incidence rates are based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward. Direct comparisons between rates for 2010 onward and prior years should generally not be made. The years before 2010 are shown to highlight the impact on new cases and rates from the change in counting standards for multiple primary cancers.

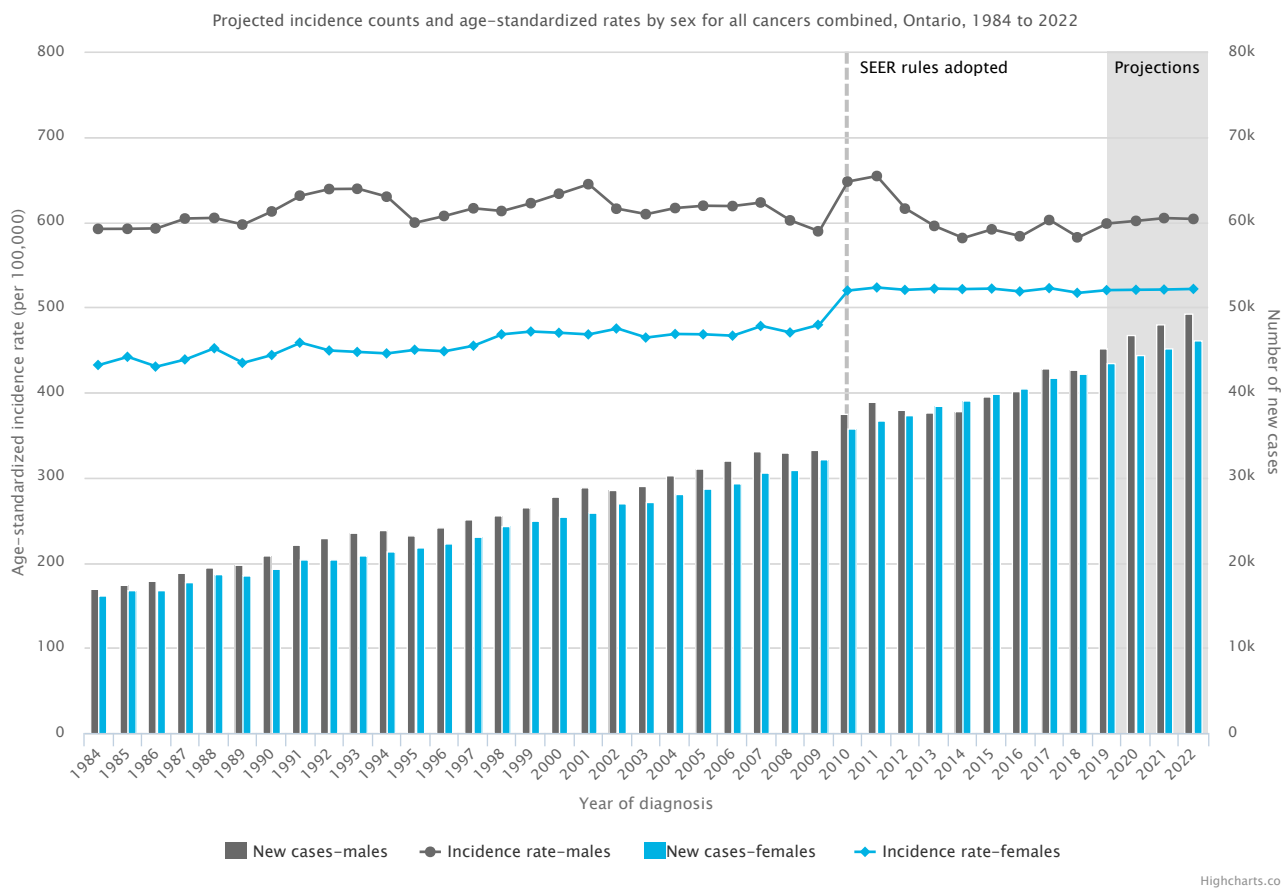
Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

INCIDENCE BY SEX

Among males, 49,221 cancer cases are expected to be diagnosed in 2022 for an age-standardized incidence rate of 603.6 per 100,000 (Figure 1.2). The rapid drop in the count and rate after 2011 is partly due to the decreasing rate of prostate cancer. This decrease followed recommendations from the U.S. Preventive Services Task Force against using prostate-specific antigen testing for the routine screening of healthy men.^[2] The latest statement by the task force made the same recommendations for men age 70 and older and modified them to include a choice for men ages 50 to 69.^[3] Similar recommendations for prostate-specific antigen testing in Canada were published by the Canadian Task Force on Preventive Health Care in 2014.^[4]

Figure 1.2

**Notes:**

1. Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.
2. Observed incidence rates are based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward. Direct comparisons with rates for 2010 onward and prior years should generally not be made. The years before 2010 are shown to highlight the impact on new cases and rates from the change in counting standards for multiple primary cancers.
3. The shaded area indicates projected data for the years 2019 onward.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 1.2 Projected incidence counts and age-standardized rates by sex for all cancers combined, Ontario, 1984 to 2022

YEAR OF DIAGNOSIS	NEW CASES-MALES	INCIDENCE RATE-MALES	NEW CASES-FEMALES	INCIDENCE RATE-FEMALES
1984	16909	591.9	16095	432.1
1985	17440	592	16826	441.7
1986	17811	592.5	16849	430.2
1987	18793	604.1	17676	438.6
1988	19393	604.8	18660	451.7
1989	19780	597	18489	434.6

1990	20907	612.4	19357	443.8
1991	22076	630.9	20385	458.3
1992	22968	638.7	20453	449.1
1993	23584	639	20862	447.4
1994	23885	629.7	21284	445.7
1995	23158	599.3	21865	450
1996	24082	607.1	22305	448.2
1997	25040	616.1	23068	454.7
1998	25496	612.9	24263	468.1
1999	26525	622.1	24956	471.4
2000	27698	633.2	25435	469.9
2001	28922	644.4	25873	468
2002	28497	615.6	26946	474.9
2003	28986	609.2	27071	464.3
2004	30211	616.4	28057	468.5
2005	31061	619.1	28679	468.1
2006	32026	618.7	29258	466.5
2007	33176	622.9	30630	477.9
2008	33008	601.9	30882	470.3
2009	33323	589.1	32199	479.3
2010	37516	647.5	35729	519.5
2011	38949	654	36720	523.1
2012	37891	615.7	37360	520.3
2013	37673	595.4	38374	521.7
2014	37855	581.2	39085	521.2
2015	39545	591.4	39877	521.8
2016	40154	583.3	40448	518.4
2017	42752	602.3	41784	522.3
2018	42630	582	42186	516.8
2019	45170	598.2	43396	520
2020	46685	601.3	44340	520.4

2021	48069	604.6	45155	520.7
2022	49221	603.6	46104	521.4

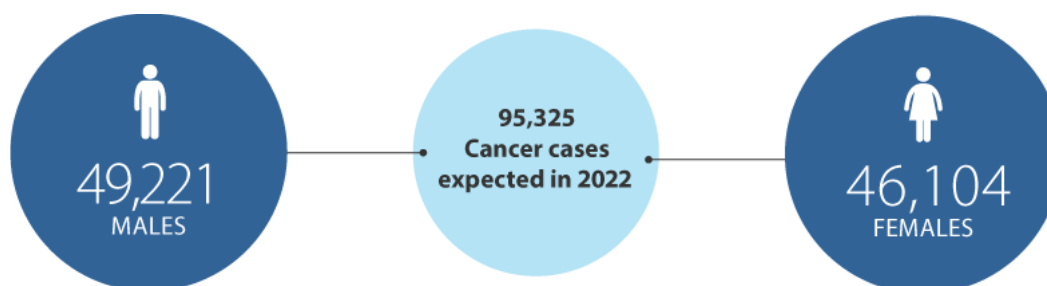
Notes:

1. Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.
2. Observed incidence rates are based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward. Direct comparisons with rates for 2010 onward and prior years should generally not be made. The years before 2010 are shown to highlight the impact on new cases and rates from the change in counting standards for multiple primary cancers.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

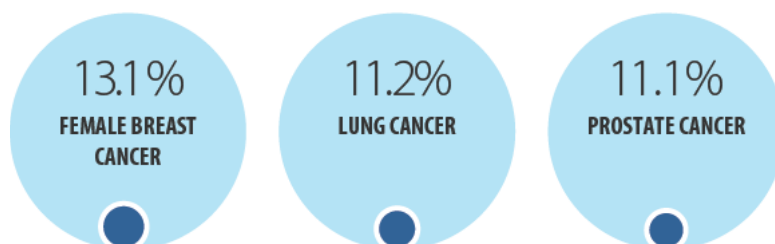
The numbers are lower for females, with 46,104 cases diagnosed and an age-standardized incidence rate of 521.4 per 100,000 (Figure 1.2). The incidence rate has been higher for males than females every year since 1984. This sex difference has been observed in many other jurisdictions.^[5,6] Higher rates of cancer among males have been attributed to differences in their behaviour^[7,8], immunity^[9], hormones^[10] and exposures (e.g., workplace carcinogens).^[11,12]



INCIDENCE BY CANCER TYPE

In 2022, the most commonly diagnosed cancer is expected to be female breast cancer (12,531 cases or 13.1% of all new cases), followed by lung cancer (10,639 cases or 11.2%) and prostate cancer (10,578 cases or 11.1%) (Table 1.1). These 3 cancers are projected to account for 35% of all new cancers diagnosed in 2022.

Most commonly diagnosed cancers



Among males, the most commonly diagnosed cancer is expected to be prostate cancer, with an age-standardized

incidence rate of 124.2 per 100,000. Breast cancer (with an age-standardized incidence rate of 147.0 per 100,000) is projected to be the most commonly diagnosed cancer among females.

The age-standardized incidence rate is expected to be higher in males than females for all cancer types listed in Table 1.1, except thyroid cancer. A higher prevalence of certain risk factors are suspected reasons for the mostly higher cancer incidence in males. These risk factors include:

- greater obesity, alcohol and tobacco use
- more occupational exposure to carcinogens
- less use of medical services
- different influence of sex hormones

The number of new thyroid cancer cases in females will outnumber male cases by more than double. This cancer has an age-standardized incidence rate of 31.8 per 100,000 in females and 13.2 per 100,000 in males. Possible reasons for the higher incidence of this cancer in females include:

- increased likelihood of diagnostic investigation for thyroid cancer ^[13]
- a greater tendency in general to seek medical attention ^[14]
- biological and hormonal factors, such as levels of thyroid stimulated hormone, levels of sex steroids, menstrual periods, use of birth control, pregnancies, breastfeeding and menopause ^[15-17]

The incidence of less aggressive types of thyroid cancer (e.g., papillary thyroid cancer) has been higher in females than males in a number of jurisdictions. However, the incidence of more aggressive types (e.g., anaplastic and medullary) is generally similar for males and females.^[13,18] As a result, thyroid mortality rates have been fairly equal for males and females (see **Chapter 5: Cancer Mortality** (</node/72791>)).

Table 1.1 Projected incidence counts and age-standardized rates by cancer type and sex, Ontario, 2022

CANCER TYPE	MALES AND FEMALES COMBINED – NEW CASES	MALES AND FEMALES COMBINED – ASIR	MALES – NEW CASES	MALES – ASIR	FEMALES – NEW CASES	FEMALES – ASIR
All cancers	95,325	556.3	49,221	603.6	46,104	521.4
Bladder	4,445	24.7	3,411	41.7	1,034	10.7
Brain	1,216	7.5	704	9.1	512	6.0
Breast (female)	n/a	n/a	n/a	n/a	12,531	147.0
Cervix	n/a	n/a	n/a	n/a	583	7.6
Colorectal	9,118	52.6	5,098	63.4	4,020	43.2
Esophagus	833	4.7	602	7.3	231	2.4
Hodgkin lymphoma	443	2.9	234	3.1	209	2.7
Kidney	3,198	19.2	2,148	27.3	1,050	11.9
Larynx	401	2.3	345	4.2	56	0.6
Leukemia	2,806	16.5	1,617	20.3	1,189	13.1
Liver	1,731	9.8	1,198	14.5	533	5.6

Lung	10,639	58.9	5,077	61.2	5,562	57.5
Melanoma	4,724	27.9	2,738	34.4	1,986	22.8
Myeloma	1,777	10.1	1,066	13.1	711	7.5
Non-Hodgkin lymphoma	5,284	30.7	3,039	38.0	2,245	24.5
Oral cavity and pharynx	2,111	12.6	1,493	18.8	618	6.9
Ovary	n/a	n/a	n/a	n/a	1,350	15.7
Pancreas	2,643	14.8	1,425	17.5	1,218	12.6
Prostate	n/a	n/a	10,578	124.2	n/a	n/a
Stomach	1,809	10.4	1,181	14.7	628	6.8
Testis	n/a	n/a	541	7.1	n/a	n/a
Thyroid	3,461	22.6	1,004	13.2	2,457	31.8
Uterus	n/a	n/a	n/a	n/a	3,400	39.1

Abbreviations: ASIR means age-standardized incidence rate; n/a means not applicable.

Notes:

1. Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.
2. Projected incidence rates are based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward.
3. Projections are based on malignant cases only.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

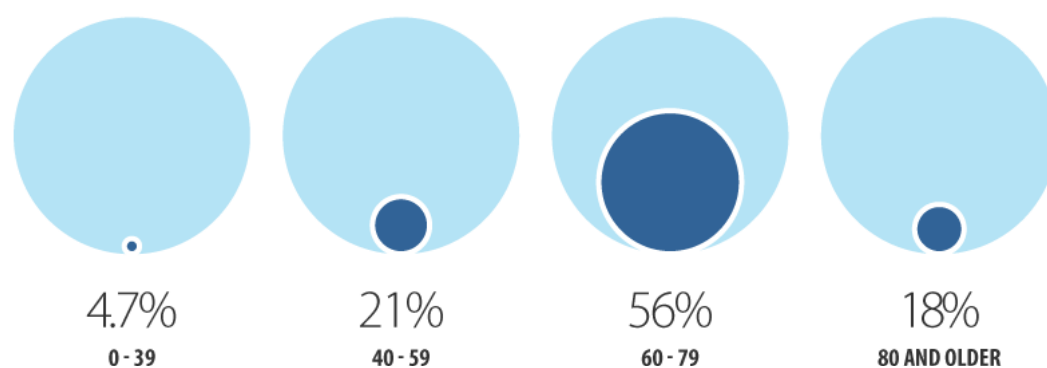
INCIDENCE BY AGE

The greatest number of new cancer cases is expected in people ages 60 to 79. An estimated 56% of all cases in 2022 are projected to be diagnosed in this age group (Table 1.2). The age group with the second highest number of new cancer cases will be people ages 40 to 59 (21%), followed by those age 80 and older (18%). Only 4.7% of cases are expected to be diagnosed in people under age 40.

The incidence rate in 2022 is projected to range from 60.2 per 100,000 in people age 39 and younger to 2,518.4 per 100,000 in people age 80 and older. The projected rates for 2022 increase with advancing age for most cancers, except:

- cervical cancer, which increases with advancing age, but peaks in people ages 40 to 59
- oral and pharynx, prostate, thyroid and uterine cancers, which increase with advancing age, but peak in people ages 60 to 79
- testicular cancer, which decreases with advancing age
- Hodgkin lymphoma, which is highest in people age 39 and younger and in people age 80 and older

Percentage of cancer cases by age group



The incidence rates of the 23 cancers reported in Table 1.2 are projected to be very low in people under age 40. The exceptions are breast cancer at 16.7 per 100,000, testicular cancer at 10.0 per 100,000 and thyroid cancer at 8.9 per 100,000.

Table 1.2 Projected incidence counts and age-specific rates by cancer type and age group, Ontario, 2022

CANCER TYPE	AGES 0 TO 39 - NEW CASES	AGES 0 TO 39 - AGE-SPECIFIC RATE	AGES 40 TO 59 - NEW CASES	AGES 40 TO 59 - AGE-SPECIFIC RATE	AGES 60 TO 79 - NEW CASES	AGES 60 TO 79 - AGE-SPECIFIC RATE	AGE 80 AND OLDER - NEW CASES	AGE 80 AND OLDER - AGE-SPECIFIC RATE
All cancers	4,504	60.2	19,887	514.1	53,530	1,733.1	17,404	2,518.4
Bladder	32	0.4	484	12.5	2,619	84.8	1,310	189.6
Brain	248	3.3	286	7.4	531	17.2	151	21.9
Breast (female)	609	16.7	4,104	208.1	6,189	383.3	1,629	397.1
Cervix	160	4.4	248	12.6	148	9.2	27	6.6
Colorectal	178	2.4	1,739	45	4,986	161.4	2,215	320.5
Esophagus	7	0.1	128	3.3	515	16.7	183	26.5
Hodgkin lymphoma	234	3.1	95	2.5	90	2.9	24	3.5
Kidney	136	1.8	892	23.1	1,764	56.5	424	61.4
Larynx	**	**	67	1.7	262	8.5	67	9.7
Leukemia	331	4.4	482	12.5	1,430	46.3	563	81.5
Liver	26	0.3	247	6.4	1,111	36.0	347	50.2
Lung	48	0.6	1,109	28.7	6,867	222.3	2,615	378.4
Melanoma	318	4.3	1,032	26.7	2,373	76.8	1,001	144.8

Myeloma	13	0.2	272	7.0	1,042	33.7	450	65.1
Non-Hodgkin lymphoma	332	4.4	974	25.2	2,827	91.5	1,151	166.6
Oral cavity and pharynx	53	0.7	578	14.9	1,212	39.2	268	38.8
Ovary	95	2.6	403	20.4	656	40.6	196	47.8
Pancreas	25	0.3	343	8.9	1,525	49.4	750	108.5
Prostate	**	**	1,365	72.0	8,123	551.0	1,089	387.8
Stomach	39	0.5	340	8.8	994	32.2	436	63.1
Testis	381	10.0	125	6.6	31	2.1	**	**
Thyroid	666	8.9	1,486	38.4	1,190	38.5	119	17.2
Uterus	74	2.0	1,017	51.6	1,982	122.8	327	79.7

Symbol: ** Suppressed due to small cell count (count less than 6).

Notes:

1. Rates are per 100,000.
2. Projected incidence rates are based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward.
3. Projections are based on malignant cases only.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March, 2021), Ontario Health (Cancer Care Ontario)

Female breast cancer will account for the largest proportion of all cases among people ages 40 to 59 (20.6%). In people ages 60 to 79, breast (11.6%), lung (12.8%) and prostate (15.2%) will be the most common cancers diagnosed. Among people age 80 and older, lung will be the most commonly diagnosed cancer (15.0%), followed by colorectal cancer (12.7%).

For more information on cancer incidence in Ontario, including data on more cancer types and trends over time, see **Chapter 4: Cancer Incidence** (</node/72481>).

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Ontario Cancer Statistics 2022

Ch 2: Estimated Current Cancer Mortality

Mortality measures the number of deaths caused by cancer. This chapter reports projections for 2019 to 2022. The projected statistics do not account for the effects of the COVID-19 pandemic.

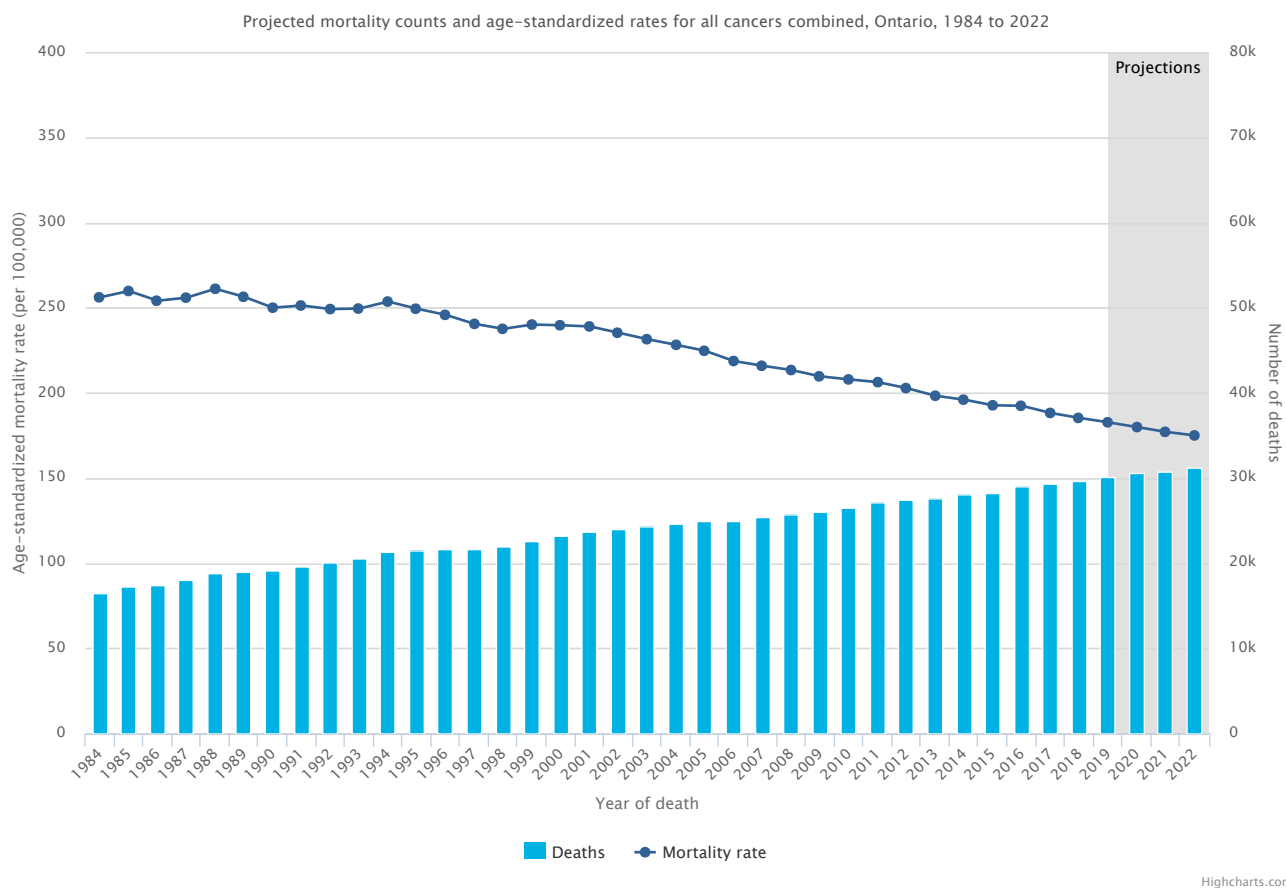
MORTALITY OVERVIEW

While the number of deaths (mortality) from all cancers in Ontario has increased over the past 3 decades, the mortality rate has decreased. In general, cancer mortality is affected by:

- cancer incidence
- cancer survival
- socio-demographic factors
- the availability and effectiveness of early detection and screening for cancer
- the availability of and access to effective treatment for cancer

In 2022, an estimated 31,196 people in Ontario are expected to die from cancer (excluding non-melanoma skin cancer). This estimate represents an age-standardized mortality rate of 174.9 out of every 100,000 people (Figure 2.1). While the number of cancer deaths has increased each year since 1984, the age-standardized mortality rate peaked in 1988 and has decreased every year since 1999.

Figure 2.1

**Notes:**

1. Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.
2. The shaded area indicates projected data for the years 2019 onward.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 2.1 Projected mortality counts and age-standardized rates for all cancers combined, Ontario, 1984 to 2022

YEAR OF DEATH	DEATHS	MORTALITY RATE
1984	16546	256
1985	17230	259.7
1986	17339	254
1987	18007	255.8
1988	18873	261
1989	19026	256.3
1990	19089	249.9

1991	19616	251.2
1992	20010	249.1
1993	20547	249.4
1994	21302	253.5
1995	21427	249.3
1996	21665	245.7
1997	21666	240.4
1998	21932	237.5
1999	22655	240
2000	23158	239.6
2001	23664	238.9
2002	23984	235.2
2003	24275	231.4
2004	24665	228.1
2005	24930	224.6
2006	24971	218.6
2007	25370	215.8
2008	25794	213.3
2009	26076	209.6
2010	26585	207.8
2011	27127	206.2
2012	27442	202.7
2013	27634	198.2
2014	28075	195.9
2015	28291	192.6
2016	29074	192.3
2017	29335	188.1
2018	29712	185.2
2019	30167	182.6
2020	30514	179.8
2021	30757	177

2022

31196

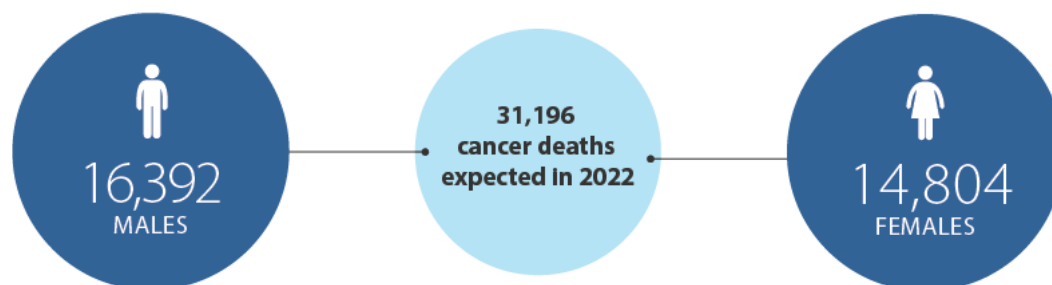
174.9

Note: Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

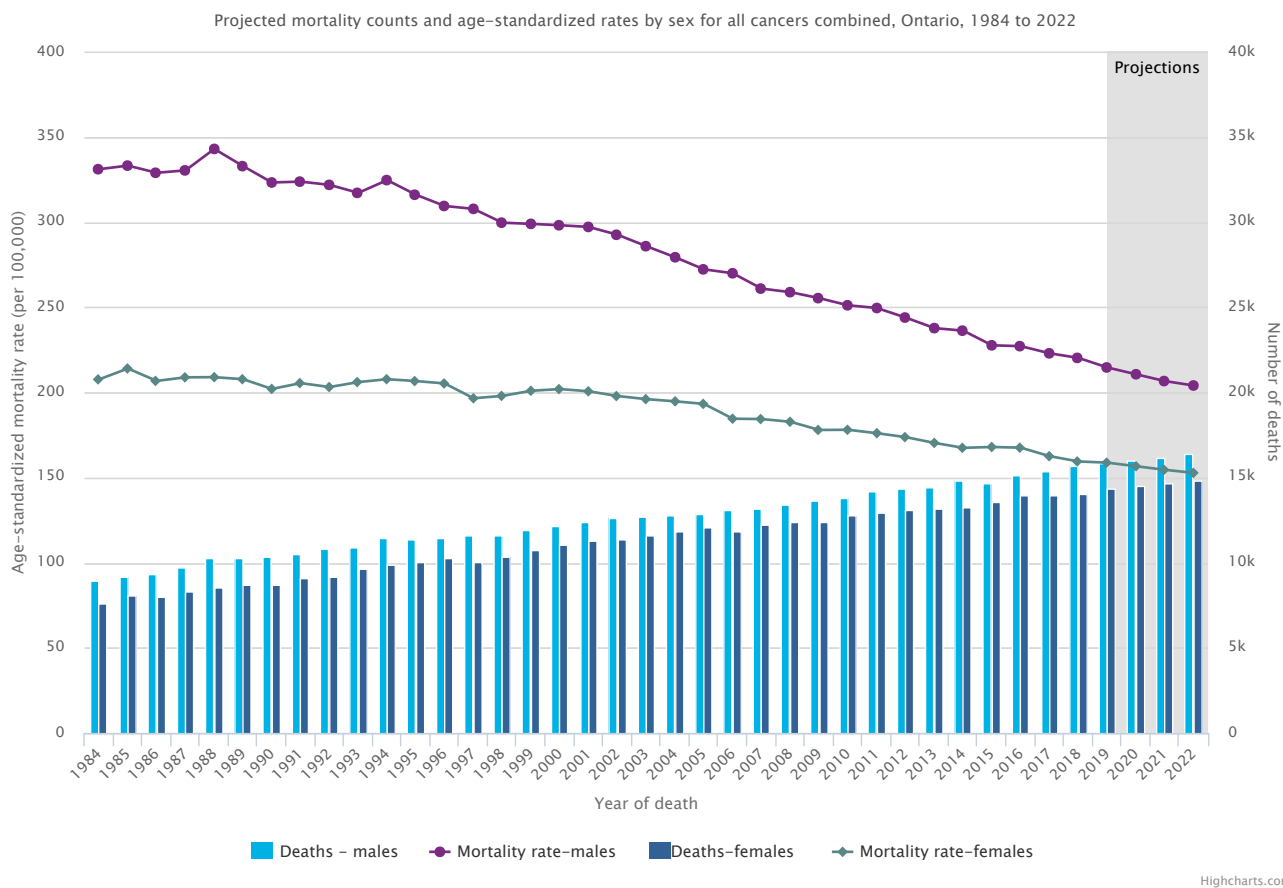
Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

MORTALITY BY SEX



Among males, cancer is expected to cause 16,392 deaths in 2022, which will result in an age-standardized mortality rate of 204.0 per 100,000 (Figure 2.2). The numbers are expected to be lower for females, with 14,804 expected deaths and an age-standardized mortality rate of 152.7 per 100,000. Males are projected to account for 52% of all cancer deaths in 2022. This percentage has decreased slightly over time, with males accounting for 54% of all cancer deaths in 1984.

Figure 2.2

**Notes:**

1. Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population
2. The shaded area indicates projected data for the years 2019 onward.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 2.2 Projected mortality counts and age-standardized rates by sex for all cancers combined, Ontario, 1984 to 2022

YEAR OF DEATH	DEATHS - MALES	MORTALITY RATE- MALES	DEATHS-FEMALES	MORTALITY RATE- FEMALES
1984	8941	331	7605	207.6
1985	9171	333.1	8059	214
1986	9366	328.9	7973	206.7
1987	9704	330.3	8303	208.8
1988	10312	342.9	8561	208.9
1989	10287	332.8	8739	207.7
1990	10349	323.2	8740	202
1991	10510	323.7	9106	205.4

1992	10799	321.8	9211	203.1
1993	10934	317.1	9613	206
1994	11423	324.6	9879	207.7
1995	11359	316	10068	206.6
1996	11421	309.4	10244	205.2
1997	11636	307.7	10030	196.5
1998	11584	299.6	10348	197.9
1999	11938	298.9	10717	200.9
2000	12118	298.1	11040	201.9
2001	12402	297.1	11262	200.6
2002	12599	292.5	11385	197.8
2003	12700	285.8	11575	196
2004	12816	279.3	11849	194.7
2005	12842	272.2	12088	193.2
2006	13124	269.9	11847	184.5
2007	13169	260.9	12201	184.3
2008	13409	258.8	12385	182.7
2009	13667	255.3	12409	177.9
2010	13839	251.1	12746	178
2011	14188	249.5	12939	176
2012	14360	243.9	13082	173.7
2013	14465	237.7	13169	170.3
2014	14799	236.2	13276	167.4
2015	14694	227.6	13597	167.9
2016	15136	227.1	13938	167.5
2017	15380	222.9	13955	162.5
2018	15706	220.2	14006	159.4
2019	15841	214.6	14326	158.7
2020	16015	210.6	14499	156.6
2021	16121	206.6	14636	154.5
2022	16392	204	14804	152.7

Notes:

1. Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)**Data source:** Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

MORTALITY BY CANCER TYPE

In 2022, the leading cause of cancer death is expected to be lung cancer, which is projected to account for 22.1% of all cancer deaths (6,908). Colorectal cancer is expected to cause the second highest number of deaths (3,226 or 10.3%), followed by pancreatic cancer. Despite having a much lower incidence, pancreatic cancer is projected to cause roughly the same number of deaths (2,156 or 6.9%) as female breast cancer (2,114 or 6.8%). Together, these 4 cancers will represent almost half of all cancer deaths.

Lung cancer will also be the leading cause of cancer death in males and in females, although the age-standardized mortality rate is projected to be significantly higher in males (42.2 per 100,000) than females (34.7 per 100,000).

For all cancers listed in Table 2.1, except thyroid cancer, the age-standardized mortality rate is expected to be higher in males than females. The higher male mortality rates is due to generally higher incidence rates among males for every cancer that occurs in both males and females. The higher incidence and mortality in males are due to:

- a higher prevalence of risk factors, such as obesity, alcohol and tobacco use ^[1]
- greater occupational exposure to carcinogens ^[2,3]
- less use of medical services ^[4–6]
- the influence of different sex hormones ^[7]

The biggest differences in cancer mortality between males and females in 2022 are expected to be for:

- Hodgkin lymphoma, as well as larynx, esophageal, oral cavity and pharynx and bladder cancers, which will have a male age-standardized mortality rate that is at least 3 times higher than the female rate
- melanoma, as well as kidney, liver and stomach cancers, which will have a male age-standardized mortality rate that is about twice as high as the female rate

Leading causes of cancer death:

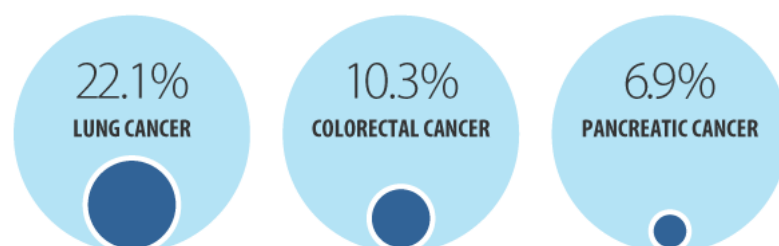


Table 2.1 Projected mortality counts and age-standardized rates by cancer type and sex, Ontario, 2022

CANCER TYPE	MALES AND FEMALES COMBINED - DEATHS	MALES AND FEMALES COMBINED - ASMR	MALES - DEATHS	MALES - ASMR	FEMALES - DEATHS	FEMALES - ASMR
All cancers	31,196	174.9	16,392	204.0	14,804	152.7
Bladder	960	5.2	683	8.6	277	2.7
Brain	901	5.3	512	6.5	389	4.3
Breast (female)	n/a	n/a	n/a	n/a	2,114	23.0
Cervix	n/a	n/a	n/a	n/a	155	1.9
Colorectal	3,226	18.2	1,773	22.3	1,453	14.7
Esophagus	929	5.2	725	8.9	204	2.1
Hodgkin lymphoma	43	0.2	29	0.4	14	0.1
Kidney	652	3.7	435	5.5	217	2.2
Larynx	131	0.7	111	1.4	20	0.2
Leukemia	1,140	6.4	637	8.0	503	5.1
Liver	1,462	8.1	952	11.6	510	5.2
Lung	6,908	38.0	3,477	42.2	3,431	34.7
Melanoma	568	3.2	367	4.6	201	2.1
Myeloma	618	3.4	350	4.3	268	2.7
Non-Hodgkin lymphoma	1,204	6.7	693	8.7	511	5.1
Oral cavity and pharynx	613	3.5	452	5.6	161	1.7
Ovary	n/a	n/a	n/a	n/a	735	7.8
Pancreas	2,156	12.0	1,129	13.9	1,027	10.3
Prostate	n/a	n/a	1,697	21.6	n/a	n/a
Stomach	809	4.6	505	6.3	304	3.2
Testis	n/a	n/a	15	0.2	n/a	n/a
Thyroid	105	0.6	50	0.6	55	0.6
Uterus	n/a	n/a	n/a	n/a	580	6.0

Abbreviations: ASMR means age-standardized mortality rate; n/a means not applicable.

Note: Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

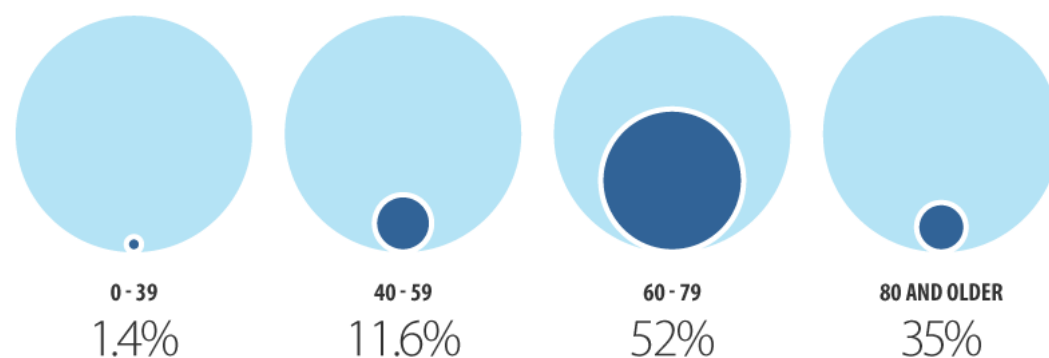
Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

MORTALITY BY AGE

In 2022, the highest cancer mortality rate is expected to be in the 80 and older age group, followed by the 60 to 79 age group. The latter group, however, will account for an estimated 52% of all deaths, compared to 35% for the older age group (Table 2.2).

Percentage of cancer deaths by age group



Deaths from cancer before age 40 will continue to be uncommon in 2022, with only 442 deaths expected. These deaths represent 1.4% of all cancer deaths and a rate of 5.9 deaths per 100,000 people.

Although projected mortality rates increase substantially at ages 60 to 79 for most cancer types, the exceptions are for breast and lung cancers. The rates for these cancers instead begin to increase rapidly in the 40 to 59 age group.

Table 2.2 Projected mortality counts and age-specific rates by cancer type and age group, Ontario, 2022

CANCER TYPE	AGES 0 TO 39 DEATHS	AGES 0 TO 39 AGE-SPECIFIC RATE	AGES 40 TO 59 DEATHS	AGES 40 TO 59 AGE-SPECIFIC RATE	AGES 60 TO 79 DEATHS	AGES 60 TO 79 AGE-SPECIFIC RATE	AGE 80 AND OLDER DEATHS	AGE 80 AND OLDER AGE-SPECIFIC RATE
All cancers	442	5.9	3,610	93.3	16,173	523.6	10,971	1,587.5
Bladder	**	**	46	1.2	414	13.4	499	72.2
Brain	68	0.9	201	5.2	487	15.8	145	21.0
Breast (female)	69	1.9	462	23.4	920	57.0	663	161.6
Cervix	13	0.4	56	2.8	62	3.8	24	5.8
Colorectal	36	0.5	391	10.1	1,500	48.6	1,299	188.0
Esophagus	**	**	129	3.3	544	17.6	252	36.5

Hodgkin lymphoma	6	0.1	**	**	22	0.7	10	1.4
Kidney	**	**	78	2.0	337	10.9	233	33.7
Larynx	**	**	15	0.4	76	2.5	40	5.8
Leukemia	40	0.5	88	2.3	529	17.1	483	69.9
Liver	18	0.2	159	4.1	874	28.3	411	59.5
Lung	18	0.2	587	15.2	4,220	136.6	2,083	301.4
Melanoma	22	0.3	83	2.1	275	8.9	188	27.2
Myeloma	**	**	52	1.3	328	10.6	238	34.4
Non-Hodgkin lymphoma	22	0.3	127	3.3	596	19.3	459	66.4
Oral cavity and pharynx	8	0.1	117	3.0	345	11.2	143	20.7
Ovary	17	0.5	124	6.3	401	24.8	193	47.0
Pancreas	10	0.1	239	6.2	1,210	39.2	697	100.9
Prostate	**	**	54	2.8	717	48.6	926	329.8
Stomach	9	0.1	129	3.3	410	13.3	261	37.8
Testis	7	0.2	**	**	**	**	**	**
Thyroid	**	**	13	0.3	57	1.8	35	5.1
Uterus	**	**	72	3.7	346	21.4	160	39.0

Symbol: ** Suppressed due to small case count (less than 6).

Note: Rates are per 100,000.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

For more information on cancer mortality in Ontario, including data on more cancer types and trends over time, see **Chapter 5: Cancer Mortality** (</node/72791>).

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Ontario Cancer Statistics 2022

Ch 3: Estimated Future Cancer Prevalence

Cancer prevalence is a measure of the number of people diagnosed with cancer who are alive. This chapter presents projected statistics on the prevalence of cancer in Ontario up to 2034. The projected statistics do not account for the effects of the COVID-19 pandemic.

Prevalent cancer cases include people who were recently diagnosed with cancer and are still under treatment, as well as people who are survivors of the disease. Survivors – defined in this report as people who are 2 or more years past their cancer diagnosis – make up the majority of prevalent cases in these statistics.

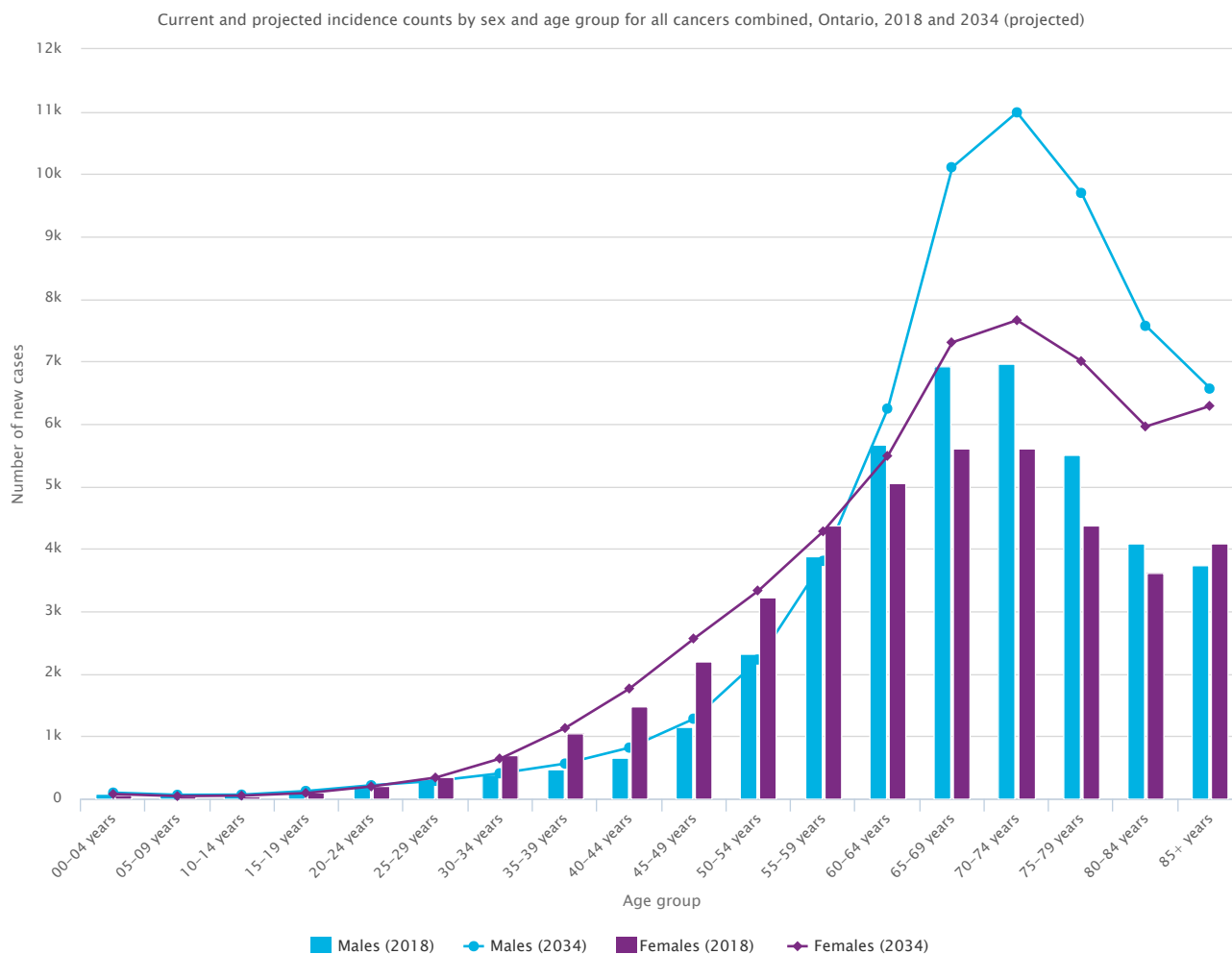
Cancer prevalence in Ontario has been rising due to a combination of improved cancer survival, lower mortality from the disease and increasing cancer incidence. Cancer incidence has risen as a result of improved early cancer detection and demographic changes in Ontario's population, such as increasing life expectancy, and the growth and aging of the population.

FACTORS AFFECTING FUTURE PREVALENCE

Demographic changes

In 2018, about half of all prevalent cancers were among people ages 60 to 79 (see [Chapter 7: Cancer Prevalence \(/node/72801\)](#)). The advancing age of the baby boomer generation – people born from 1946 to 1964 and who make up the majority of the 60 to 79 age group – is expected to contribute to the growing incidence of cancer in Ontario. People age 65 and older will represent a larger proportion of cancer cases by 2034 compared with 2018. The greater proportion of seniors and population growth in the coming years are consistent with Ontario's population projections.^[1]

Figure 3.1



Note: Current and projected incidence counts are based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 3.1 Current and projected incidence counts by sex and age group for all cancers combined, Ontario, 2018 and 2034 (projected)

AGE GROUP	MALES (2018)	FEMALES (2018)	MALES (2034)	FEMALES (2034)
00-04 years	84	60	96	74
05-09 years	64	48	61	41
10-14 years	68	49	64	49
15-19 years	118	105	123	90
20-24 years	231	210	214	195

25-29 years	296	350	285	338
30-34 years	388	697	406	643
35-39 years	482	1050	561	1130
40-44 years	651	1476	817	1763
45-49 years	1159	2200	1280	2564
50-54 years	2316	3216	2227	3333
55-59 years	3877	4367	3807	4280
60-64 years	5678	5062	6245	5488
65-69 years	6919	5608	10110	7306
70-74 years	6966	5614	10988	7660
75-79 years	5508	4372	9699	7005
80-84 years	4088	3614	7570	5959
85+ years	3738	4088	6565	6289

Note: Current and projected incidence counts are based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

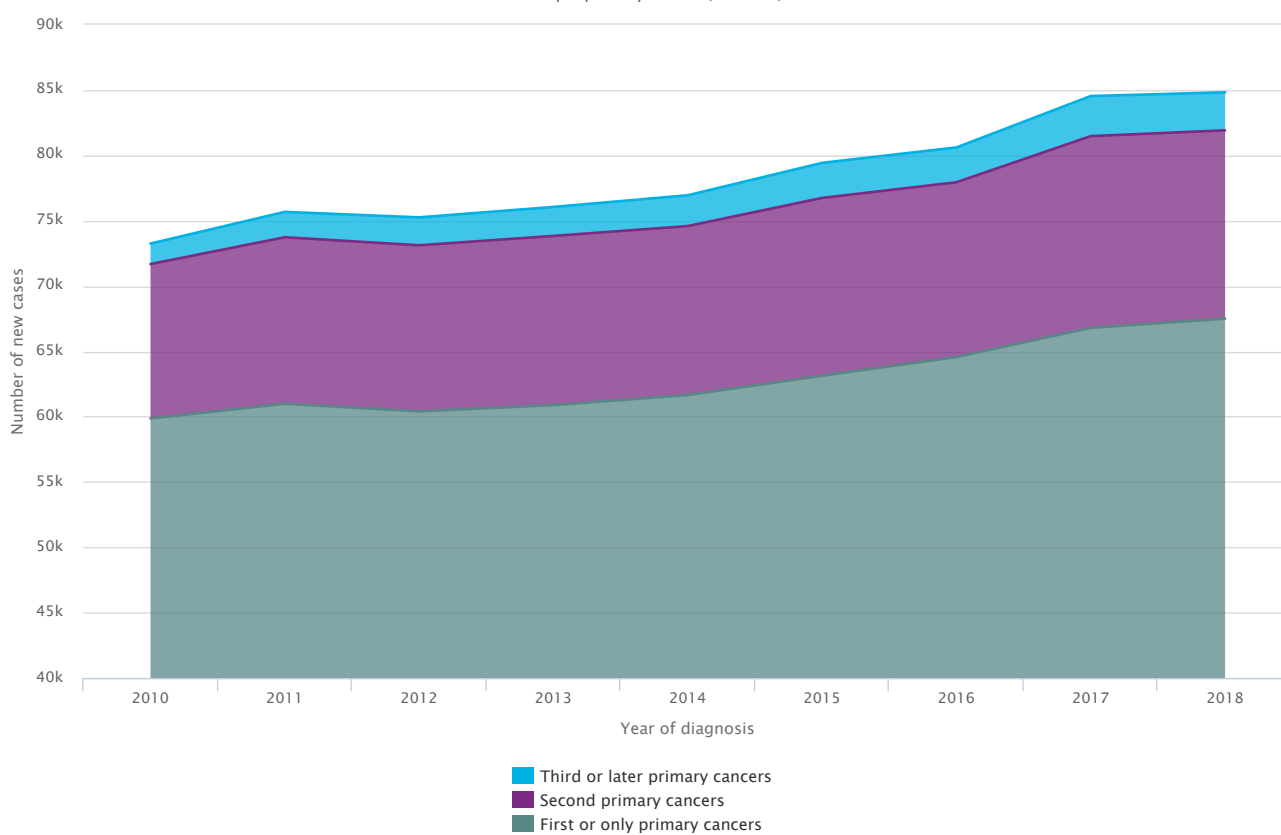
Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Improving cancer survival

Because cancer survival has improved over time for most cancers (see **Chapter 6: Cancer Survival** ([/node/72796](#))), the risk of cancer survivors developing a late effect of treatment or a subsequent cancer has grown. The proportion of subsequent primary cancers has steadily increased, with about 20% of new cancer cases in 2018 representing a second or subsequent new cancer diagnosis (Figure 3.2). Because multiple cancer diagnoses can have a compounding impact on quality of life ^[2], knowing the increasing proportion of subsequent cancers can inform the needs around care for future cancer survivors.

Figure 3.2

Distribution of multiple primary cancers, Ontario, 2010 to 2018



Highcharts.com

Notes:

1. Number of new cases is based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward.
2. First or only primary cancers are cases diagnosed in people with no previous cancer diagnoses, second primary cancers are cases diagnosed in people who had 1 previous cancer diagnosis, and third or later primary cancers are cases diagnosed in people with 2 or more previous cancer diagnoses.
3. In 2010, 81.7% of new cancer cases were first or only primary cancers, 16.1% were second primary cancers and 2.1% were third or later primary cancers; in 2018, 79.6% of new cancer cases were first or only primary cancers, 17.0% were second primary cancers and 3.4% were third or later primary cancers

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)**Data source:** Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 3.2 Distribution of multiple primary cancers, Ontario, 2010 to 2018

YEAR OF DIAGNOSIS	THIRD OR LATER PRIMARY CANCERS	SECOND PRIMARY CANCERS	FIRST OR ONLY PRIMARY CANCERS
2010	1570	11818	59857
2011	1940	12746	60983
2012	2139	12707	60405
2013	2216	12950	60881

2014	2356	12931	61653
2015	2683	13609	63130
2016	2664	13378	64560
2017	3068	14676	66793
2018	2908	14410	67503

Notes:

1. Number of new cases is based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward.
2. First or only primary cancers are cases diagnosed in people with no previous cancer diagnoses, second primary cancers are cases diagnosed in people who had 1 previous cancer diagnosis, and third or later primary cancers are cases diagnosed in people with 2 or more previous cancer diagnoses.
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Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Prevalence projections for planning healthcare and social service

While statistics on recent cancer prevalence can be useful for understanding how many people with cancer are currently in different phases of cancer care (see **Chapter 7: Cancer Prevalence** ([/node/72801](#))), estimating the future prevalence of cancer can help health system planners, policy-makers and healthcare service providers anticipate the amount and type of health system resources needed to treat people recently diagnosed with cancer and provide follow-up services to cancer survivors. For example, prevalence projections can help ensure there is adequate distribution of health and social services to meet the future needs of survivors.^[3]

In addition to helping predict future resources for treatment and recovery, other jurisdictions have shown that prevalence projections can be analyzed with other data and used by governments to plan for the costs associated with care and other services. Due to the growing cancer prevalence in the United States, cancer care costs were projected to increase 27% from 2010 to 2020.^[4] Costs for care will depend on the proportion of people in different phases of survivorship and is expected to be highest in people recently diagnosed with cancer. However, the number of survivors who were diagnosed less than 5 years ago was projected to increase less than the number of cancer survivors who were diagnosed 5 or more years ago. Survivors who were diagnosed 5 or more years ago require supports that fall outside the cancer system and the costs associated with their care can be difficult to determine.^[5] Finally, prevalence projections can influence research on the issues that survivors face, such as effects on quality of life, financial hardship and other social challenges.^[6]

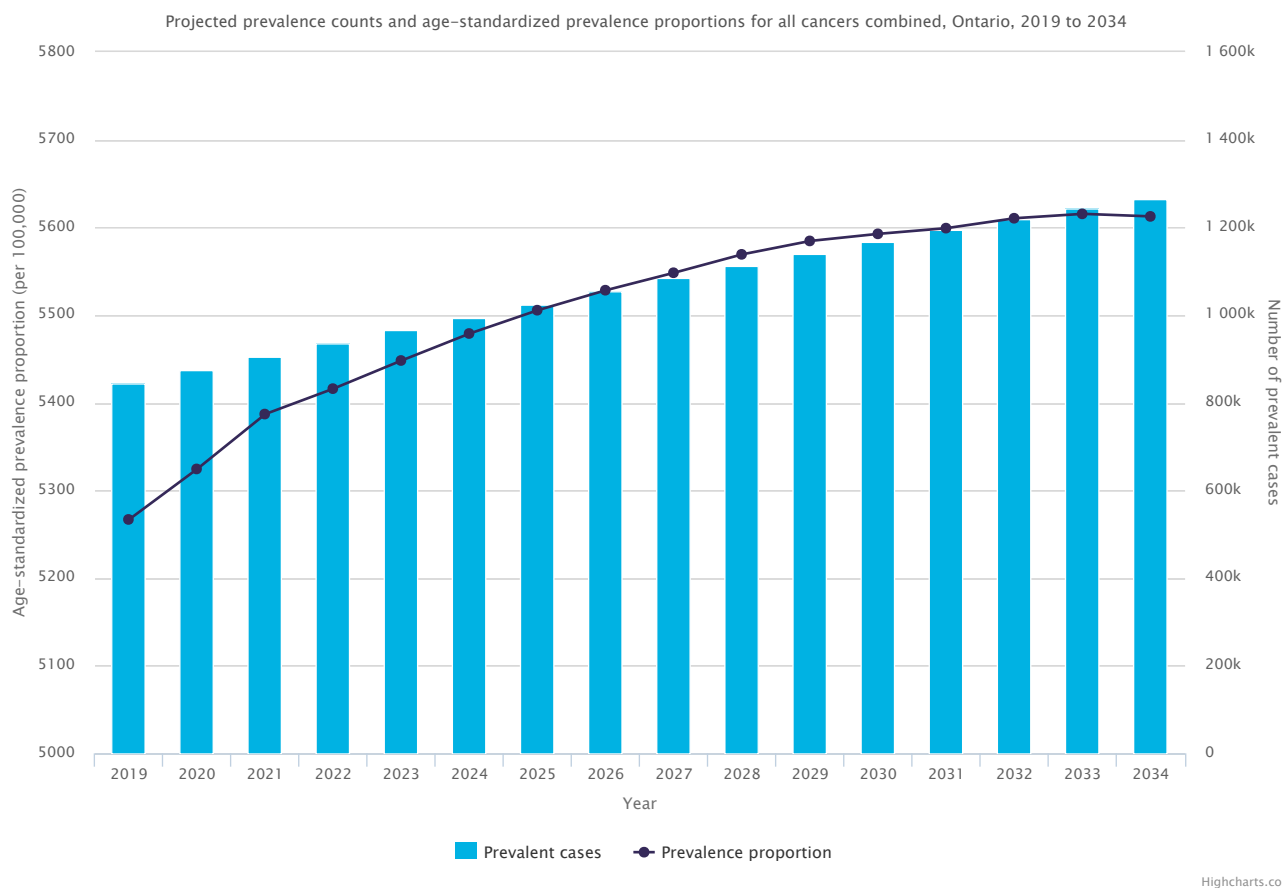
This chapter presents complete prevalence projections from 2019 to 2034 for all cancers combined and for the current 10 most prevalent cancers in Ontario. "Complete" cancer prevalence describes the number of people alive on a certain date (e.g., at the start of a calendar year) who were ever diagnosed with cancer. Complete prevalence therefore represents a heterogeneous group made up of people who were diagnosed many years ago (and are who likely to be cured of their cancer) and people who were diagnosed only recently (and who may still be undergoing cancer treatment).

Due to differences in methodology, statistics in this chapter and **Chapter 7: Cancer Prevalence** ([/node/72801](#)) are not comparable.

PROJECTED TREND IN PREVALENCE

The prevalence of cancer is projected to increase from 2019 to 2034, from an estimated 845,188 people in 2019 to 1,265,216 in 2034 (Figure 3.3). Over this period, the prevalence proportion will have increased from 5,266.8 per 100,000 in 2019 to 5,612.5 per 100,000 in 2034. As in 2019, there is expected to be considerable heterogeneity in the prevalent cancer population in 2034 in terms of cancer type and how long people have survived beyond their cancer diagnosis.

Figure 3.3



Notes:

1. Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.
2. Prevalence proportions are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 3.3 Projected prevalence counts and age-standardized prevalence proportions for all cancers combined, Ontario, 2019 to 2034

YEAR	PREVALENT PROPORTION	PREVALENCE PROPORTION
2019	845188	5266.8

2020	875204	5324.4
2021	904984	5387
2022	934775	5416
2023	964697	5448.1
2024	994733	5478.9
2025	1024686	5505.5
2026	1054234	5528.3
2027	1083480	5548.2
2028	1112265	5569.2
2029	1140293	5584.5
2030	1167567	5592.6
2031	1193961	5599.1
2032	1219209	5610.4
2033	1242928	5615.4
2034	1265216	5612.5

Notes:

1. Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.
2. Prevalence proportions are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

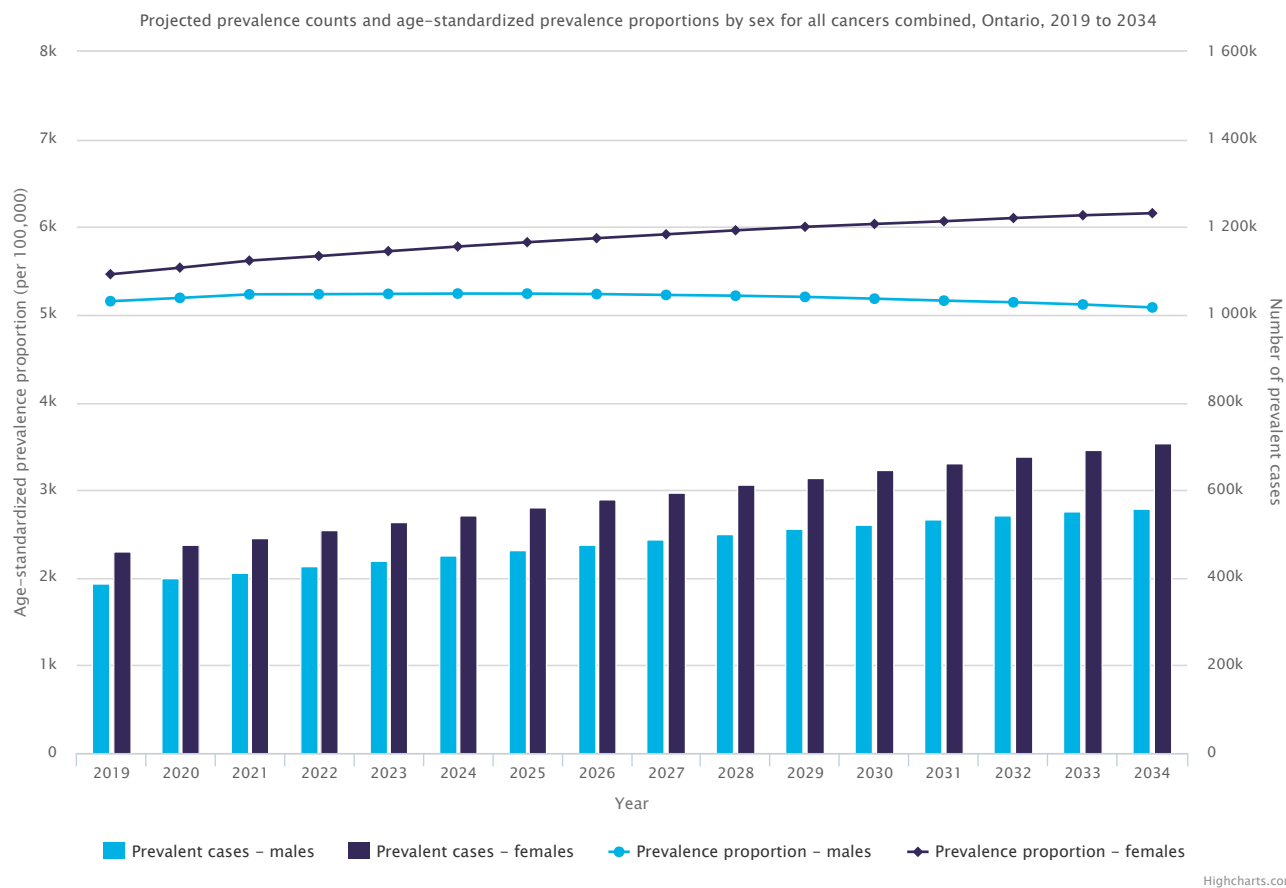
Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

The number of prevalent cases among males is expected to increase 45%, from 386,404 in 2019 to 558,836 by 2034. In females, the number of prevalent cases is expected to grow 54%, from 458,784 in 2019 to 706,380 in 2034 (Figure 3.4).

While the projected prevalence proportion is expected to continue to increase in females, the projected rate will decrease in males. The increasing prevalence proportion in females will be driven largely by a few cancer types (see next section, **Projected prevalence by cancer type** ([#projected-prevalence-by-cancer-type](#))).

Figure 3.4

**Notes:**

1. Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.
2. Prevalence proportions are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 3.4 Projected prevalence counts and age-standardized prevalence proportions by sex for all cancers combined, Ontario, 2019 to 2034

YEAR	PREVALENT CASES - MALES	PREVALENCE PROPORTIONS- MALES	PREVALENT CASES - FEMALES	PREVALENCE PROPORTIONS - FEMALES
2019	386404	5154.1	458784	5462
2020	399730	5191.8	475474	5536.6
2021	412818	5232.4	492166	5617.4
2022	425783	5233.7	508992	5669.2
2023	438657	5237.3	526040	5724.6
2024	451473	5240.8	543260	5777.8

2025	464156	5240.4	560530	5826.7
2026	476532	5235.1	577702	5872.6
2027	488612	5225	594868	5917
2028	500356	5216.2	611909	5962.7
2029	511663	5202.8	628630	6002.3
2030	522508	5182.4	645059	6034.8
2031	532812	5160.1	661149	6065.8
2032	542379	5141.5	676830	6102.5
2033	551015	5115.9	691913	6133.9
2034	558836	5082.6	706380	6157.8

Notes:

1. Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.
2. Prevalence proportions are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

PROJECTED PREVALENCE BY CANCER TYPE

Table 3.1 shows that the change in prevalence over time is projected to differ by cancer type. In males and females combined, the prevalence proportion are expected to stay the same between 2019 and 2034. However, large relative increases in the prevalence proportion are expected for thyroid and kidney cancers. In males, the largest relative increases are similarly expected for thyroid and kidney cancers, while in females the greatest increases are expected for uterus and thyroid cancers.

The relative increase from 2019 to 2034 in the prevalence proportion of lung cancer is expected to be higher in females than in males.

Table 3.1 Projected prevalence counts and age-standardized prevalence proportions by cancer type and sex, Ontario, 2019

CANCER TYPE	BOTH SEXES PREVALENCE COUNT (2019)	BOTH SEXES PREVALENCE COUNT (2034)	BOTH SEXES PREVALENCE PROPORTION (2019)	BOTH SEXES PREVALENCE PROPORTION (2034)	MALES PREVALENCE COUNT (2019)	MALES PREVALENCE COUNT (2034)	MALES PREVALENCE PROPORTION (2019)
All cancers	845,188	1,265,216	5,266.8	5,612.5	386,404	558,836	5,154.1
Breast (female)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Colorectal	77,097	115,460	470.6	503.6	42,225	64,386	564.6

Kidney	25,453	46,693	159.0	212.5	15,550	30,531	206.9
Leukemia	26,695	39,975	170.5	186.1	15,292	23,088	206.3
Lung	35,003	49,303	210.4	192.8	15,267	18,538	202.1
Melanoma	47,935	71,513	303.9	320.1	23,204	35,617	312.0
Non-Hodgkin lymphoma	41,901	67,949	262.9	301.4	22,686	36,772	304.8
Prostate	n/a	n/a	n/a	n/a	119,093	190,241	1,560.1
Thyroid	50,917	118,172	342.2	623.8	10,754	26,747	148.0
Uterus	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Abbreviation: n/a means not applicable.

Notes:

1. Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.
2. Prevalence proportions are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

PROJECTED PREVALENCE BY AGE

The anticipated growth in prevalent cases will vary by age group, with the relative proportion of cases increasing most for people age 60 and older (Figure 3.5).

Ages 0 to 39:

- In 2019, this age group represented about 4% of prevalent cases. In 2034, they will represent 3% of cases.
- The number of prevalent cases will increase slightly in this age group, with cases increasing 8%, from 37,222 in 2019 to 40,227 in 2034.

Ages 40 to 59:

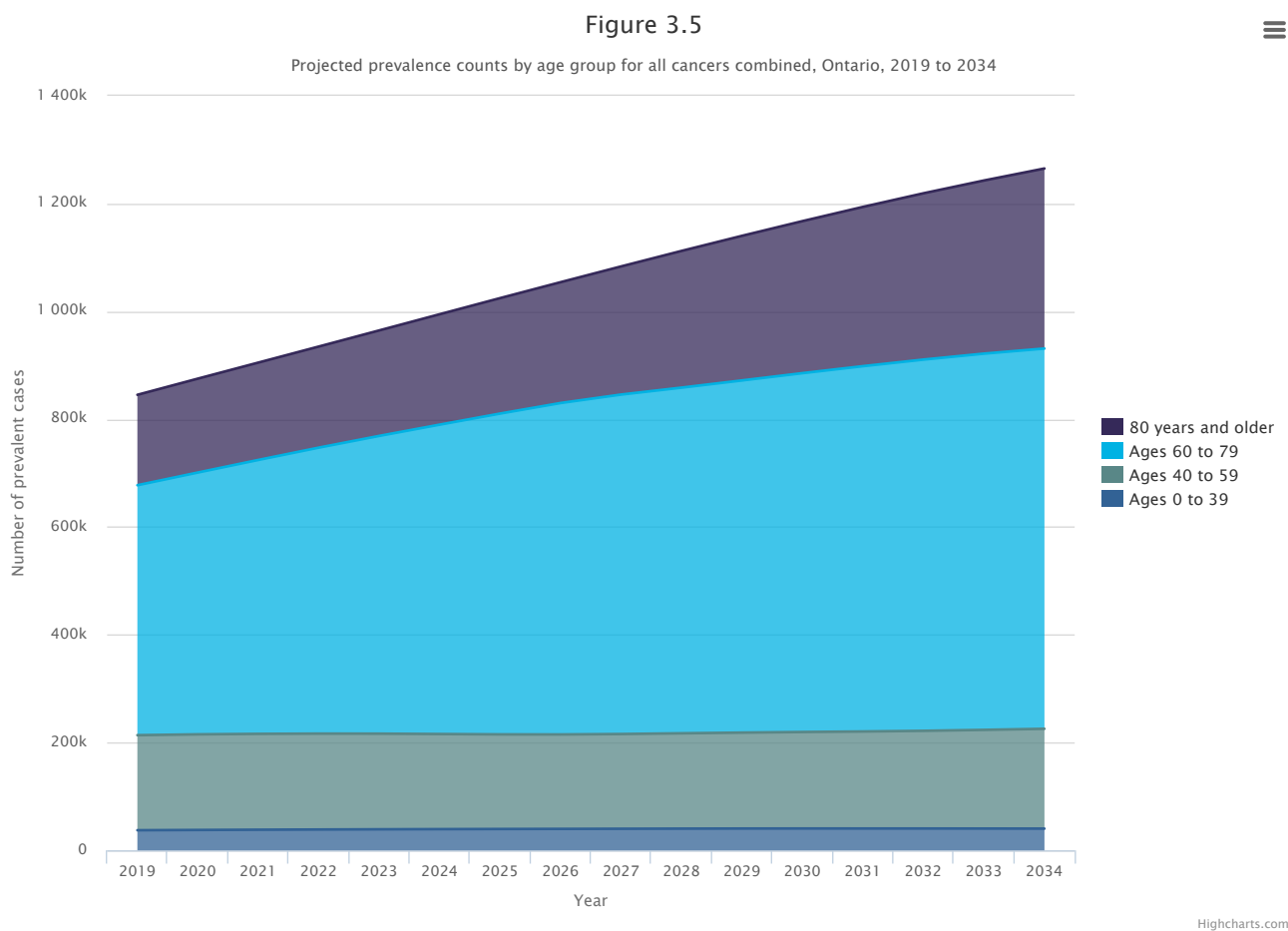
- In 2019, this age group represented 21% of prevalent cases. In 2034, they will represent about 15% of cases.
- Similar to the youngest age group, a modest increase of 5% will occur among people ages 40 to 59 from 176,393 prevalent cases in 2019 to 185,269 prevalent cases in 2034.

Ages 60 to 79:

- In 2019, this age group represented about 55% of prevalent cases. In 2034, they will represent 56% of cases.
- Unlike younger ages, the proportion of prevalent cases will increase substantially in this age group, with cases increasing 52%, from 463,854 in 2019 to 705,601 in 2034.

Ages 80 and older:

- In 2019, this age group represented about 20% of prevalent cases. In 2034, they will represent 26% of cases.
- The change in the number of prevalent cases will be highest for people age 80 and older, with prevalent cases nearly doubling from 167,719 cases in 2019 to 334,119 cases in 2034.



Note: Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 3.5 Projected prevalence counts by age group for all cancers combined, Ontario, 2019 to 2034

YEAR	80 YEARS AND OLDER	AGES 60 TO 79	AGES 40 TO 59	AGES 0 TO 39
2019	167719	463854	176393	37222

2020	174214	485805	177458	37727
2021	180640	508276	177892	38176
2022	187615	530644	177933	38583
2023	195740	552523	177484	38950
2024	204880	574068	176528	39257
2025	214251	595338	175576	39521
2026	224220	615041	175233	39740
2027	237789	629919	175813	39959
2028	253700	641474	176897	40194
2029	268359	653545	178006	40383
2030	282135	665920	179048	40464
2031	295579	677906	180027	40449
2032	308617	688876	181297	40419
2033	321278	698181	183118	40351
2034	334119	705601	185269	40227

Note: Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

INTERPRETING PREVALENCE PROJECTIONS WITH CAUTION

Prevalence projections can be challenging to derive and interpret because they are a function of 2 other types of data: cancer incidence and survival. Therefore, the projections are sensitive to assumptions made about trends in incidence and trends in survival. For example, although historical incidence data are used to derive future incidence for calculating future prevalence, those data do not account for possible changes in recent practices that could affect the incidence of cancer such as early detection or cancer screening.

The prevalence projections also depend on the accuracy of the forecasts about population size. The approach used in this chapter assumes dynamic projections of the population.

Finally, several statistical methods exist for projecting prevalence, each relying on different types of available data. As a result, projected estimates can differ according to the method and the look-back period used.^[7] The analysis presented in this chapter used the Prevalence and Incidence Analysis Model ^[8] (see [Analysis \(/node/72821\)](#) for details), which has been used in many other jurisdictions.

Conclusion

The anticipated growth in cancer prevalence in Ontario is similar to findings from other modelling studies in the

United States^[5] and in the United Kingdom^[9]. Because many cancer survivors are expected to live long after their diagnosis, it is important to consider the impact of cancer and its treatment, recurrence and subsequent cancers, psychosocial care and other important effects that survivors may experience.^[6]

The projected statistics presented in this chapter can be useful for health system planners, health providers and social service providers when planning for the unique healthcare needs and challenges of the growing number of people living with and after recovering from cancer.

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Ontario Cancer Statistics 2022

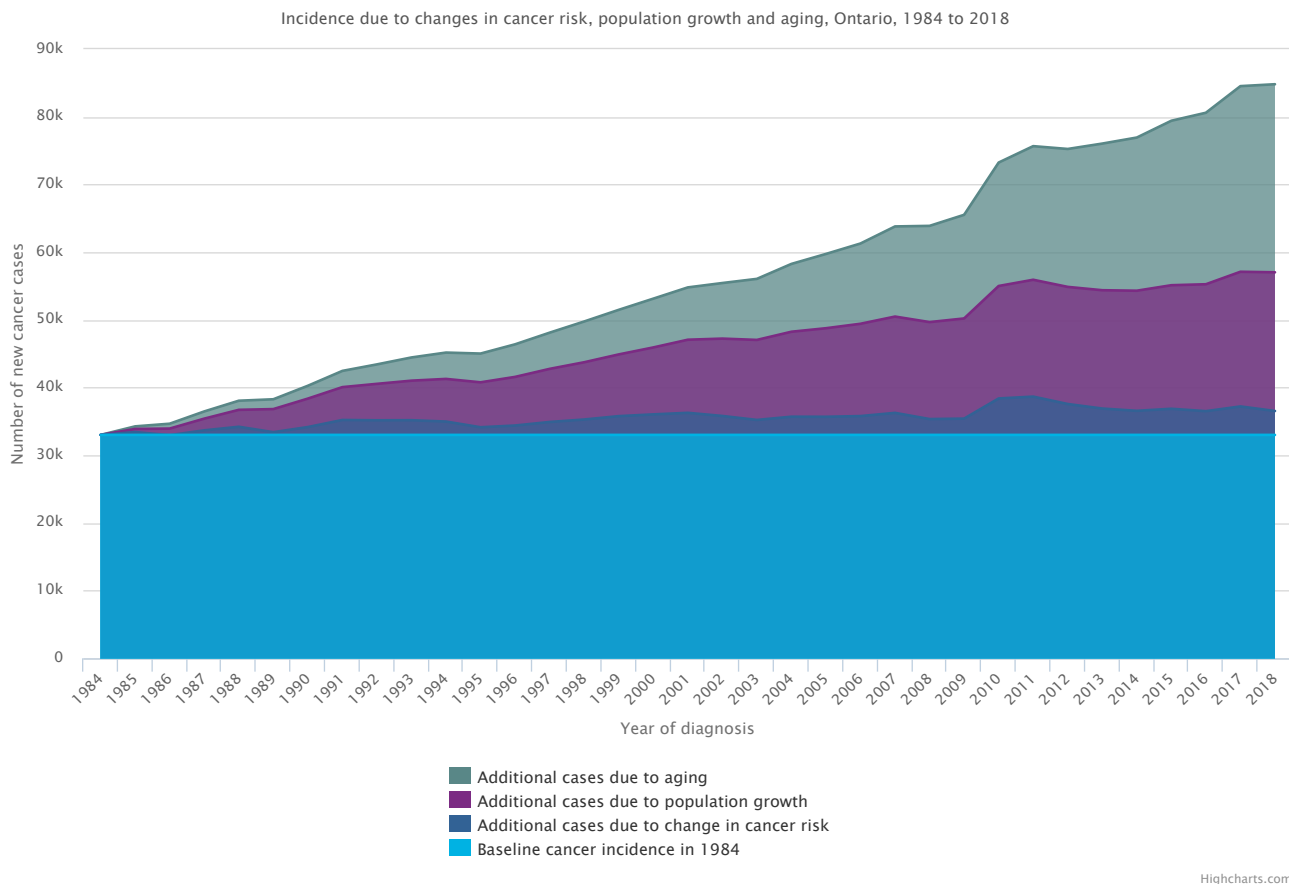
Ch 4: Cancer Incidence

Cancer incidence refers to the number of new cancer cases diagnosed within a specific period. This chapter presents actual (non-projected) incidence rates and trends based on counts considered complete as of 2018, which is the latest available year.

From 1984 to 2018, population aging and growth have contributed far more to the number of new cancer cases than actual changes in cancer risk and cancer control practices (Figure 4.1).

In 2018, 84,816 new cancer cases were diagnosed in Ontario, representing a 157% increase since 1984 (33,004 cases). Of this 157% increase, approximately 84% is due to aging of the population, 62% is due to population growth and only 11% is due to changes in cancer risk and cancer control practices.

Figure 4.1



Note: Number of new cancer cases are based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward. Direct comparisons between counts for 2010 onward and prior years should generally not be made.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 4.1 Incidence due to changes in cancer risk, population growth and aging, Ontario, 1984 to 2018

YEAR OF DIAGNOSIS	TOTAL NEW CASES	ADDITIONAL CASES DUE TO POPULATION GROWTH	CHANGE IN CANCER RATES	BASELINE CANCER INCIDENCE
1984	33004	33004	33004	33004
1985	34266	33886	33423	33004
1986	34660	33939	32969	33004
1987	36469	35406	33677	33004
1988	38053	36709	34205	33004
1989	38269	36818	33408	33004

1990	40264	38368	34163	33004
1991	42461	40064	35210	33004
1992	43421	40548	35161	33004
1993	44446	41018	35175	33004
1994	45169	41276	34975	33004
1995	45023	40773	34135	33004
1996	46387	41575	34390	33004
1997	48108	42760	34914	33004
1998	49759	43738	35278	33004
1999	51481	44895	35775	33004
2000	53133	45924	36035	33004
2001	54795	47067	36267	33004
2002	55443	47233	35803	33004
2003	56057	47039	35216	33004
2004	58268	48246	35694	33004
2005	59740	48766	35683	33004
2006	61284	49425	35785	33004
2007	63806	50488	36259	33004
2008	63890	49672	35345	33004
2009	65522	50209	35411	33004
2010	73245	55006	38389	33004
2011	75669	55927	38662	33004
2012	75251	54873	37567	33004
2013	76047	54380	36898	33004
2014	76940	54309	36562	33004
2015	79422	55120	36865	33004
2016	80602	55263	36512	33004
2017	84536	57108	37209	33004
2018	84816	57029	36538	33004

Note: Number of new cancer cases are based on the National Cancer Institute's Surveillance, Epidemiology and End Results standards for counting multiple primary cancers, which were adopted by the Ontario Cancer Registry for cases diagnosed from 2010 onward. Direct comparisons between counts for 2010 onward and prior years should generally not be made.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

PROBABILITY OF DEVELOPING CANCER

The lifetime probability of developing cancer refers to the average chance of being diagnosed with cancer over the course of a lifetime.

The probability of developing a specific type of cancer depends on many factors, including:

- a population's characteristics (e.g., demographics)
- the prevalence of risk factors (e.g., age, family history of cancer, smoking, obesity)
- current life expectancy

In addition, the probabilities in this report reflect the average risks for the overall population and do not consider personal risk factors. In other words, an individual's risk may be higher or lower than the numbers reported here.

In Ontario, nearly 1 in 2 people will develop cancer in their lifetime.

In Ontario, nearly 1 in 2 people (44.3%) will develop cancer in their lifetime (not including non-melanoma skin cancer) (Table 4.1). The probability of developing cancer was lower for females than for males and varied based on cancer type:

- Among males, the probability was highest for prostate (1 in 9 males), lung (1 in 17) and colorectal (1 in 20) cancers.
- Among females, the probability was highest for breast (1 in 9 females), lung (1 in 18) and colorectal (1 in 23) cancers.

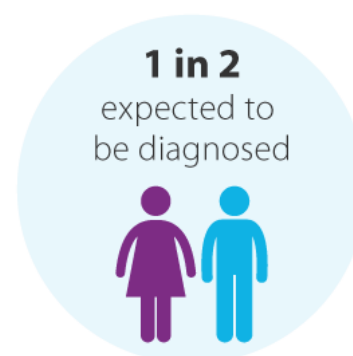


Table 4.1 Lifetime probability of developing cancer by cancer type and sex, Ontario, 2014 to 2018

CANCER TYPE	MALES AND FEMALES COMBINED %	MALES AND FEMALES COMBINED 1 IN	MALES %	MALES 1 IN	FEMALES %	FEMALES 1 IN
All cancers	44.3%	2	45.8%	2	43.0%	2
Bladder	2.4%	42	3.7%	27	1.2%	87
Brain	0.6%	163	0.7%	144	0.5%	186
Breast (female)	n/a	n/a	n/a	n/a	11.1%	9
Cervix	n/a	n/a	n/a	n/a	0.5%	212
Colorectal	4.7%	21	5.1%	20	4.4%	23
Esophagus	0.4%	241	0.6%	165	0.2%	434

Hodgkin lymphoma	0.2%	459	0.2%	429	0.2%	491
Kidney	1.2%	84	1.6%	64	0.8%	121
Larynx	0.2%	473	0.4%	273	0.1%	1,556
Leukemia	1.4%	71	1.6%	61	1.2%	86
Liver	0.8%	127	1.1%	93	0.5%	198
Lung	5.7%	18	5.9%	17	5.6%	18
Melanoma	1.8%	56	2.0%	49	1.5%	65
Myeloma	0.9%	117	1.0%	105	0.8%	132
Non-Hodgkin lymphoma	2.4%	42	2.6%	38	2.1%	47
Oral cavity and pharynx	0.9%	115	1.2%	83	0.5%	183
Ovary	n/a	n/a	n/a	n/a	1.3%	78
Pancreas	1.2%	80	1.3%	80	1.2%	81
Prostate	n/a	n/a	10.7%	9	n/a	n/a
Stomach	0.9%	115	1.1%	90	0.6%	156
Testis	n/a	n/a	0.4%	231	n/a	n/a
Thyroid	1.5%	68	0.7%	134	2.2%	45
Uterus	n/a	n/a	n/a	n/a	2.9%	34

Abbreviation: n/a means not applicable.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario). Statistics Canada, Table 13-10-0710-01 Mortality rates, by age group.

INCIDENCE BY SEX AND CANCER TYPE

In 2018, 84,816 new cancer cases were diagnosed in Ontario for an age-standardized incidence rate of 543.1 per 100,000 (Table 4.2).

Table 4.2 Age-standardized incidence rates and counts by cancer type and sex, Ontario, 2018

CANCER TYPE	MALES AND FEMALES COMBINED				MALES				FEMALES	
	NEW CASES	% OF CASES	ASIR	ASIR 95% CI	NEW CASES	% OF CASES	ASIR	ASIR 95% CI	NEW CASES	% OF CASES
All cancers	84,816	100%	543.1	539.5-546.8	42,630	100%	582.0	576.5-587.6	42,186	100%
Brain and nervous system										

Brain and other nervous system - malignant	1,193	1.4%	7.9	7.5-8.4	683	1.6%	9.6	8.9-10.3	510	1.2%
Glioblastoma	595	0.7%	3.9	3.5-4.2	346	0.8%	4.8	4.3-5.3	249	0.6%
All other gliomas	326	0.4%	2.3	2.0-2.5	182	**	3	2.2-3.0	144	**
Brain and other nervous system - non-malignant	2,349	2.8%	15.7	15.1-16.3	977	2.3%	13.8	12.9-14.7	1,372	3.3%
Meningiomas	629	0.7%	4.2	3.9-4.6	183	0.4%	2.6	2.2-3.0	446	1.1%
Pituitary, pineal and craniopharyngeal duct	530	0.6%	3.6	3.3-3.9	266	0.6%	3.7	3.3-4.2	264	0.6%
Breast and genital system										
Breast (female)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	11,728	27.8%
Cervix	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	620	1.5%
Ovary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1,293	3.1%
Prostate	n/a	n/a	n/a	n/a	9,734	22.8%	128.9	126.4-131.5	n/a	n/a
Testis	n/a	n/a	n/a	n/a	536	1.3%	7.6	7.0-8.3	n/a	n/a
Uterus	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3,153	7.5%
Uterus - endometrial	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2,909	6.9%
Uterus - uterine sarcoma	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	81	0.2%
Digestive system										
Colorectal	8,398	9.9%	53.5	52.3-54.6	4,609	10.8%	63.8	61.9-65.6	3,789	9.0%
Colon excluding rectum	5,541	6.5%	35.0	34.1-35.9	2,848	6.7%	39.4	38.0-40.9	2,693	6.4%
Colon - left sided	1,935	2.3%	12.4	11.9-13.0	1,089	2.6%	14.9	14.1-15.9	846	2.0%
Colon - right sided	3,305	3.9%	20.7	20.0-21.4	1,620	3.8%	22.4	21.4-23.6	1,685	4.0%
Rectum and rectosigmoid junction	2,836	3.3%	18.4	17.7-19.1	1,751	4.1%	24.2	23.1-25.4	1,085	2.6%
Rectosigmoid junction	705	0.8%	4.5	4.2-4.9	415	1.0%	5.7	5.2-6.3	290	0.7%
Rectum	2,131	2.5%	13.8	13.2-14.4	1,336	3.1%	18.5	17.5-19.5	795	1.9%
Esophagus	924	1.1%	5.8	5.5-6.2	693	1.6%	9.5	8.8-10.2	231	0.5%

Esophagus - adenocarcinoma	522	0.6%	3.3	3.0-3.6	459	1.1%	6.3	5.7-6.9	63	0.1%
Esophagus - squamous cell carcinoma	281	0.3%	1.8	1.6-2.0	156	0.4%	2.1	1.8-2.5	125	0.3%
Liver	1,321	1.6%	8.3	7.8-8.7	907	2.1%	12.3	11.5-13.1	414	1.0%
Pancreas	2,059	2.4%	12.8	12.3-13.4	1,070	2.5%	14.6	13.7-15.5	989	2.3%
Stomach	1,669	2.0%	10.6	10.1-11.1	1,070	2.5%	14.7	13.8-15.6	599	1.4%
Head and neck										
Larynx	412	0.5%	2.6	2.4-2.9	359	0.8%	4.9	4.4-5.4	53	0.1%
Oral cavity and pharynx	1,870	2.2%	12.1	11.5-12.6	1,342	3.1%	18.3	17.3-19.3	528	1.3%
Lip and oral cavity	920	1.1%	5.9	5.5-6.3	575	1.3%	7.9	7.2-8.5	345	0.8%
Hypopharynx	78	0.1%	0.5	0.4-0.6	70	0.2%	0.9	0.7-1.2	8	0.0%
Nasopharynx	107	0.1%	0.7	0.6-0.9	82	0.2%	1.1	0.9-1.4	25	0.1%
Oropharynx	700	0.8%	4.5	4.2-4.9	572	1.3%	7.7	7.1-8.4	128	0.3%
Thyroid	3,070	3.6%	21.4	20.6-22.1	828	1.9%	11.7	10.9-12.6	2,242	5.3%
Thyroid - anaplastic	25	0.0%	0.2	0.1-0.2	13	0.0%	0.2	0.1-0.3	12	0.0%
Thyroid - follicular	136	0.2%	0.9	0.8-1.1	37	0.1%	0.5	0.4-0.7	99	0.2%
Thyroid - medullary	35	0.0%	0.2	0.2-0.3	15	0.0%	0.2	0.1-0.4	20	0.0%
Thyroid - papillary	2,789	3.3%	19.5	18.8-20.2	726	1.7%	10.3	9.6-11.1	2,063	4.9%
Hematological										
Leukemia	2,417	2.8%	15.6	15.0-16.2	1,440	3.4%	19.9	18.9-21.0	977	2.3%
Acute lymphocytic leukemia	216	0.3%	1.5	1.3-1.7	122	0.3%	1.7	1.4-2.1	94	0.2%
Acute monocytic leukemia	934	1.1%	5.9	5.5-6.3	589	1.4%	8.0	7.4-8.7	345	0.8%
Acute myeloid leukemia	26	0.0%	0.2	0.1-0.2	11	0.0%	0.1	0.1-0.3	15	0.0%
Chronic lymphocytic leukemia	662	0.8%	4.3	3.9-4.6	347	0.8%	4.8	4.3-5.3	315	0.7%
Chronic myeloid leukemia	327	0.4%	2.1	1.9-2.4	213	0.5%	3.0	2.6-3.4	114	0.3%
Lymphoma	4,703	5.5%	30.2	29.4-31.1	2,570	6.0%	35.5	34.2-36.9	2,133	5.1%

Hodgkin lymphoma	420	0.5%	2.9	2.6-3.2	210	0.5%	3.0	2.6-3.4	210	0.5%
Non-Hodgkin lymphoma	4,283	5.0%	27.3	26.5-28.2	2,360	5.5%	32.6	31.3-33.9	1,923	4.6%
Non-Hodgkin lymphoma - extranodal	2,085	2.5%	13.3	12.7-13.9	1,174	2.8%	16.1	15.2-17.1	911	2.2%
Non-Hodgkin lymphoma - nodal	2,198	2.6%	14.0	13.5-14.6	1,186	2.8%	16.5	15.5-17.4	1,012	2.4%
Myeloma	1,468	1.7%	9.2	8.8-9.7	840	2.0%	11.5	10.8-12.4	628	1.5%
Melanoma										
Melanoma of the skin	3,882	4.6%	25.2	24.4-26.0	2,161	5.1%	29.9	28.7-31.2	1,721	4.1%
Melanoma (non-cutaneous)	175	0.2%	1.1	1.0-1.3	97	0.2%	1.3	1.1-1.6	78	0.2%
Melanoma - mucosal	56	0.1%	0.3	0.3-0.5	20	0.0%	0.3	0.2-0.4	36	0.1%
Melanoma - ocular	119	0.1%	0.8	0.6-0.9	77	0.2%	1.1	0.8-1.3	42	0.1%
Thoracic system										
Lung	10,337	12.2%	64.1	62.8-65.3	5,060	11.9%	68.6	66.7-70.6	5,277	12.5%
Lung - adenocarcinoma	3,924	4.6%	24.5	23.7-25.2	1,784	4.2%	24.1	23.0-25.2	2,140	5.1%
Lung - large cell	132	0.2%	0.8	0.7-1.0	68	0.2%	0.9	0.7-1.2	64	0.2%
Lung - small cell	1,009	1.2%	6.3	5.9-6.7	505	1.2%	6.8	6.2-7.4	504	1.2%
Lung - squamous cell	1,601	1.9%	9.9	9.4-10.4	1,001	2.3%	13.5	12.7-14.4	600	1.4%
Urinary system										
Bladder	4,115	4.9%	25.6	24.9-26.4	3,158	7.4%	43.6	42.1-45.1	957	2.3%
Kidney	2,609	3.1%	16.9	16.3-17.6	1,707	4.0%	23.3	22.2-24.5	902	2.1%

Abbreviations: ASIR means age-standardized incidence rate; CI means confidence interval.

Notes:

1. Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.
2. Only selected subsites and histological subtypes of major cancers are shown. As a result, counts for the subsites and subtypes shown may not add up to the total for each cancer.

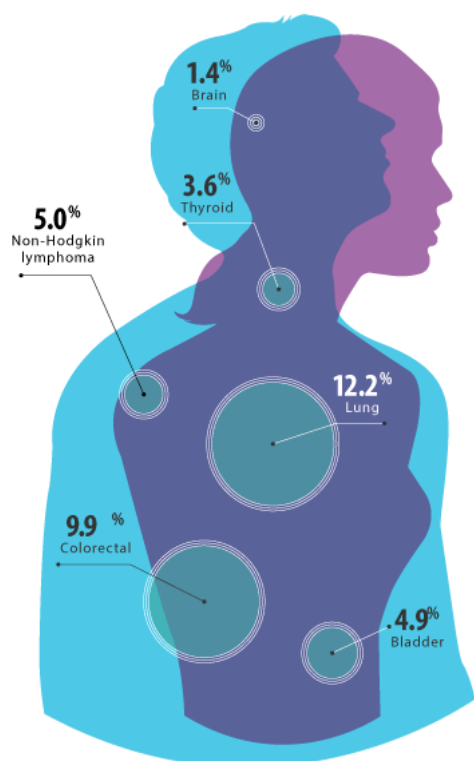
Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

The 4 most commonly diagnosed cancers (breast, colorectal, lung and prostate) were responsible for almost 50%

of all new cancer cases in 2018. Lung, colorectal and prostate cancers accounted for 46% of new cases among males, while lung, breast and colorectal cancers accounted for 49% of new cases among females (Figure 4.2).

Distribution of new cases for
selected cancers, 2018



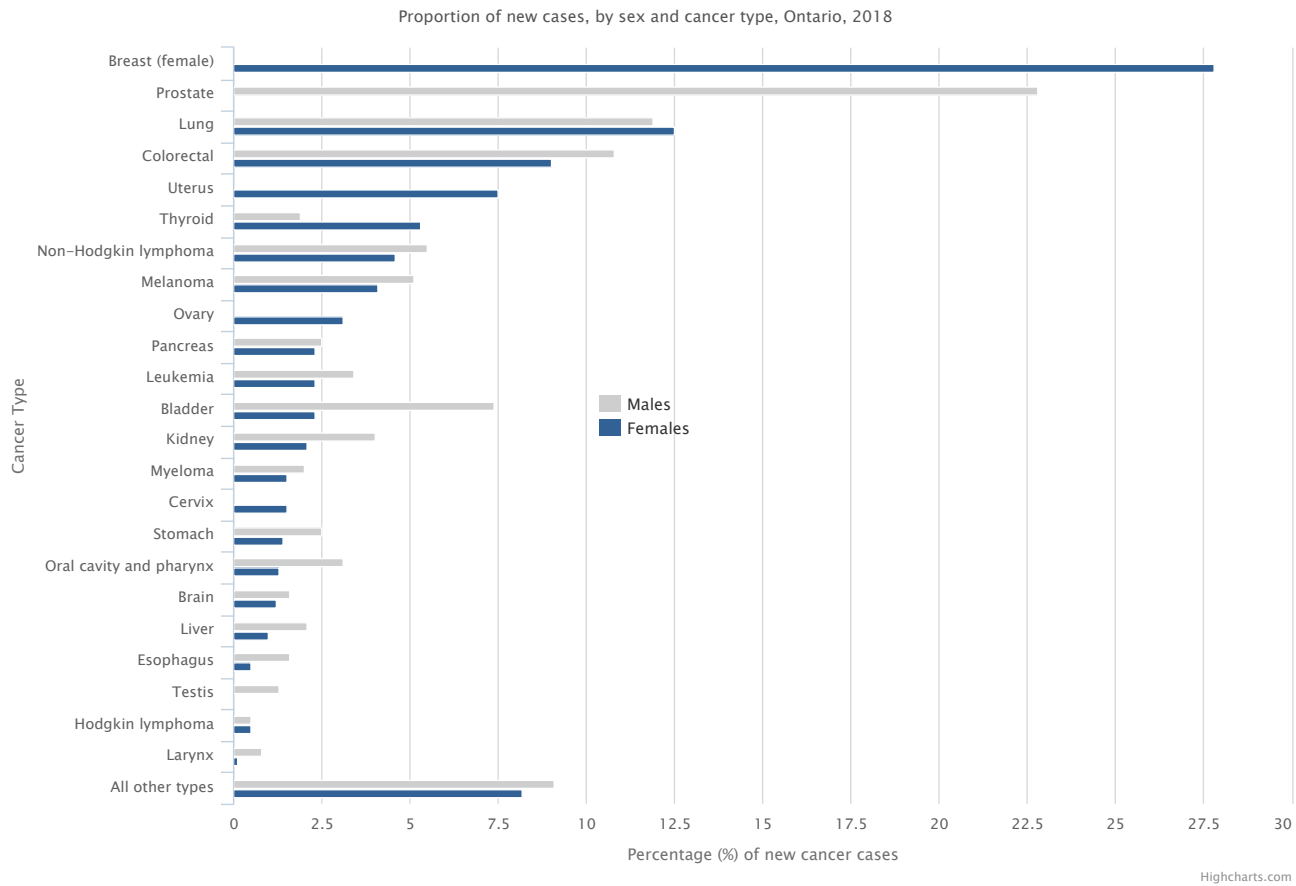
Non-melanoma skin cancers represent the most common type of cancer in most jurisdictions, but they are not included in this report because Ontario does not routinely collect data about them. Other jurisdictions have reported an increasing trend in non-melanoma skin cancers.^[1–3]

In 2018, the highest age-standardized incidence rates for cancers occurring in males and females were for lung cancer (64.1 per 100,000), colorectal cancer (53.5 per 100,000) and lymphoma (30.2 per 100,000).

The age-standardized incidence rates for all cancers combined was significantly higher in males (582.0 per 100,000) than in females (516.8 per 100,000) (Table 4.2).

- In males, the most commonly diagnosed cancers were prostate (9,734, or 22.8% of all new male cases), lung (5,060, or 11.9%) and colorectal (4,609, or 10.8%).
- In females, the leading cancer types were breast (11,728, or 27.8% of all new female cases), lung (5,277, or 12.5%) and colorectal (3,789, or 9.0%).

Figure 4.2



Note: Incidence counts based on International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Table 4.2 Proportion of new cases by sex and cancer type, Ontario, 2018

CANCER TYPE	MALES	FEMALES
All other types	9.1	8.2
Larynx	0.8	0.1
Hodgkin lymphoma	0.5	0.5
Testis	1.3	-
Esophagus	1.6	0.5
Liver	2.1	1.0
Brain	1.6	1.2
Oral cavity and pharynx	3.1	1.3
Stomach	2.5	1.4
Cervix	-	1.5

Myeloma	2.0	1.5
Kidney	4.0	2.1
Bladder	7.4	2.3
Leukemia	3.4	2.3
Pancreas	2.5	2.3
Ovary	-	3.1
Melanoma	5.1	4.1
Non-Hodgkin lymphoma	5.5	4.6
Thyroid	1.9	5.3
Uterus	-	7.5
Colorectal	10.8	9.0
Lung	11.9	12.5
Prostate	22.8	-
Breast (female)	-	27.8

Note: Incidence counts based on International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

The greatest differences in incidence between males and females were for laryngeal, bladder, esophageal, oral cavity and pharynx, liver, kidney and stomach cancers. The risk of each of these cancer types is associated with the use of tobacco or alcohol ^[4,5] and in Ontario, tobacco and alcohol use are more prevalent among men.^[6]

- Laryngeal cancer: The male rate was over 8 times higher than the female rate. Smokers are 7 times more likely to develop laryngeal cancer ^[7] and heavy alcohol use more than doubles laryngeal cancer risk.^[4]
- Bladder cancer: The male rate was nearly 4 times higher than the female rate. One of the main risk factors for bladder cancer is smoking, with smokers being 2 to 3 times more likely to develop bladder cancer than non-smokers.^[8,9]
- Esophageal cancer: The male rate for esophageal cancer overall was more than 3 times higher than the female rate, with the rate of adenocarcinoma of the esophagus being 9 times higher in males than in females. Smoking more than doubles the risk of esophageal cancer.^[7] Alcohol use and obesity – also more common in males – are other risk factors for esophageal cancer.^[10]
- Oral cavity and pharynx cancer: The male rate for oral cavity and pharynx cancer overall was almost 3 times higher than the female rate, with the rate of oropharynx cancers in males being nearly 5 times higher than in females. Tobacco and alcohol use are risk factors for oral cavity and pharynx cancer.^[11] Alcohol use increases the risk of this cancer by more than 5 times.^[4]
- Liver cancer: The male rate was more than double the female rate. Tobacco and alcohol use are linked to increased risk of liver cancer.^[4] Chronic viral hepatitis is another risk factor for liver cancer.^[12]
- Kidney cancer: The male rate was double the female rate. Heavy alcohol use is associated with increased risk of kidney cancer.^[4]
- Stomach cancer: The male rate was double the female rate. Heavy alcohol use is associated with a 20% increase in risk of stomach cancer.^[4]

The incidence rate was higher in males than females for almost all cancers. One exception was thyroid cancer, which had an age-standardized incidence rate for females of 30.7 per 100,000, compared with just 11.7 per 100,000 for males. A number of possible reasons for the higher thyroid cancer incidence in females have been proposed, including:

- a greater likelihood of diagnostic investigation among females because they are more likely to have thyroid disease ^[13], and they have a greater tendency to seek medical attention and participate more actively in medical visits ^[14–16]
- the differences in hormone levels of males and females (such as thyroid stimulated hormone and sex steroids) ^[17–19]

While the incidence of less aggressive types of thyroid cancer, such as papillary carcinoma, was higher for females than males in Ontario (Table 4.2), the rates of more aggressive types, such as anaplastic and medullary thyroid cancers, were generally similar for males and females. The same pattern is seen in other jurisdictions. ^[13,20]

The incidence rates of non-malignant tumours of the brain and nervous system were higher in females than males. Although the higher rate of non-malignant brain tumours in females has also been seen in many other jurisdictions ^[21–24], the reason for these sex differences is not clear.

INCIDENCE BY AGE

From 2016 to 2018, the median age at cancer diagnosis was 69 for males and 66 for females (Table 4.3). The median age at diagnosis varied by cancer type. Of the 23 cancer types, cancers with the lowest median age (all under age 50) were testis, Hodgkin lymphoma and cervix.

From 2016 to 2018, the median age at cancer diagnosis was 69 for males and 66 for females.

Among children, the cancer types with the lowest median age at diagnosis from 2016 to 2020 were neuroblastoma, retinoblastoma and hepatic tumours. In addition during this time period, neuroblastoma, leukemias and central nervous system tumours were the most common types of cancer in children under age 1.

For more details on childhood cancer incidence, see Spotlight: Childhood Cancer Incidence, **Table 4.S1** ([#spotlight-childhood-cancer-incidence](#)) or read the **Pediatric Oncology Group of Ontario Surveillance Report** ^[25] (https://www.pogo.ca/research-data/data-reports/?utm_source=outlook&utm_medium=email&utm_campaign=OCS_2022).

The median age at diagnosis for most cancer types was above age 60, with a few exceptions.

Table 4.3 Median age at diagnosis by cancer type and sex, Ontario, 2016 to 2018

CANCER TYPE	MALES AND FEMALES COMBINED AGE (YEARS)	MALES AGE (YEARS)	FEMALES AGE (YEARS)
All cancers	68	69	66
Bladder	73	73	73
Brain	61	61	62
Breast (female)	n/a	n/a	63
Cervix	n/a	n/a	48

Colorectal	70	69	72
Esophagus	69	68	72
Hodgkin lymphoma	38	39	37
Kidney	65	65	65
Larynx	68	68	68
Leukemia	68	68	68
Liver	69	68	73
Lung	71	72	71
Melanoma	66	68	64
Myeloma	72	71	72
Non-Hodgkin lymphoma	69	68	69
Oral cavity and pharynx	64	64	67
Ovary	n/a	n/a	64
Pancreas	72	70	73
Prostate	n/a	68	n/a
Stomach	70	70	71
Testis	n/a	34	n/a
Thyroid	52	55	51
Uterus	n/a	n/a	64

Abbreviation: n/a means not applicable.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

In 2018, more than half of all newly diagnosed cancer cases were in people ages 60 to 79 (Table 4.4). The distribution of cancer types by age group varied widely.

Table 4.4 Incidence counts and rates by cancer type and age group, Ontario, 2018

CANCER TYPE	AGES 0 TO 39			AGES 40 TO 59			AGES 60 TO 79		
	NEW CASES	AGE-SPECIFIC RATE	95 % CI	NEW CASES	AGE-SPECIFIC RATE	95 % CI	NEW CASES	AGE-SPECIFIC RATE	95 % CI
All cancers	4,300	61.0	59.2-62.9	19,262	490.7	483.8-497.6	45,726	1,686.1	1,670.7
Brain and nervous system									
Brain and other nervous system - malignant*	257	3.6	3.2-4.1	290	7.4	6.6-8.3	485	17.9	16.3-19.5
Glioblastoma	35	0.5	0.3-0.7	155	3.9	3.4-4.6	337	12.4	11.1-13.7

All other gliomas	157	2.2	1.9-2.6	99	2.5	2.0-3.1	60	2.2	1.7-2.8
Brain and other nervous system - non-malignant*	378	5.4	4.8-5.9	749	19.1	17.7-20.5	854	31.5	29.4-33.6
Meningiomas	47	0.7	0.5-0.9	269	6.9	6.1-7.7	264	9.7	8.6-11.0
Pituitary, pineal and craniopharyngeal duct	111	1.6	1.3-1.9	182	4.6	4.0-5.4	178	6.6	5.6-7.6
Breast and genital system									
Breast (female)	542	15.7	14.4-17.1	4,057	203.6	197.4-210.0	5,602	394.3	384.0-404.6
Cervix	187	5.4	4.7-6.2	254	12.7	11.2-14.4	150	10.6	8.9-12.3
Ovary	101	2.9	2.4-3.5	404	20.3	18.3-22.4	597	42.0	38.7-45.3
Prostate	**	**	**	1520†	78.6	74.7-82.7	6,957	538.8	526.2-551.4
Testis	363	10.1	9.1-11.2	144	7.4	6.3-8.8	25	1.9	1.3-2.9
Uterus	75	2.2	1.7-2.7	1,016	51.0	47.9-54.2	1,794	126.3	120.5-132.1
Uterus - endometrial	64	1.9	1.4-2.4	917	46.0	43.1-49.1	1,702	119.8	114.2-125.4
Uterus - uterine sarcoma	**	**	**	52	2.6	1.9-3.4	22	1.5	1.0-2.3
Digestive system									
Colorectal	185	2.6	2.3-3.0	1,800	45.9	43.8-48.0	4,263	157.2	152.5-161.9
Colon excluding rectum*	86	1.2	1.0-1.5	980	25.0	23.4-26.6	2,850	105.1	101.3-108.9
Colon - left sided	44	0.6	0.5-0.8	497	12.7	11.6-13.8	1,015	37.4	35.2-39.6
Colon - right sided*	39	0.6	0.4-0.8	456	11.6	10.6-12.7	1,730	63.8	60.8-66.8
Rectum and rectosigmoid junction	99	1.4	1.1-1.7	820	20.9	19.5-22.4	1,405	51.8	49.1-54.5
Rectosigmoid junction	13	0.2	0.1-0.3	184	4.7	4.0-5.4	362	13.3	12.0-14.6
Rectum	86	1.2	1.0-1.5	636	16.2	15.0-17.5	1,043	38.5	36.2-40.8
Esophagus	6	0.1	0.0-0.2	182	4.6	4.0-5.4	539	19.9	18.2-21.6
Esophagus - adenocarcinoma	**	**	**	115†	2.9	2.4-3.5	300	11.1	9.8-12.3
Esophagus - squamous cell carcinoma	**	**	**	45†	1.1	0.8-1.5	174	6.4	5.5-7.4
Liver	24	0.3	0.2-0.5	222	5.7	4.9-6.4	796	29.4	27.3-31.5

Pancreas	20	0.3	0.2-0.4	308	7.8	7.0-8.8	1,172	43.2	40.8-45.6
Stomach	31	0.4	0.3-0.6	325	8.3	7.4-9.2	919	33.9	31.7-36.1
Head and neck									
Larynx	**	**	**	95†	2.4	2.0-3.0	237	8.7	7.7-9.9
Oral cavity and pharynx	43	0.6	0.4-0.8	550	14.0	12.9-15.2	1,041	38.4	36.1-40.7
Hypopharynx	27	0.4	0.3-0.6	229	5.8	5.1-6.6	502	18.5	16.9-20.1
Lip and oral cavity	**	**	**	20†	0.5	0.3-0.8	50	1.8	1.4-2.4
Nasopharynx	11	0.2	0.1-0.3	46	1.2	0.9-1.6	44	1.6	1.2-2.2
Oropharynx	**	**	**	230†	5.9	5.1-6.7	415	15.3	13.9-16.7
Thyroid	694	9.8	9.1-10.6	1,378	35.1	33.3-37.0	888	32.7	30.6-35.0
Thyroid - anaplastic	**	**	**	**	**	**	19	0.7	0.4-1.1
Thyroid - follicular	19	0.3	0.2-0.4	56	1.4	1.1-1.9	51	1.9	1.4-2.5
Thyroid - medullary	**	**	**	16	0.4	0.2-0.7	13	0.5	0.3-0.8
Thyroid - papillary	659	9.4	8.7-10.1	1,291	32.9	31.1-34.7	763	28.1	26.2-30.0
Hematological									
Leukemia*	292	4.1	3.7-4.6	463	11.8	10.7-12.9	1,191	43.9	41.5-46.3
Acute lymphocytic leukemia	154	2.2	1.9-2.6	23	0.6	0.4-0.9	33	1.2	0.8-1.7
Acute monocytic leukemia	8	0.1	0.0-0.2	184	4.7	4.0-5.4	555	20.5	18.8-22.2
Acute myeloid leukemia*	**	**	**	6	0.2	0.1-0.3	15	0.6	0.3-0.9
Chronic lymphocytic leukemia	63	0.9	0.7-1.1	125	3.2	2.7-3.8	342	12.6	11.3-14.0
Chronic myeloid leukemia*	38	0.5	0.4-0.7	77	2.0	1.5-2.5	147	5.4	4.6-6.4
Lymphoma*	469	6.7	6.1-7.3	982	25.0	23.5-26.6	2,361	87.1	83.6-90.6
Hodgkin lymphoma	224	3.2	2.8-3.6	93	2.4	1.9-2.9	82	3.0	2.4-3.8
Non-Hodgkin lymphoma	245	3.5	3.1-3.9	889	22.6	21.2-24.2	2,279	84.0	80.6-87.4
Non-Hodgkin lymphoma - extranodal*	109	1.5	1.3-1.9	436	11.1	10.1-12.2	1,190	43.9	41.4-46.4
Non-Hodgkin lymphoma - nodal	136	1.9	1.6-2.3	453	11.5	10.5-12.7	1,089	40.2	37.8-42.6

Myeloma	14	0.2	0.1-0.3	238	6.1	5.3-6.9	815	30.1	28.0-32
Melanoma									
Melanoma of the skin	268	3.8	3.4-4.3	1,032	26.3	24.7-27.9	1,895	69.9	66.8-73
Melanoma (non-cutaneous)	11	0.2	0.1-0.3	51	1.3	1.0-1.7	88	3.2	2.6-4.0
Melanoma - mucosal	**	**	**	10†	0.3	0.1-0.5	34	1.3	0.9-1.8
Melanoma - ocular	10	0.1	0.1-0.3	42	1.1	0.8-1.4	54	2.0	1.5-2.6
Thoracic system									
Lung	52	0.7	0.6-1.0	1,290	32.9	31.1-34.7	6,665	245.8	239.9-2
Lung - adenocarcinoma	32	0.5	0.3-0.6	579	14.7	13.6-16.0	2,524	93.1	89.5-96
Lung - large cell	**	**	**	20†	0.5	0.3-0.8	94	3.5	2.8-4.2
Lung - small cell	**	**	**	155†	3.9	3.4-4.6	704	26.0	24.1-27
Lung - squamous cell	**	**	**	135†	3.4	2.9-4.1	1,120	41.3	38.9-43
Urinary system									
Bladder	52	0.7	0.6-1.0	502	12.8	11.7-14.0	2,396	88.3	84.8-92
Kidney	106	1.5	1.2-1.8	760	19.4	18.0-20.8	1,410	52.0	49.3-54

Abbreviation: CI means confidence interval.

Symbols:

*Significant increasing trend in age-specific rate with increasing age.

**Suppressed due to small case count (less than 6).

†Count has been rounded to ensure confidentiality; associated rate and confidence interval have been adjusted to reflect rounded count.

Notes:

1. Rates are per 100,000.
2. Excludes cases with no age information.
3. Only selected subsites and histological subtypes of major cancers are shown. As a result, counts for these may not add to the total for each cancer type.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Ages 0 to 39

Five percent of all new cases occurred in people under age 40, with female breast and thyroid being the leading cancers.

The under-40 age group also accounted for the majority of new cases of Hodgkin lymphoma (53.3%) and testicular cancer (68.2%).

From 2016 to 2020, about 0.5% of all new cancers occurred in children ages 0 to 14. Childhood cancers are, in general, distinct from adult cancers, with differences in cancer types, biology, treatments and response to treatment. The most common types of childhood cancer are leukemias (32.9%), central nervous system tumours (23.6%) and lymphomas (12.7%) (see Spotlight: Childhood Cancer Incidence, Table 4.S1).

For more details on childhood cancer incidence, read the **Pediatric Oncology Group of Ontario Surveillance Report** https://www.pogo.ca/research-data/data-reports/?utm_source=outlook&utm_medium=email&utm_campaign=OCS_2022.

SPOTLIGHT: Childhood Cancer Incidence

Table 4.S1: Childhood cancer incidence counts and rates, by cancer type, 0 to 14 years, Ontario, 2016 to 2020

TYPES OF CANCER/TUMOUR (ICCC DIAGNOSIS GROUP)	N	%	AGE-SPECIFIC INCIDENCE RATE	ASIR	ASIR 95% CI
All cancers combined	1,935	100.0%	171.30	173.40	165.70 - 181.30
I. Leukemias, myeloproliferative diseases, and myelodysplastic diseases	636	32.9%	56.30	57.29	52.92 - 61.93
II. Lymphomas and reticuloendothelial neoplasms	246	12.7%	21.78	21.63	19.01 - 24.52
III. CNS and miscellaneous intracranial and intraspinal neoplasms	456	23.6%	40.36	40.54	36.90 - 44.45
IV. Neuroblastoma and other peripheral nervous system tumours	136	7.0%	12.04	12.62	10.59 - 14.93
V. Retinoblastoma	38	2.0%	3.36	3.55	2.51 - 4.87
VI. Renal tumours	76	3.9%	6.73	6.88	5.42 - 8.62
VII. Hepatic tumours	45	2.3%	3.98	4.16	3.03 - 5.57
VIII. Malignant bone tumours	69	3.6%	6.11	6.00	4.67 - 7.61
IX. Soft tissue and other extraosseous sarcomas	111	5.7%	9.83	9.88	8.13 - 11.91
X. Germ cell tumours, trophoblastic tumours, and neoplasms of gonads	61	3.2%	5.40	5.46	4.18 - 7.03
XI. and XII. Other and unspecified malignant neoplasms	61	3.2%	5.40	5.36	4.10 - 6.90

Abbreviations: ASIR means age-standardized incidence rate; CI means confidence interval; CNS means central nervous system; ICCC means International Classification of Childhood Cancer

Notes:

1. Rates are per 1,000,000.

2. The POGONIS database classifies childhood cancer according to the International Classification of Childhood Cancer, third edition, which has 12 main diagnostic groups.
3. Pediatric incidence is reported over 5-year period due to variations in annual incidence and potential for small cell disclosure.

Analysis by: Health Analytics, POGO

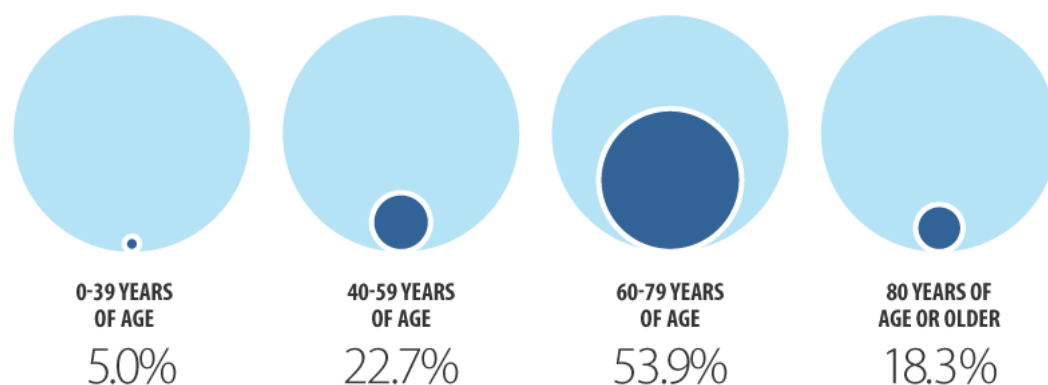
Data source: Pediatric Oncology Group of Ontario Networked Information System (POGONIS, April 7, 2021), POGO

Ages 40 to 59

Of all new cases, 22.7% occurred in people ages 40 to 59, with colorectal and female breast being the leading cancers.

Nearly half of all new cases of thyroid cancer occurred in people ages 40 to 59 and 41.0% of new cervical cancer cases occurred in females in this age group.

Distribution of newly diagnosed cancer cases by age group



Ages 60 to 79

Of all new cases, 53.9% occurred in people ages 60 to 79.

This age group was more likely than other age groups to be diagnosed with the most common cancers:

- 47.8% of new cases of female breast cancer
- 50.8% of new cases of colorectal cancer
- 64.5% of new cases of lung cancer
- 71.5% of new cases of prostate cancer

Age 80 and older

Of all new cases, 18.3% occurred in people age 80 or older, with lung and colorectal being the leading cancers.

Cancer incidence increased with age, from a rate of 61.0 per 100,000 in people diagnosed at age 39 or younger to 2,486.2 per 100,000 in people diagnosed at age 80 or older. Rates varied by cancer type. Incidence rates for the following cancer types increased significantly with age:

- malignant and non-malignant cancers of the brain and other nervous system
- colon excluding rectum and right-sided colon
- leukemia, including acute and chronic myeloid leukemias
- lymphoma, including extranodal non-Hodgkin lymphoma

Gliomas (other than glioblastoma), testicular cancer and acute lymphocytic leukemia showed non-significant decreases with age, while all other cancer types increased non-significantly or remained stable with age.

INCIDENCE TRENDS BY CANCER TYPE

This section describes annual percent changes in the age-standardized incidence rates, which are used to examine short-term changes in the trend in rates over time (Table 4.5).

Following a long period of stable rates, the age-standardized incidence rate for all cancers combined decreased by 1.4% per year from 2007 to 2014 before stabilizing again in recent years.

Among males, the incidence rate remained stable from 1984 to 2007, decreased by 2.8% per year until 2014 and was stable from 2014 to 2018. Although the cancer incidence rate among females did not see a similar decrease, the incidence rate stabilized from 2002 to 2018 following a steady increase of 0.5% per year from 1984 to 2002.

Table 4.5 Annual percent change in age-standardized incidence rates by cancer type and sex, Ontario, 1984 to 2018

CANCER TYPE	MALES AND FEMALES COMBINED PERIOD	MALES AND FEMALES COMBINED APC (%)	MALES PERIOD	MALES APC (%)	FEMALES PERIOD	FEMALES APC (%)
All cancers	1984–1991	0.8	1984–1992	0.8	1984–2002	0.5*
	1991–2007	0.3	1992–2007	-0.1	2002–2018	0
	2007–2014	-1.4*	2007–2014	-2.8*		
	2014–2018	0.1	2014–2018	0.2		
Brain and other nervous system – malignant	1984–2008	-0.3*	1984–2018	-0.5*	1984–2018	-0.8*
	2008–2018	-1.5*				
Glioblastoma	1984–2001	1.7*	1984–2018	0.7*	1984–2001	1.6*
	2001–2005	-6.2			2001–2005	-7.7
	2005–2009	6.6			2005–2012	5.6*
	2009–2018	0.2			2012–2018	-0.8
All other gliomas	1984–2004	-1.8*	1984–2018	-1.1*	1984–2018	-1.1*
	2004–2008	4.7				
	2008–2018	-3.1*				
Brain and other nervous system – non-malignant	-	**	-	**	-	**
Meningiomas	-	**	-	**	-	**
Pituitary, pineal and craniopharyngeal duct	-	**	-	**	-	**

Breast (female)	n/a	n/a	n/a	n/a	1984–1991	1.9*
	n/a	n/a	n/a	n/a	1991–1999	0.5
	n/a	n/a	n/a	n/a	1999–2012	-0.7*
	n/a	n/a	n/a	n/a	2012–2018	0.4
Cervix	n/a	n/a	n/a	n/a	1984–2006	-2.1*
	n/a	n/a	n/a	n/a	2006–2010	2.2
	n/a	n/a	n/a	n/a	2010–2014	-5
	n/a	n/a	n/a	n/a	2014–2018	3.7
Ovary	n/a	n/a	n/a	n/a	1984–2001	0.4*
	n/a	n/a	n/a	n/a	2001–2018	-1.1*
Prostate	n/a	n/a	1984–1992	6.2*	n/a	n/a
	n/a	n/a	1992–2007	1.3*	n/a	n/a
	n/a	n/a	2007–2014	-6.6*	n/a	n/a
	n/a	n/a	2014–2018	1.9	n/a	n/a
Testis	n/a	n/a	1984–2018	1.3*	n/a	n/a
Uterus	n/a	n/a	n/a	n/a	1984–1989	-2.4
	n/a	n/a	n/a	n/a	1989–2005	0.5*
	n/a	n/a	n/a	n/a	2005–2011	3.9*
	n/a	n/a	n/a	n/a	2011–2018	1.2*
Uterus – endometrial	n/a	n/a	n/a	n/a	1984–1989	-3.4*
	n/a	n/a	n/a	n/a	1989–2005	0.6*
	n/a	n/a	n/a	n/a	2005–2011	4.8*
	n/a	n/a	n/a	n/a	2011–2018	1.2*
Uterus – uterine sarcoma	n/a	n/a	n/a	n/a	1984–2018	1.1*
Colorectal	1984–1996	-1.0*	1984–2008	-0.4*	1984–1996	-1.4*
	1996–2000	1.2	2008–2018	-2.6*	1996–2000	1.4
	2000–2008	-0.9*			2000–2010	-1.3*
	2008–2018	-2.4*			2010–2018	-2.4*
Colon excluding rectum	1984–1996	-1.0*	1984–2009	-0.6*	1984–1992	-1.6*
	1996–2008	-0.3	2009–2018	-2.7*	1992–2008	-0.6*
	2008–2018	-2.5*			2008–2018	-2.4*
Colon – left sided	1984–2004	-1.1*	1984–2004	-0.8*	1984–2009	-1.3*
	2004–2008	1.4	2004–2008	2.0	2009–2018	-3.1*
	2008–2018	-3.9*	2008–2018	-4.2*		
Colon – right sided	1984–2011	0.0	1984–2011	0.1	1984–2011	-0.1
	2011–2018	-2.5*	2011–2018	-2.3*	2011–2018	-2.8*
Rectum and rectosigmoid junction	1984–1996	-1.0*	1984–1997	-0.6	1984–1996	-1.6*
	1996–2001	3.1*	1997–2001	3.7	1996–2000	4.2
	2001–2018	-1.8*	2001–2018	-2.0	2000–2018	-1.6*
Rectosigmoid junction	1984–2001	2.4*	1984–2001	2.4*	1984–1991	4.5*
	2001–2018	-3.8*	2001–2018	-3.8*	1991–1996	-5.2
					1996–2000	11.8
					2000–2018	-4.2*
Rectum	1984–1991	-3.0*	1984–1995	-1.6*	1984–1991	-3.7*
	1991–2008	0.3*	1995–2006	0.9*	1991–2018	-0.1
	2008–2018	-1.5*	2006–2018	-1.8*		

Esophagus	1984–2006	-0.1	1984–2006	0.1	1984–2018	-0.7*
	2006–2010	3.7	2006–2010	4.5		
	2010–2014	-4.7*	2010–2014	-5.2*		
	2014–2018	2.0	2014–2018	1.9		
Esophagus – adenocarcinoma	1984–2010	3.5*	1984–2010	3.4*	1984–2018	2.6*
	2010–2018	-0.8	2010–2018	-0.9		
Esophagus – squamous cell carcinoma	1984–2018	-2.1*	1984–2018	-2.4*	1984–2018	-1.9*
Liver	1984–2008	4.0*	1984–2013	4.6*	1984–2008	3.3*
	2008–2012	9.5*	2013–2018	-0.9	2008–2012	14.8*
	2012–2018	-1.5			2012–2018	-2.6
Pancreas	1984–2006	-0.7*	1984–2003	-1.3*	1984–2006	-0.4*
	2006–2013	3.0*	2003–2018	1.7*	2006–2012	2.8*
	2013–2018	-1.1			2012–2018	-1.1
Stomach	1984–2007	-1.8*	1984–2008	-1.9*	1984–1999	-2.5*
	2007–2018	0.4	2008–2018	0.4	1999–2018	-0.1
Larynx	1984–2018	-2.4*	1984–2018	-2.4*	1984–2018	-2.7*
Oral cavity and pharynx	1984–2003	-1.9*	1984–2003	-2.4*	1984–2003	-1.3*
	2003–2018	1.4*	2003–2018	1.5*	2003–2018	0.9*
Hypopharynx	1984–2018	-2.6*	1984–2018	-2.4*	1984–2018	-3.5*
Lip and oral cavity	1984–2003	-2.9*	1984–2003	-3.8*	1984–2003	-1.4*
	2003–2018	1.3*	2003–2018	0.9	2003–2018	1.7*
Nasopharynx	1984–2018	0.0	1984–2018	0.2	1984–2018	-0.3
Oropharynx	1984–1998	-1.1	1984–1998	-1.2	1984–2018	0.0
	1998–2018	2.5*	1998–2018	3.1*		
Thyroid	1984–1998	4.8*	1984–2014	6.6*	1984–1998	4.9*
	1998–2002	13.3*	2014–2018	-2.2	1998–2002	15.1*
	2002–2013	6.3*			2002–2013	5.9*
	2013–2018	-4.1*			2013–2018	-5.0*
Thyroid – anaplastic	1984–2018	-0.1	1984–2018	2.0*	1984–2018	-1.1
Thyroid – follicular	1984–2018	-0.7*	1984–2018	-0.8	1984–2018	-0.7*
Thyroid – medullary	1984–2018	2.0*	1984–2018	2.1*	1984–2018	1.9*
Thyroid – papillary	1984–2012	9.1*	1984–2013	8.5*	1984–1998	7.7*
	2012–2018	-3.3*	2013–2018	-1.0	1998–2002	14.5*
					2002–2012	8.2*
					2012–2018	-3.9*
Leukemia	1984–2000	-0.3	1984–2010	0.3	1984–2001	-0.4
	2000–2007	1.7	2010–2018	-1.3*	2001–2009	1.8
	2007–2018	-1.1*			2009–2018	-1.8*
Acute lymphocytic leukemia	1984–2018	0.9*	1984–2018	0.9*	1984–2018	0.8*

Acute monocytic leukemia	1984–2018	2.6*	1984–2018	2.5*	1984–2018	2.4*
Acute myeloid leukemia	1984–2018	0.7*	1984–2018	0.7*	1984–2018	0.6*
Chronic lymphocytic leukemia	1984–2008 2008–2018	1.2* -2.6*	1984–2009 2009–2018	1.1* -3.1*	1984–2000 2000–2004 2004–2018	-0.2 7.4 -2.5*
Chronic myeloid leukemia	1984–2004 2004–2018	-1.0* 1.6*	1984–2004 2004–2018	-1.2* 1.6*	1984–2018	0.2
Lymphoma	1984–1998 1998–2009 2009–2013 2013–2018	1.6* 0.6* 4.2* -0.4	1984–2009 2009–2013 2013–2018	1.1* 4.4* -0.7	1984–1998 1998–2008 2008–2012 2012–2018	1.8* 0.2 3.2 0.4
Hodgkin lymphoma	1984–2018	-0.3*	1984–2018	-0.5*	1984–2018	0.0
Non-Hodgkin lymphoma	1984–1998 1998–2009 2009–2013 2013–2018	1.9* 0.7* 4.6* -0.5	1984–1990 1990–2009 2009–2013 2013–2018	3.1* 1.2* 5.0* -0.8	1984–1998 1998–2008 2008–2012 2012–2018	2.1* 0.3 3.7 0.2
Non-Hodgkin lymphoma – extranodal	1984–2007 2007–2011 2011–2018	7.4* 44.5* 2.7	1984–2007 2007–2012 2012–2018	7.6* 37.7* -0.1	1984–2007 2007–2011 2011–2018	7.9* 41.6* 3.1
Non-Hodgkin lymphoma – nodal	1984–2007 2007–2013 2013–2018	0.9* -7.3* -0.2	1984–2007 2007–2011 2011–2018	1.1* -8.7 -1.5	1984–1994 1994–2007 2007–2013 2013–2018	2.2* 0.2 -7.0* -0.9
Myeloma	1984–2008 2008–2018	0.3 2.6*	1984–2003 2003–2007 2007–2011 2011–2018	0.7* -3.6 6.4 1.5	1984–2009 2009–2018	0.1 2.6*
Melanoma of the skin	1984–1988 1988–1992 1992–2014 2014–2018	4.9 -2.6 2.3* -0.4	1984–1988 1988–1992 1992–2014 2014–2018	7 -2 2.4* -1	1984–1993 1993–2018	-0.4 2*
Melanoma (non-cutaneous)	1984–2018	0.7*	1984–2018	0.7*	1984–2018	0.8*
Melanoma – mucosal	1984–2006 2006–2010 2010–2018	-0.4 41.0 -1.6	-	** ** **	-	** ** **
Melanoma – ocular	1984–2018	-0.1	1984–2018	0.1	1984–2018	-0.3
Lung	1984–1991 1991–2008 2008–2012 2012–2018	0.5 -0.9* 0.7 -1.9*	1984–1990 1990–2008 2008–2012 2012–2018	-0.7 -2.1* 0.4 -2.9*	1984–1998 1998–2008 2008–2012 2012–2018	2.1* 0.2 1.6 -1.0*

Lung – adenocarcinoma	1984–1996	2.5*	1984–1998	1.1*	1984–1995	4.1*
	1996–2008	-0.9*	1998–2007	-2.9*	1995–2008	0.5
	2008–2012	10.0*	2007–2012	7.8*	2008–2014	7.5*
	2012–2018	-1.5*	2012–2018	-1.7*	2014–2018	-4.4*
Lung – large cell	1984–2000	0.1	1984–2000	-1.0*	1984–1999	2.3*
	2000–2004	-15.1*	2000–2004	-17.4*	1999–2018	-8.5*
	2004–2018	-7.2*	2004–2018	-6.8*		
Lung – small cell	1984–1990	4.1*	1984–1991	2.2	1984–1997	3.3*
	1990–2011	-0.6*	1991–2018	-1.7*	1997–2018	-0.5*
	2011–2018	-2.3*				
Lung – squamous cell	1984–1989	-0.5	1984–1988	-0.5	1984–1996	0.7
	1989–2008	-3.5*	1988–2008	-4.4*	1996–2007	-2.7*
	2008–2012	4.4	2008–2012	3.6	2007–2012	5.0*
	2012–2018	-2.4*	2012–2018	-2.8*	2012–2018	-1.7
Bladder†	1989–2018	-1.2*	1989–2018	-1.3*	1989–2018	-1.3*
Kidney	1984–1990	3.6*	1984–1989	4.9*	1984–2018	1.1*
	1990–1996	-0.8	1989–1999	-0.4		
	1996–2018	1.7*	1999–2018	2.0*		

Abbreviations: APC means annual percent change; n/a means not applicable.

Symbols:

*Statistically significant trend.

**Too few cases to calculate.

†Bladder cancer trend begins at 1989 due to classification changes.

Notes:

1. Rates are standardized to the age distribution of the 2011 Canadian Standard population.
2. Only selected subsites and histological subtypes of major cancers are shown.
3. For all cancers combined, breast cancer, melanoma of the skin and bladder cancer, the National Cancer Institute Surveillance, Epidemiology and End Results Program standards for counting multiple primary cancers were used for assessing trends over time. For all other cancer types, the International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules were used.
4. The jump model in the Joinpoint software was applied in trend analyses for all cancers combined, breast cancer, melanoma of the skin and bladder cancer.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Recent incidence trends for the 4 most common cancers

BREAST CANCER

The age-standardized incidence rate for female breast cancer in Ontario increased by 1.9% per year until 1991. It then stabilized from 1991 to 1999 before steadily decreasing at 0.7% per year until 2012. The rate has remained stable in recent years. This trend is likely due to the diminishing number of women with undetected cancer. This kind of rise and fall in incidence rate is typical when a new method of early diagnosis is introduced.

The decrease in breast cancer incidence rate may also have been due to the reduced use of hormone replacement therapy starting in the early 2000s. Hormone replacement therapy is associated with an increased risk of breast cancer among post-menopausal women.^[25,26]

COLORECTAL CANCER

The age-standardized incidence rate for colorectal cancer among males decreased by 2.6% per year from 2008 to 2018. Incidence rates for colon cancer and rectal cancer dropped in males during this period.

Among females, the colorectal cancer incidence rate was stable from 1996 to 2000. It then decreased after 2000, first at a rate of 1.3% per year until 2010, and then more rapidly by 2.4% per year until 2018. These patterns may reflect the following opposing trends for colorectal cancer subsites in females:

- an increase in cancer of the rectosigmoid junction from 1996 to 2000
- an overall decrease in colon cancer from 1984 to 2018

LUNG CANCER

In males, the age-standardized incidence rate for lung cancer experienced 2 periods of significant decrease – the first from 1990 to 2008 at a rate of 2.1% per year and then again more recently from 2012 to 2018 at a rate of 2.9% per year. The incidence rate among females increased from 1984 to 1998, remained stable until 2012 and then began steadily decreasing by 1.0% per year.

The differences in timing for these decreases in lung cancer incidence rates in males and females over the last 2 decades reflect historical differences in male and female smoking rates.^[27] While tobacco use is the primary cause of lung cancer, other causes include exposure to radon, asbestos, second-hand smoke and air pollution.

PROSTATE CANCER

The age-standardized incidence rate for prostate cancer increased 1.3% per year from 1992 to 2007, and then fell by 6.6% per year from 2007 to 2014 before stabilizing in recent years. An abrupt rise and fall in incidence rate is common when a new method of early diagnosis is introduced or its frequency of use is heavily influenced by clinical guidance. For example, the widespread use of the prostate-specific antigen test has led to the early detection of prostate cancer. However, a decrease in the use of the test reflects the influence of recommendations from the U.S. Preventive Services Task Force against using prostate-specific antigen testing to routinely screen healthy males^[28].

Notable changes in trend for other cancers

CERVICAL CANCER

Following 2 decades of decline, the cervical cancer incidence rate had no significant upward or downward trend from 2006 to 2018. However, from 2010 to 2014 there was a decrease in the incidence rate for cervical cancer of 5.0% per year (although not statistically significant), which follows the introduction of school-based human papillomavirus vaccination for Ontario girls in 2007. A drop in cervical cancer incidence has also been observed in other jurisdictions where human papillomavirus vaccination was introduced.^[29]

LEUKEMIA

Following 3 decades of stable trends, leukemia incidence rates began decreasing in 2007. Since 2008, the incidence rate for chronic lymphocytic leukemia in particular has decreased, while the rates for other leukemia types have increased. The decreasing trend in chronic lymphocytic leukemia mirrors recent observations in other countries^[30], and likely reflects the effect of the change of the more restricted diagnostic criteria for chronic lymphocytic leukemia in 2008.^[31, 32]

LIVER CANCER

Incidence rates for liver cancer increased steeply from 1984 to 2012, although the rates have stabilized in recent years. Among males, the age-standardized incidence rate increased at a rate of 4.6% per year from 1984 to 2013 and was stable from 2013 to 2018. The trend was more pronounced among females, with the age-standardized incidence rate increasing by 3.3% per year from 1984 to 2008, by 14.8% per year from 2008 to 2012, and finally stabilizing from 2012 to 2018.

The abrupt stabilization of the upward incidence trend in liver cancer could be due to the recent introduction of direct-acting antiviral treatment for viral hepatitis C, and suggests that the risk of liver cancer among people treated for hepatitis may be lower in the medium- to long-term.^[33]

LYMPHOMA

A steady increase in lymphomas from 1984 to 2013 plateaued from 2013 to 2018, mirroring the trend in non-Hodgkin lymphoma. Following a prominent increase from 2009 to 2013 of 4.6% per year, the non-Hodgkin lymphoma rate stabilized from 2013 to 2018.

MYELOMA

For males and females combined, the age-standardized incidence rate for myeloma increased by 2.6% per year from 2008 to 2018. This trend is likely driven by a similar increase among females.

THYROID CANCER

The age-standardized incidence rate for thyroid cancer decreased significantly, following nearly 3 decades of increasing rates. The incidence rate decreased by 4.1% per year from 2013 to 2018, largely due to the declining trend in papillary thyroid cancer. This trend was most prominent in females who experienced a decrease in rate of 5.0% per year over the same period.

UTERINE CANCER

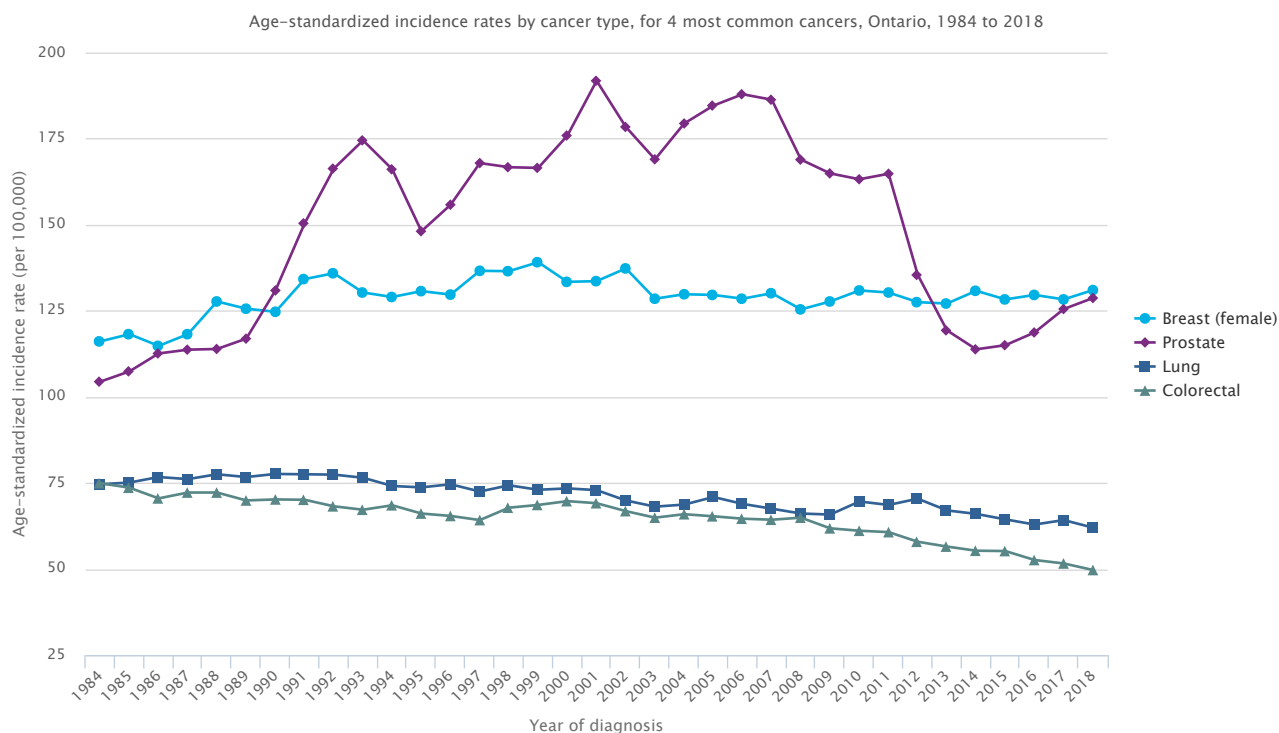
The age-standardized incidence rate for uterine cancer increased by 3.9% per year from 2005 to 2011 and continued to increase at a slower rate of 1.2% per year from 2011 to 2018. These increases were mainly due to rising incidence rates for the endometrial subsite (4.8% per year from 2005 to 2011).

Increasing incidence of endometrial cancer in other jurisdictions suggests a link to rising rates of obesity and decreasing rates of pregnancy, both of which increase exposure to estrogen, a key risk factor for endometrial cancer.^[34]

Thirty-five year trend in incidence

The age-standardized incidence rates from 1984 to 2018 for selected cancers are shown in Figure 4.3. These cancers represent the 4 most common cancers in Ontario (breast, prostate, lung and colorectal) and cancers with significantly increasing recent age-standardized incidence rate trends.

Figure 4.3

**Notes:**

- Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.
- International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules used when presenting trends over time.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 4.3A Age-standardized incidence rates by cancer type, for 4 most common cancers, Ontario, 1984 to 2018

YEAR OF DIAGNOSIS	BREAST (FEMALE)	PROSTATE	LUNG	COLORECTAL
1984	116.1	104.4	74.6	74.9
1985	118.2	107.4	75.1	73.6
1986	114.8	112.6	76.7	70.5
1987	118.2	113.7	76.1	72.2
1988	127.7	113.9	77.5	72.2
1989	125.6	116.9	76.7	69.9
1990	124.7	130.9	77.6	70.2
1991	134.2	150.4	77.5	70.1
1992	135.9	166.3	77.4	68.2
1993	130.3	174.5	76.5	67.2

1994	129	166.1	74.1	68.5
1995	130.7	148.1	73.7	66.1
1996	129.7	155.8	74.6	65.4
1997	136.6	167.9	72.5	64.2
1998	136.5	166.7	74.3	67.8
1999	139.1	166.5	73	68.6
2000	133.4	175.9	73.4	69.7
2001	133.6	191.8	72.9	69.1
2002	137.3	178.4	69.9	66.8
2003	128.5	169	68.1	64.9
2004	129.8	179.4	68.7	65.9
2005	129.6	184.6	70.9	65.3
2006	128.5	187.9	68.9	64.6
2007	130.1	186.3	67.5	64.3
2008	125.4	168.9	66.1	64.9
2009	127.7	164.9	65.8	61.8
2010	130.9	163.2	69.6	61.1
2011	130.3	164.8	68.6	60.7
2012	127.5	135.4	70.4	57.9
2013	127.1	119.3	67	56.5
2014	130.8	113.8	66	55.3
2015	128.3	115	64.4	55.2
2016	129.6	118.7	62.9	52.6
2017	128.3	125.5	64.2	51.6
2018	131	128.7	62	49.7

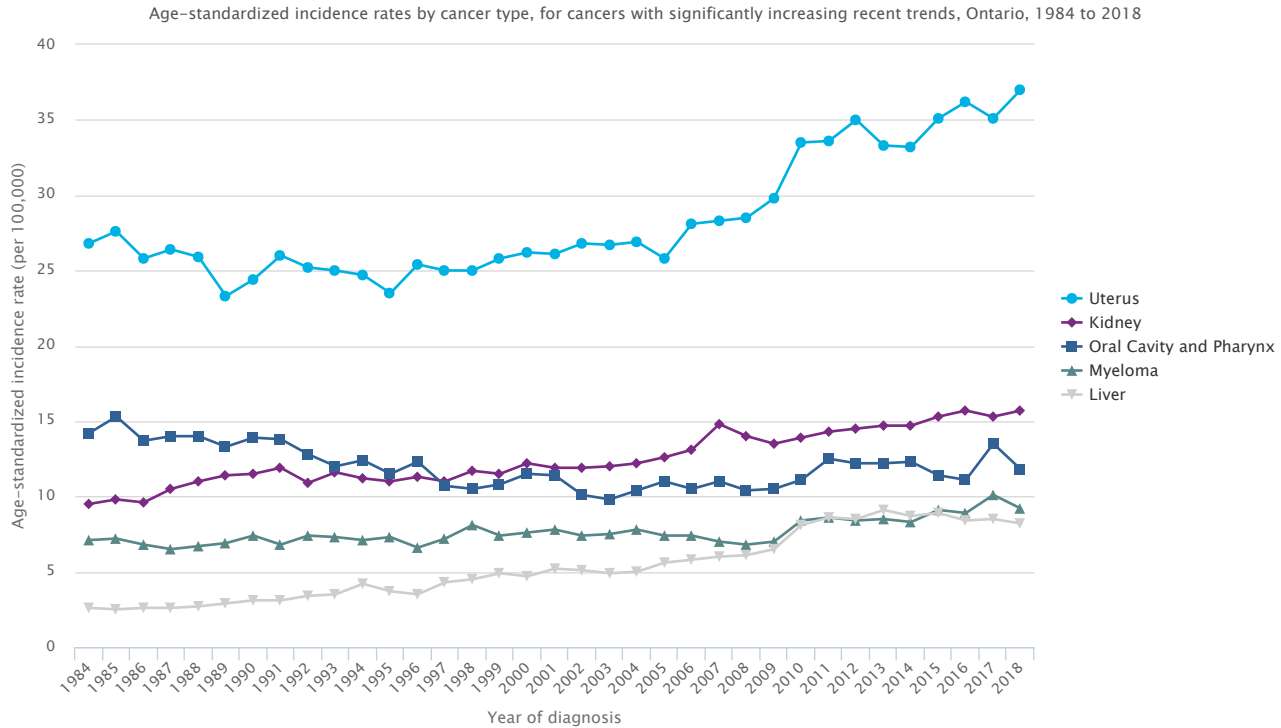
Notes:

- Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.
- International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules used when presenting trends over time.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 4.3B

**Notes:**

- Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.
- International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules used when presenting trends over time.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 4.3B Age-standardized incidence rates by cancer type, for cancers with significantly increasing recent trends, Ontario, 1984 to 2018

YEART OF DIAGNOSIS	UTERUS	KIDNEY	ORAL CAVITY AND PHARYNX	MYELOMA	LIVER
1984	26.8	9.5	14.2	7.1	2.6
1985	27.6	9.8	15.3	7.2	2.5
1986	25.8	9.6	13.7	6.8	2.6
1987	26.4	10.5	14	6.5	2.6
1988	25.9	11	14	6.7	2.7
1989	23.3	11.4	13.3	6.9	2.9
1990	24.4	11.5	13.9	7.4	3.1
1991	26	11.9	13.8	6.8	3.1

1992	25.2	10.9	12.8	7.4	3.4
1993	25	11.6	12	7.3	3.5
1994	24.7	11.2	12.4	7.1	4.2
1995	23.5	11	11.5	7.3	3.7
1996	25.4	11.3	12.3	6.6	3.5
1997	25	11	10.7	7.2	4.3
1998	25	11.7	10.5	8.1	4.5
1999	25.8	11.5	10.8	7.4	4.9
2000	26.2	12.2	11.5	7.6	4.7
2001	26.1	11.9	11.4	7.8	5.2
2002	26.8	11.9	10.1	7.4	5.1
2003	26.7	12	9.8	7.5	4.9
2004	26.9	12.2	10.4	7.8	5
2005	25.8	12.6	11	7.4	5.6
2006	28.1	13.1	10.5	7.4	5.8
2007	28.3	14.8	11	7	6
2008	28.5	14	10.4	6.8	6.1
2009	29.8	13.5	10.5	7	6.5
2010	33.5	13.9	11.1	8.4	8.1
2011	33.6	14.3	12.5	8.6	8.6
2012	35	14.5	12.2	8.4	8.5
2013	33.3	14.7	12.2	8.5	9.1
2014	33.2	14.7	12.3	8.3	8.7
2015	35.1	15.3	11.4	9.1	8.9
2016	36.2	15.7	11.1	8.9	8.4
2017	35.1	15.3	13.5	10.1	8.5
2018	37	15.7	11.8	9.2	8.2

Notes:

- Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.
- International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules used when presenting trends over time.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

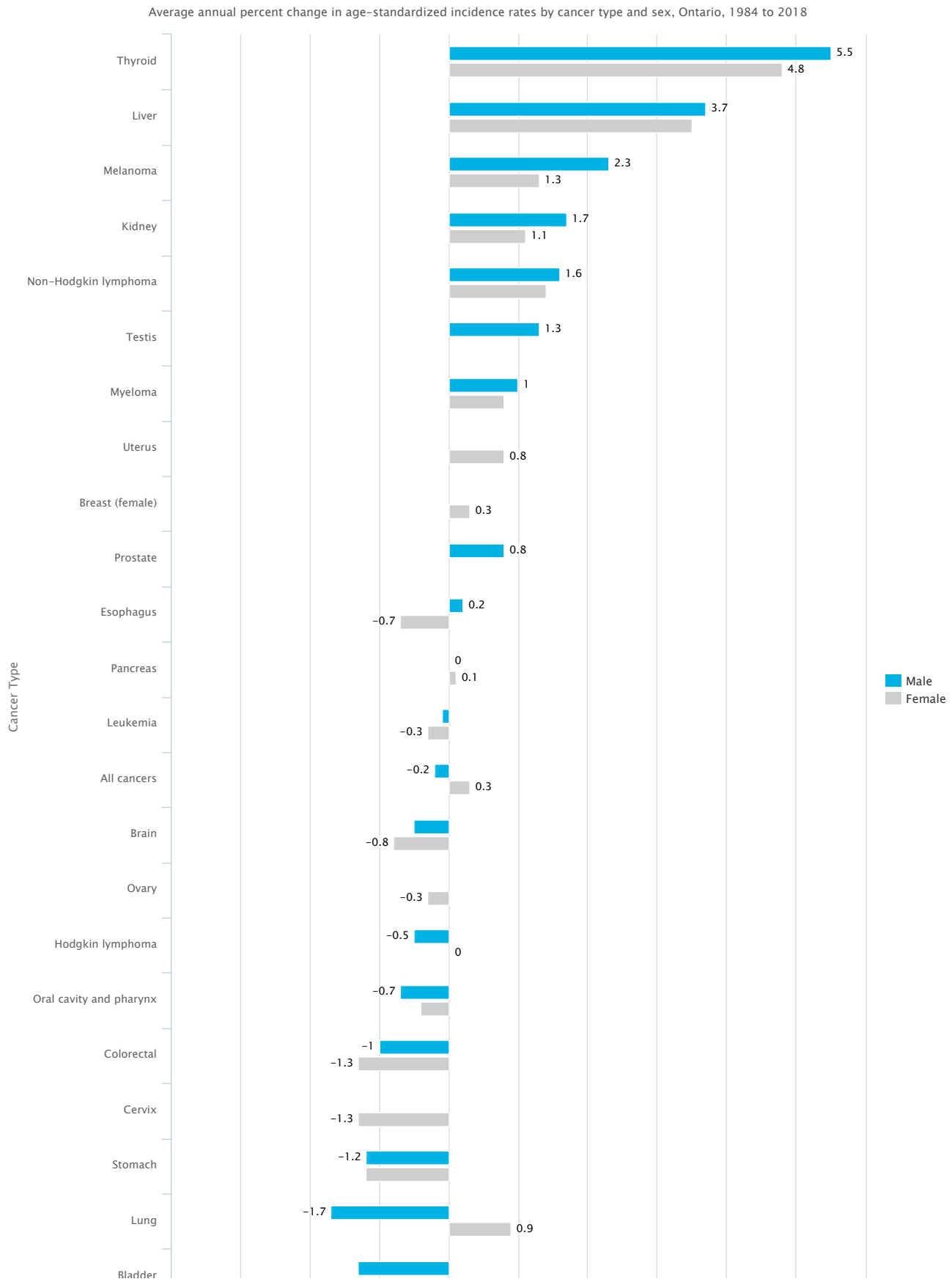
Over the last 35 years (1984 to 2018) the average annual percent change in age-standardized incidence rate for males (Figure 4.4):

- increased most for thyroid cancer (5.5%), liver cancer (3.7%), melanoma (2.3%) and kidney cancer (1.7%)
- remained stable for esophageal, pancreatic and prostate cancers, leukemia, myeloma and all cancers combined
- decreased most for laryngeal (2.4%), lung (1.7%), bladder (1.6%) and stomach (1.2%) cancers

For females, the average annual percent change:

- increased most for thyroid (4.8%) and liver (3.5%) cancers, as well as for Non-Hodgkin lymphoma (1.4%) and melanoma (1.3%)
- remained stable for pancreatic cancer, Hodgkin lymphoma and leukemia
- decreased most for laryngeal (2.7%), cervical (1.3%), bladder (2.0%) and stomach (1.2%) cancer

Figure 4.4



Notes:

1. The bladder cancer trend begins in 1989 due to classification changes and excludes carcinomas *in situ*; the average annual percent change is for 1989 to 2018.
2. Rates are standardized to the age distribution of the 2011 Canadian Standard population.
3. International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules are used when presenting trends over time.
4. The average annual percent changes for the following cancer types were not statistically significant among males: all cancers, esophagus, leukemia, myeloma, pancreas and prostate.
5. The average annual percent changes for the following cancer types were not statistically significant among females: Hodgkin lymphoma, pancreas and leukemia.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)**Data source:** Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Table 4.4 Average annual percent change in age-standardized incidence rates by cancer type and sex, Ontario, 1984 to 2018

AVERAGE ANNUAL PERCENT CHANGE (%)	MALE	FEMALE
Thyroid	5.5	4.8
Liver	3.7	3.5
Melanoma	2.3	1.3
Kidney	1.7	1.1
Non-Hodgkin lymphoma	1.6	1.4
Testis	1.3	-
Myeloma	1	0.8
Uterus	-	0.8
Breast (female)	-	0.3
Prostate	0.8	-
Esophagus	0.2	-0.7
Pancreas	0	0.1
Leukemia	-0.1	-0.3
All cancers	-0.2	0.3
Brain	-0.5	-0.8
Ovary	-	-0.3
Hodgkin lymphoma	-0.5	0
Oral cavity and pharynx	-0.7	-0.4
Colorectal	-1	-1.3
Cervix	-	-1.3

Stomach	-1.2	-1.2
Lung	-1.7	0.9
Bladder	-1.3	-1.6
Larynx	-2.4	-2.7

Notes:

1. The bladder cancer trend begins in 1989 due to classification changes and excludes carcinomas *in situ*; the average annual percent change is for 1989 to 2018.
2. Rates are standardized to the age distribution of the 2011 Canadian Standard population.
3. International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules are used when presenting trends over time.
4. The average annual percent changes for the following cancer types were not statistically significant among males: all cancers, esophagus, leukemia, myeloma, pancreas and prostate.
5. The average annual percent changes for the following cancer types were not statistically significant among females: Hodgkin lymphoma, pancreas and leukemia.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

INCIDENCE TRENDS BY AGE

Over the past 35 years, cancer incidence rates have been generally increasing among people under 40 and decreasing among people 80 and older, although these trends differ by sex.

Ages 0 to 39

Among people under age 40, the cancer incidence rate increased by 0.5% per year from 1981 to 2001, and then by 1.6% per year from 2001 to 2011 before stabilizing from 2011 to 2018 (Figure 4.5).

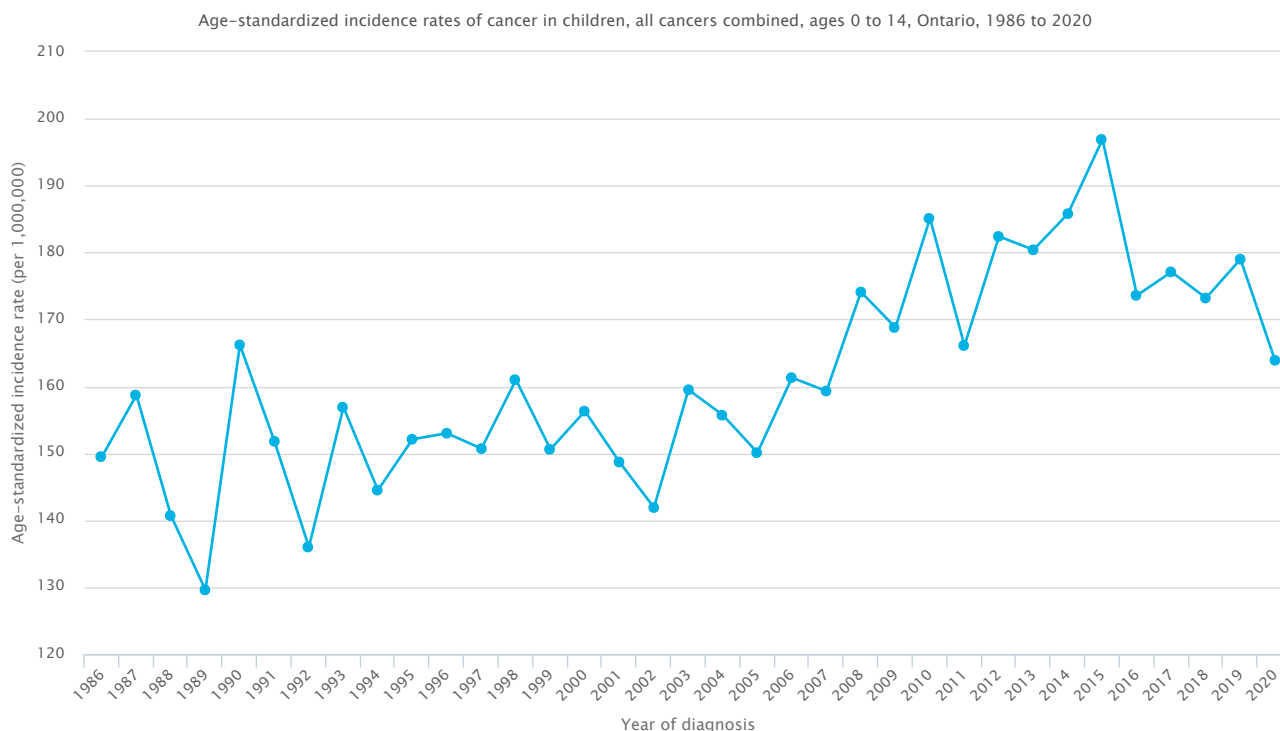
Different trends were seen in males and females. Among males, the rate increased by 1.9% per year from 1984 to 1990, remained stable until 2001 and then increased by 0.8% per year from 2001 to 2018. For females, the rate was stable from 1984 to 1994, increased by 1.7% per year until 2009 and then stabilized from 2009 to 2018. The increase in incidence among males is probably due to the increasing rates of testicular, colorectal and thyroid cancers in this age group (data not shown).

Among children ages 0 to 14, the overall average annual percent change in age-standardized incidence rate was stable from 1986 to 2020 (0.3% per year, not significant), but increased by 1.7% per year from 2002 to 2015 before becoming relatively stable again from 2015 to 2020 (see **Spotlight: Childhood Cancer Incidence Trend, Figure 4.S1** ([#spotlight-childhood-cancer-incidence-trends](#))).

For more details on childhood cancer incidence trends, read the **Pediatric Oncology Group of Ontario Surveillance Report** (https://www.pogo.ca/research-data/data-reports/?utm_source=outlook&utm_medium=email&utm_campaign=OCS_2022).

SPOTLIGHT: Childhood Cancer Incidence Trend

Figure 4.S1



Abbreviation: ASIR means age-standardized incidence rate; APC means annual percent change.

Symbol: * Means significant changing APC.

Notes:

1. Rates are per 1,000,000.
2. For childhood cancers, the International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules were used.

Analysis by: Health Analytics, Pediatric Oncology Group of Ontario

Data source: Pediatric Oncology Group of Ontario Networked Information System (April 7, 2021), Pediatric Oncology Group of Ontario

PERIOD	APC (%)
1986 to 2002	0.1
2002 to 2015	1.7*
2015 to 2020	-2.5

Figure 4.S1: Age-standardized incidence rates of cancer in children, all cancers combined, ages 0 to 14, Ontario, 1986 to 2020

YEAR OF DIAGNOSIS	ASIR
1986	149.5
1987	158.7
1988	140.7

1989	129.6
1990	166.2
1991	151.8
1992	136
1993	156.9
1994	144.5
1995	152.1
1996	153
1997	150.7
1998	161
1999	150.6
2000	156.3
2001	148.7
2002	141.9
2003	159.5
2004	155.7
2005	150.1
2006	161.3
2007	159.3
2008	174.1
2009	168.8
2010	185.1
2011	166.1
2012	182.4
2013	180.4
2014	185.8
2015	196.9
2016	173.6
2017	177.1
2018	173.2
2019	179

2020

163.9

Abbreviation: ASIR means age-standardized incidence rate; APC means annual percent change.

Symbol: * Means significant changing APC.

Notes:

1. Rates are per 1,000,000.
2. For childhood cancers, the International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules were used.

Analysis by: Health Analytics, Pediatric Oncology Group of Ontario

Data source: Pediatric Oncology Group of Ontario Networked Information System (April 7, 2021), Pediatric Oncology Group of Ontario

Ages 40 to 59

Among people ages 40 to 59, the rate of cancer increased by 0.5% per year from 1984 to 2007 and then decreased by 0.5% per year from 2007 to 2018. While the trend among males was similar to the overall trend, the female rate increased by 0.4% per year from 1984 to 2018.

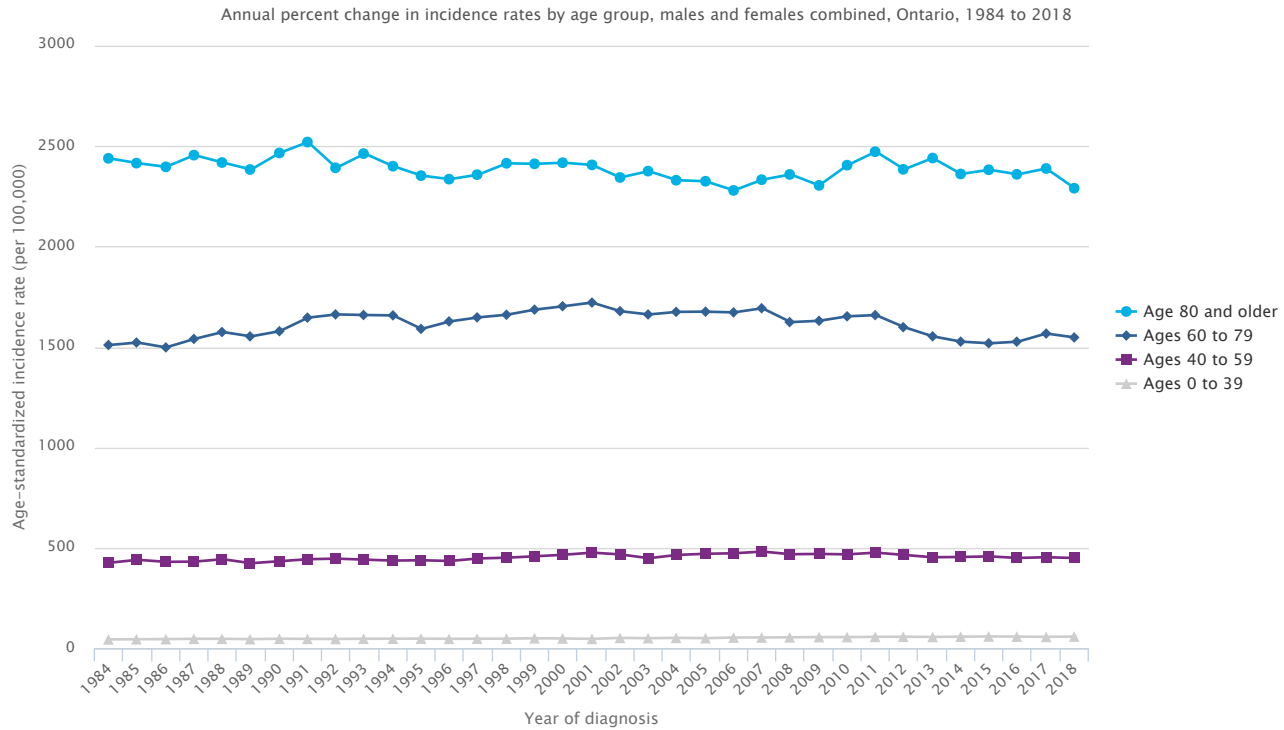
Ages 60 to 79

For people ages 60 to 79, the rate increased by 1.2% per year from 1984 to 1992, remained stable until 2007, decreased by 2.2% per year from 2007 to 2014 and was stable from 2014 to 2018. The trend among males was similar to the overall trend, although the rate of decrease from 2007 to 2014 was greater, at 3.7% per year. Females in this age group had no significant increase or decrease in incidence rate, remaining stable from 1984 to 2018.

Ages 80 and older

In the oldest age group (people age 80 and older), the incidence rate decreased steadily from 1984 to 2018 by 0.2% per year. While males had a period of stable incidence rates from 1984 to 1991, followed by a decrease of 1.2% per year from 1991 onward, the female rate increased slowly by 0.2% per year from 1984 to 2018.

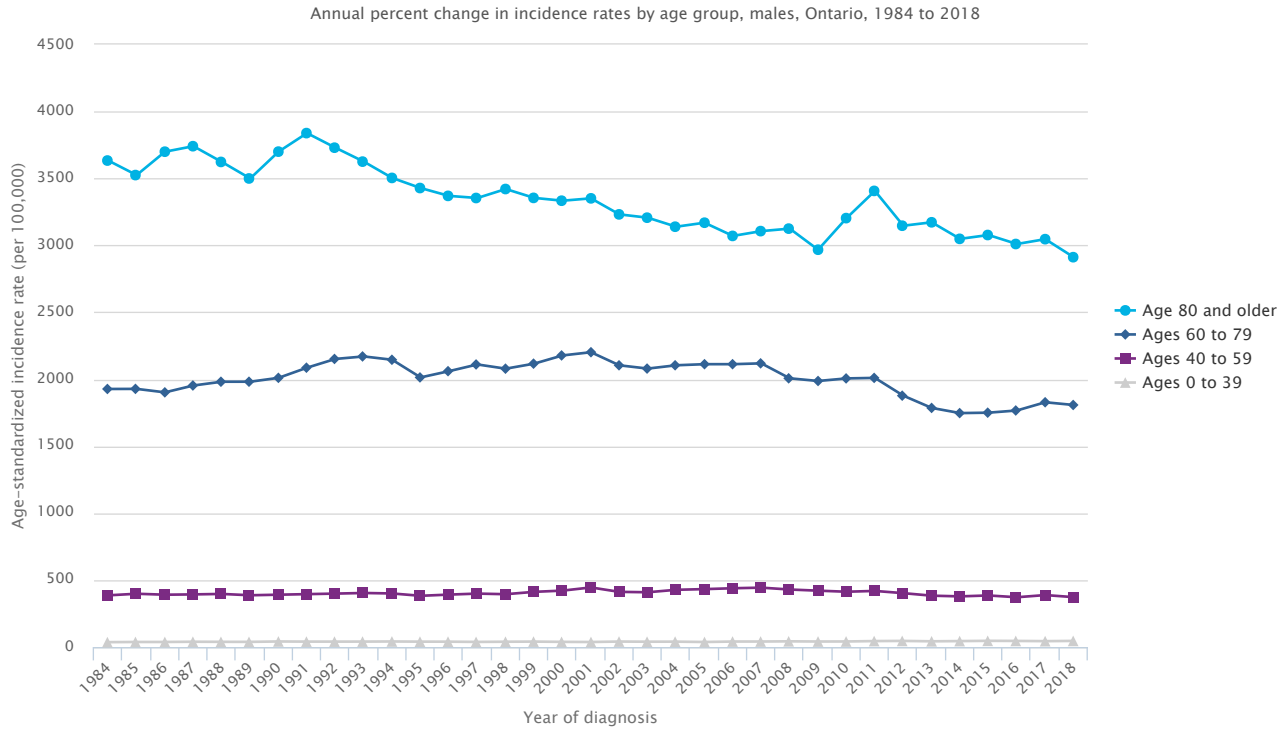
Figure 4.5A



Both Sexes APCs (Annual percentage change (%))

Ages 0 to 39		Ages 40 to 59		Ages 60 to 79		Age 80 or older	
PERIOD	APC	PERIOD	APC	PERIOD	APC	PERIOD	APC
1984-2001	0.5*	1984-2007	0.5*	1984-1992	1.2*	1984-2018	-0.2*
2001-2011	1.6*	2007-2018	-0.5*	1992-2007	0.2		
2011-2018	0.3			2007-2014	-2.2*		
				2014-2018	0.6		

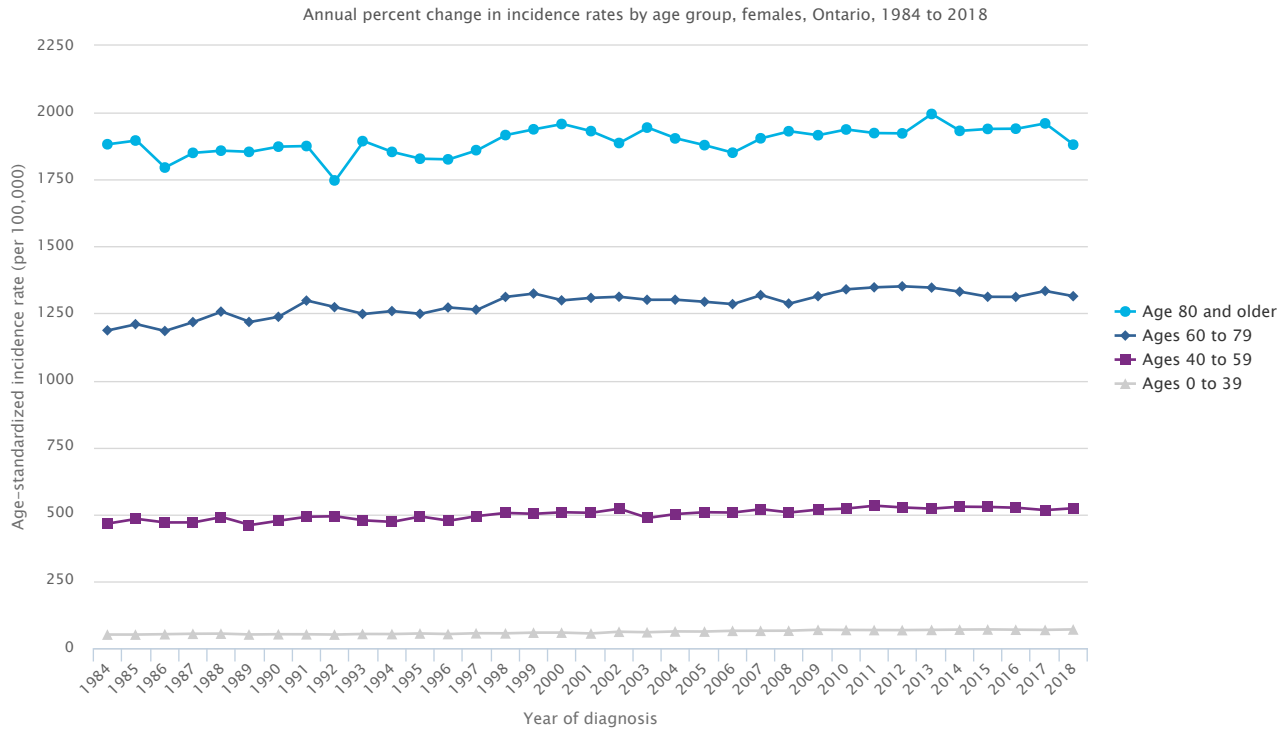
Figure 4.5B



Males APCs (Annual percentage change (%))

Ages 0 to 39		Ages 40 to 59		Ages 60 to 79		Age 80 or older	
PERIOD	APC	PERIOD	APC	PERIOD	APC	PERIOD	APC
1984-1990	1.9*	1984-1996	0.1	1984-1992	1.4*	1984-1991	0.4
1990-2001	-0.4	1996-2007	1*	1992-2007	0	1991-2018	-1.2*
2001-2018	0.8*	2007-2014	-2.4*	2007-2014	-3.7*		
		2014-2018	-0.1*	2014-2018	1		

Figure 4.5C



Females APCs (Annual percentage change (%))

Ages 0 to 39		Ages 40 to 59		Ages 60 to 79		Age 80 or older	
PERIOD	APC	PERIOD	APC	PERIOD	APC	PERIOD	APC
1984-1994	0.1	1984-2018	0.4*	1984-1991	1.1	1984-2018	0.2*
1994-2009	1.7*			1991-1995	-0.4		
2009-2018	0.3			1995-1999	1.3		
				1999-2018	-0.1		

Abbreviation: APC means annual percent change.

Notes:

- Counts are based on the National Cancer Institute Surveillance, Epidemiology and End Results Program standards for counting multiple primary cancers.
- Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 4.5A Annual percent change in incidence rates by age group, males and females combined, Ontario, 1984 to 2018

YEAR OF DIAGNOSIS	AGE 80 AND OLDER	AGES 60 TO 79	AGES 40 TO 59	AGES 0 TO 39
1984	2439	1509.4	425.1	43.5
1985	2415.1	1521.7	439.9	44.2

1986	2396.6	1497.5	429.6	44.9
1987	2455.1	1539.7	430.9	46.6
1988	2418.2	1574.1	442.7	46.5
1989	2383.4	1552.5	422.9	44.8
1990	2465.7	1578.2	432.9	46.8
1991	2520.2	1645.7	442.8	46.1
1992	2391.9	1661.8	445.7	45.6
1993	2462.5	1658.8	440.6	46.7
1994	2399.9	1656.9	436	47
1995	2352.9	1589.6	437.6	47.5
1996	2335.3	1627	434.1	46.3
1997	2357.7	1647.1	446.7	46.9
1998	2414.3	1660.2	450.3	47.3
1999	2411.7	1685.7	457.4	49.2
2000	2417.1	1702.6	464.8	48.2
2001	2406.4	1720.8	475.5	46.1
2002	2343.8	1677.9	466.7	51
2003	2375.2	1661.5	447.9	49.5
2004	2330	1674.5	464.1	51.2
2005	2325	1675.5	469.8	49.7
2006	2279.4	1671.9	472.3	52.8
2007	2332.7	1692.6	480.8	53.1
2008	2358.8	1623.5	467.7	53.9
2009	2304.3	1630	469	55
2010	2405	1652.4	467.1	54.9
2011	2472.1	1658.4	475.5	56.3
2012	2384.3	1598.2	464	56.8
2013	2440.5	1552.7	452.6	55.7
2014	2361.2	1526.3	453.9	57.1
2015	2382.1	1518.1	456.9	58.3
2016	2359.3	1526	449	57.4

2017	2388.5	1566.7	452.7	56.1
2018	2290.2	1547.1	448.8	57.8

Figure 4.5B Annual percent change in incidence rates by age group, males, Ontario, 1984 to 2018

	AGE 80 AND OLDER	AGES 60 TO 79	AGES 40 TO 59	AGES 0 TO 39
1984	3633.7	1927.4	386	36.3
1985	3525.2	1928.1	397.9	37.7
1986	3699.8	1902.2	390.7	37.7
1987	3740.9	1953.4	393	39.4
1988	3623.3	1981.6	396.5	38.7
1989	3499.9	1981.7	386.6	38.5
1990	3700.3	2010.6	390.7	41.5
1991	3838.6	2086.4	395	40.3
1992	3729.7	2151.8	399	40.4
1993	3625.6	2170.5	403.6	40.5
1994	3503.9	2145.7	400	41.4
1995	3428.4	2013.8	382.6	40.1
1996	3369.7	2060.5	391.4	39.9
1997	3353.9	2110.6	399.1	38.2
1998	3421	2079.1	394.5	39.5
1999	3354.8	2116.6	412.1	40.5
2000	3333.7	2178	421.2	38.5
2001	3351.4	2202	445	37.5
2002	3231.6	2104.2	412	40.8
2003	3206.9	2079.8	409.1	39.7
2004	3139.5	2104.4	427.4	40.1
2005	3169.3	2112.6	432.5	37.5
2006	3070.7	2112.6	439	40.9
2007	3106.6	2118.8	443.5	41.1
2008	3125.2	2007.1	429.5	42.5
2009	2967.7	1987.2	420.9	41.1
2010	3203.7	2006.3	412.9	41.4

2011	3406.9	2010.2	418.9	44.4
2012	3146.9	1877.4	402.3	45.5
2013	3172.4	1786	383.5	42.6
2014	3048.8	1747.3	378.3	44.3
2015	3077.5	1750.4	385.1	46.2
2016	3010.3	1766.8	371.8	45.4
2017	3046.5	1828.2	388	43.8
2018	2911.8	1807.9	372.6	45.6

Figure 4.5C Annual percent change in incidence rates by age group, females, Ontario, 1984 to 2018

YEAR OF DIAGNOSIS	AGE 80 AND OLDER	AGES 60 TO 79	AGES 40 TO 59	AGES 0 TO 39
1984	1881.9	1186.9	465.4	50.7
1985	1895.8	1209.9	482.8	50.7
1986	1794.9	1184.5	469.4	52.1
1987	1849.7	1217.8	469.5	53.7
1988	1857.9	1256.9	489.6	54.2
1989	1853.5	1218.2	459.7	51
1990	1872.9	1237.4	475.6	51.9
1991	1875.2	1298	490.8	51.8
1992	1746.8	1273.4	492.4	50.7
1993	1893.5	1247.9	477.3	52.9
1994	1853.3	1258.9	471.5	52.6
1995	1827.8	1248.5	491.6	54.8
1996	1825.5	1272.2	475.9	52.7
1997	1859.8	1263.9	493.3	55.7
1998	1916.1	1311.7	504.9	55.3
1999	1937.7	1324.3	501.7	57.9
2000	1957.5	1298.9	507.5	58
2001	1931	1308.1	505.4	54.8
2002	1886.5	1312.3	520.7	61.3
2003	1944.1	1301	486.4	59.4
2004	1903.7	1301.2	500.9	62.4

2005	1878.5	1293.6	507.6	61.9
2006	1850.3	1284.8	506.4	64.8
2007	1904.1	1318.6	518.9	64.9
2008	1930.5	1286.9	506.6	65.2
2009	1915.6	1314.4	517.4	68.6
2010	1937	1340	521.3	67.9
2011	1923.6	1347.5	532	67.6
2012	1922.5	1351.3	525.3	67.4
2013	1994.9	1346.4	520.9	68.2
2014	1931.9	1331.2	528.3	69.2
2015	1939.1	1312.1	527.3	69.8
2016	1940	1311.8	524.3	68.9
2017	1959.7	1333.9	515.5	68.2
2018	1880.3	1314.4	522.5	69.9

Abbreviation: APC means annual percent change.

Notes:

1. Counts are based on the National Cancer Institute Surveillance, Epidemiology and End Results Program standards for counting multiple primary cancers.
2. Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

INCIDENCE BY STAGE

“Cancer staging” refers to classifying people with cancer into groups according to the extent of their disease. “Stage at diagnosis” is the extent of the disease at the time of initial diagnosis.

A stage group (i.e., stage 0, 1, 2, 3 or 4) is based on distinct characteristics of a tumour that describe the extent of spread of a cancer in the body. Knowing the stage of the disease helps physicians plan appropriate treatment and determine the likely outcome or course of the disease. Information about stage at diagnosis is one of the most important factors for predicting the outcome for someone with cancer.

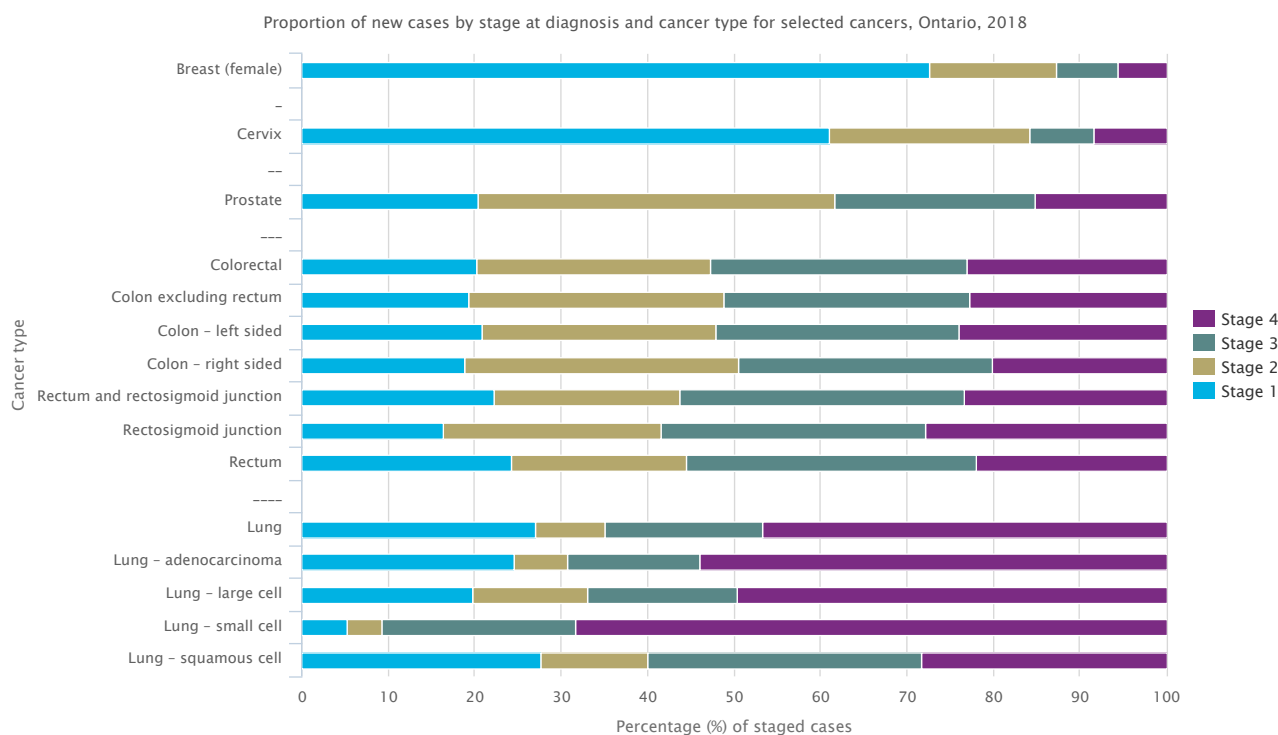
A cancer diagnosed at an early stage is more likely to be treated successfully. If the cancer has spread, treatment becomes more difficult and someone’s chances of survival are generally much lower.

The stage group is useful as a comparator within and across different cancer types, as well as for comparing trends over time. High-quality stage information at the population level supports healthcare providers, administrators, researchers and decision-makers in planning, evaluating and enhancing quality of care to improve treatment outcomes.

Population-level stage at diagnosis data with high completeness are available in Ontario for 5 cancers: female

breast, prostate, colorectal, lung and cervical. In 2018, a new staging classification scheme was adopted by the Ontario Cancer Registry that affects the stage distribution of many cancers for cases diagnosed from 2018 onward (see **Appendix 1: Data Sources** [\(node/72816\)](#)).

Figure 4.6



Note: Cases that had no stage group assigned were excluded from this analysis. Case counts are as follows: prostate n = 8,105 (excludes unknown stage = 843); breast n = 10,139 (excludes unknown stage = 519); colorectal n = 6,383 (excludes unknown stage = 685); lung n = 8,440 (excludes unknown stage = 190); cervix n = 503 (excludes unknown stage = 12).

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 4.6 Proportion of new cases by stage at diagnosis and cancer type for selected cancers, Ontario, 2018

PERCENTAGE (%) OF STAGED CASES	STAGE 1 (%)	STAGE 2 (%)	STAGE 3 (%)	STAGE 4 (%)
Breast (female)	72.6	14.7	7	5.6
—				
Cervix	61	23.3	7.4	8.3
—				
Prostate	20.4	41.2	23.1	15.2
—				
Colorectal	20.2	27.1	29.7	23

Colon excluding rectum	19.3	29.6	28.4	22.8
Colon - left sided	20.8	27.1	28.2	23.9
Colon - right sided	18.9	31.7	29.3	20.1
Rectum and rectosigmoid junction	22.3	21.5	32.8	23.4
Rectosigmoid junction	16.3	25.3	30.5	27.8
Rectum	24.2	20.3	33.6	21.9
Lung	27	8.1	18.2	46.7
Lung - adenocarcinoma	24.5	6.3	15.2	54
Lung - large cell	19.8	13.2	17.4	49.6
Lung - small cell	5.3	3.9	22.5	68.3
Lung - squamous cell	27.7	12.4	31.7	28.3

Note: Cases that had no stage group assigned were excluded from this analysis. Case counts are as follows: prostate n = 8,105 (excludes unknown stage = 843); breast n = 10,139 (excludes unknown stage = 519); colorectal n = 6,383 (excludes unknown stage = 685); lung n = 8,440 (excludes unknown stage = 190); cervix n = 503 (excludes unknown stage = 12).

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

The majority of breast, prostate and cervical cancer cases, and half of all staged colorectal cancer cases were diagnosed at stage 1 or 2.

The majority of breast, prostate and cervical cancer cases, and half of all staged colorectal cancer cases were diagnosed at stage 1 or 2 (Figure 4.6). Some of these early stage diagnoses may partly be because screening is available for breast, colorectal and cervical cancers. The breast and colorectal screening programs aim to detect cancers at an early stage, while the cervical screening program's goal is to prevent cancer by detecting and treating pre-cancers. The distribution of stage varied by cancer type:

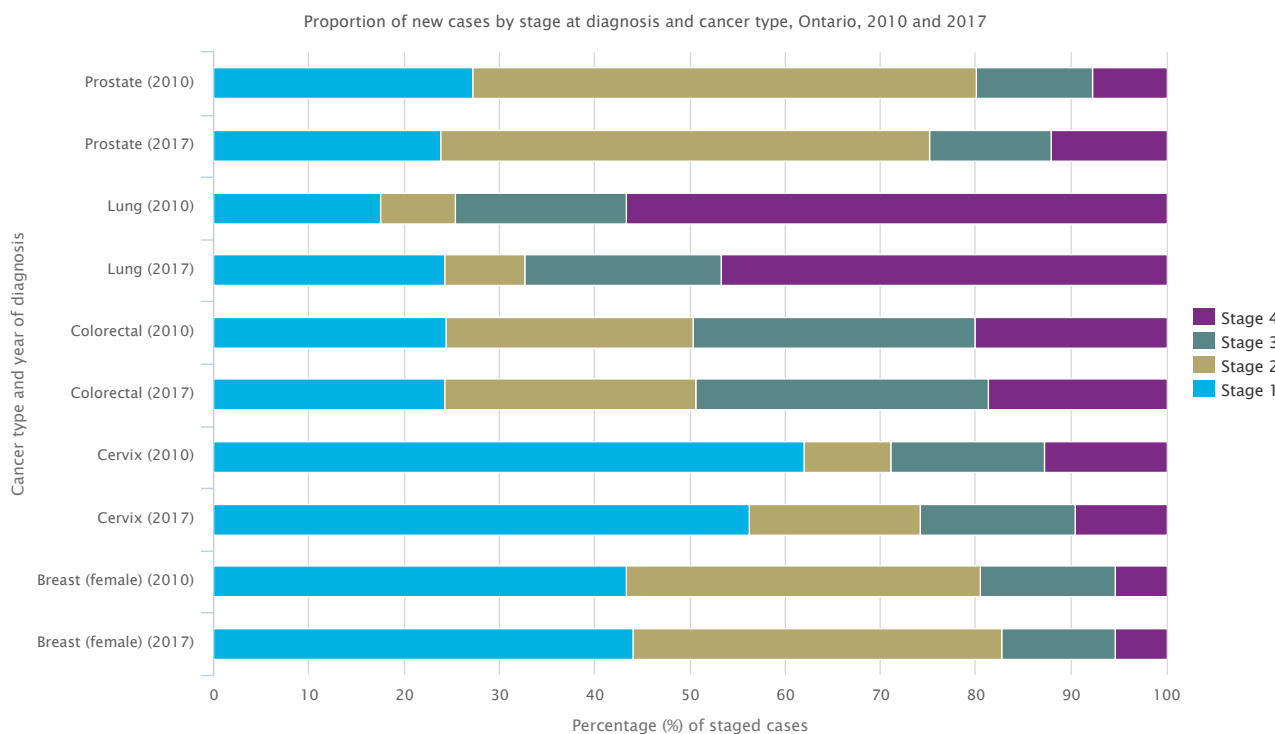
- The majority of staged breast cancer cases were diagnosed at stage 1 (72.6%) or stage 2 (14.7%) in 2018.
- Cervical cancer was most likely to be diagnosed at stage 1 (61.0%). People diagnosed at a later stage are less likely to have been routinely screened, which supports the need for efforts to improve cervical screening participation in the population.⁽³⁵⁾ About 8.3% of cases were not diagnosed until stage 4.
- The majority of staged colorectal cancer cases were diagnosed at stage 2 (27.1%) or stage 3 (29.7%). The distribution of stage was similar for the colorectal cancer subsites; however, a slightly greater proportion of cancers of the rectum (33.6%) and rectosigmoid junction (30.5%) were diagnosed at stage 3.
- Prostate cancer was most likely to be diagnosed at stage 2 (41.2%), followed by stage 3 (23.1%).
- Lung cancer was most likely to be diagnosed at stage 4, which accounted for 46.7% of all staged lung cancer cases. Out of all lung cancer subtypes, small cell lung cancer had the greatest proportion of cases diagnosed at stage 4 (68.3%).

Trends in stage distribution

The distribution of stage at diagnosis for female breast, prostate, colorectal, lung and cervical cancers changed from 2010 to 2017 (Figure 4.7). Because of the change in staging rules starting in 2018, cases from this year are excluded from the comparison with historical stage group distributions.

- The proportion of prostate cancer cases diagnosed at stage 1 decreased from 27% in 2010 to 24% in 2017. However, the proportion of cases diagnosed at stage 4 increased from 8% in 2010 to 12% in 2017. This shift in stage distribution may be partly because less opportunistic screening for prostate cancer took place following a recommendation against using the prostate-specific antigen test.^(28,36) This recommendation may have resulted in the detection of fewer early stage cases and more symptomatic cases at later stages.
- The proportion of lung cancer cases diagnosed at stage 1 increased from 18% in 2010 to 24% in 2017, while the proportion of cases diagnosed at stage 4 decreased from 57% in 2010 to 47% in 2017. Some evidence suggests that this downward shift in stage at diagnosis may reflect earlier detection resulting from recent lung cancer awareness campaigns.⁽³⁷⁾
- The stage distribution has remained relatively unchanged for colorectal cancer. There was no change in the proportion of cases diagnosed at early stages from 2010 to 2017. The proportion of cases diagnosed at later stages shifted slightly from 20% diagnosed at stage 4 in 2010 to 19% in 2017, and from 30% diagnosed at stage 3 in 2010 to 31% in 2017.
- The proportion of cervical cancer cases diagnosed at stage 1 dropped from 62% in 2010 to 56% in 2017, while the proportion of cases diagnosed at stage 2 increased from 9% in 2010 to 18% in 2017. This shift in stage distribution may be explained by factors such as decreasing screening participation⁽³⁸⁾ and inadequate follow-up of abnormal screening results in some people⁽³⁸⁾. Lack of timely and appropriate access to care for people with symptoms may also have contributed to this change. To better understand this shift in stage distribution in Ontario, further analysis is warranted.
- The stage distribution of breast cancer cases remained relatively stable, with the proportion of early-stage cases increasing slightly (from 43% to 44% for stage 1 and 37% to 39% for stage 2) from 2010 to 2017.

Figure 4.7



Notes:

1. Case counts for 2010: prostate count = 8,767 (excludes unknown stage = 51); breast n = 8,513 (excludes unknown stage =

- 59); colorectal count = 7,402 (excludes unknown stage = 208); lung count = 7,955 (excludes unknown stage = 84); cervix count = 197 (excludes unknown stage less than 6).
2. Case counts for 2017: prostate count = 8,282 (excludes unknown stage = 17); breast count = 10,084 (excludes unknown stage = 47); colorectal count = 7,004 (excludes unknown stage = 168); lung count = 7,954 (excludes unknown stage = 22); cervix count = 532 (excludes unknown stage less than 6).
3. Cases not staged were excluded from this analysis.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 4.7 Proportion of new cases by stage at diagnosis and cancer type, Ontario, 2010 and 2017

PERCENTAGE (%) OF STAGED CASES	STAGE 1	STAGE 2	STAGE 3	STAGE 4
Prostate (2017)	23.8	51.3	12.7	12.1
Prostate (2010)	27.2	52.9	12.2	7.7
Lung (2017)	24.3	8.3	20.6	46.7
Lung (2010)	17.5	7.9	17.9	56.7
Colorectal (2017)	24.2	26.4	30.8	18.6
Colorectal (2010)	24.4	26	29.6	20
Cervix (2017)	56.2	18	16.2	9.6
Cervix (2010)	61.9	9.1	16.2	12.7
Breast (female) (2017)	44	38.7	12	5.3
Breast (female) (2010)	43.4	37.1	14.2	5.3

Notes:

- Case counts for 2010: prostate count = 8,767 (excludes unknown stage = 51); breast n = 8,513 (excludes unknown stage = 59); colorectal count = 7,402 (excludes unknown stage = 208); lung count = 7,955 (excludes unknown stage = 84); cervix count = 197 (excludes unknown stage less than 6).
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- Cases not staged were excluded from this analysis.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

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Ontario Cancer Statistics 2022

Ch 5: Cancer Mortality

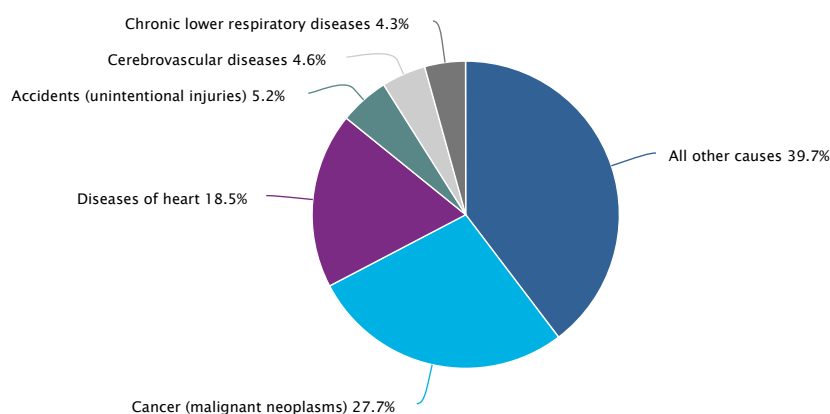
Mortality measures the number of deaths caused by cancer. This chapter presents actual (non-projected) cancer mortality rates and trends over time. These statistics are based on counts complete as of 2018, which is the latest available year.

CANCER AS A LEADING CAUSE OF DEATH

In 2018, cancer caused 27.7% of all deaths in Ontario, making it the province's leading cause of death (Figure 5.1).^[1] Cancer caused almost as many deaths as the next 3 leading causes of death combined: diseases of the heart, accidents and cerebrovascular diseases.

Figure 5.1

Leading causes of death, Ontario, 2018



Highcharts.com

Notes:

- ICD-10 codes for causes of death: chronic lower respiratory diseases [J40-J47]; accidents (unintentional injuries) [V01-X59, Y85-Y86]; cerebrovascular diseases [I60-I69]; diseases of heart [I00-I09, I11, I13, I20-I51]; cancer (malignant neoplasms) [C00-C97].

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Statistics Canada. Table 13-10-0801-01 Leading causes of death, total population (age

standardization using 2011 population)

Figure 5.1 Leading causes of death, Ontario, 2018

CAUSE OF DEATH	NUMBER OF DEATHS
All other causes 39.7%	42451
Cancer (malignant neoplasms) 27.7%	29585
Diseases of heart 18.5%	19786
Accidents (unintentional injuries) 5.2%	5593
Cerebrovascular diseases 4.6%	4970
Chronic lower respiratory diseases 4.3%	4606

Notes:

- ICD-10 codes for causes of death: chronic lower respiratory diseases [J40-J47]; accidents (unintentional injuries) [V01-X59, Y85-Y86]; cerebrovascular diseases [I60-I69]; diseases of heart [I00-I09, I11, I13, I20-I51]; cancer (malignant neoplasms) [C00-C97].

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Statistics Canada. Table 13-10-0801-01 Leading causes of death, total population (age standardization using 2011 population)

PROBABILITY OF DYING FROM CANCER

The probability of dying from cancer represents the average chance of death due to cancer. This probability depends on many factors:

- population characteristics (e.g., demographics)
- prevalence of risk factors (e.g., smoking, obesity)
- availability and uptake of effective screening tests
- current life expectancy
- treatment options available

These probabilities also 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, 1 in 4, or 25.1% of people, will die from cancer (Table 5.1). Males have a greater chance of dying from cancer at slightly more than 1 in 4 (27.4%), compared with females at 1 in 4 (23.2%).

As with the chance of developing cancer, the probability of dying from cancer varies based on cancer type:

- Among males, the probability is highest for lung (1 in 16 males), prostate (1 in 29) and colorectal (1 in 32) cancers.
- Among females, the probability is highest for lung (1 in 19 females) breast (1 in 31) and colorectal (1 in 38) cancers.



Table 5.1 Lifetime probability of dying of cancer, by cancer type and sex, Ontario, 2014 to 2018

CANCER TYPE	MALES AND FEMALES COMBINED %	MALES AND FEMALES COMBINED 1 IN	MALES %	MALES 1 IN	FEMALES %	FEMALES 1 IN
All cancers	25.1%	4	27.4%	4	23.2%	4
Bladder	0.9%	116	1.3%	77	0.5%	210
Brain	0.6%	170	0.7%	152	0.5%	192
Breast (female)	n/a	n/a	n/a	n/a	3.2%	31
Cervix	n/a	n/a	n/a	n/a	0.2%	467
Colorectal	2.9%	35	3.1%	32	2.7%	38
Esophagus	0.6%	162	0.9%	106	0.3%	317
Hodgkin lymphoma	0.0%	2,845	0.0%	2,373	0.0%	3,512
Kidney	0.5%	192	0.7%	150	0.4%	261
Larynx	0.1%	923	0.2%	537	0.0%	2,750
Leukemia	1.0%	104	1.1%	88	0.8%	123
Liver	0.9%	107	1.2%	84	0.7%	146
Lung	5.7%	17	6.3%	16	5.3%	19
Melanoma	0.4%	242	0.6%	180	0.3%	351
Myeloma	0.5%	195	0.6%	170	0.4%	225
Non-Hodgkin lymphoma	1.0%	101	1.1%	90	0.9%	114
Oral cavity and pharynx	0.4%	247	0.5%	182	0.3%	376
Ovary	n/a	n/a	n/a	n/a	1.1%	95
Pancreas	1.6%	64	1.6%	63	1.5%	66
Prostate	n/a	n/a	3.5%	29	n/a	n/a
Stomach	0.6%	157	0.8%	122	0.5%	212
Testis	n/a	n/a	0.0%	6,011	n/a	n/a
Thyroid	0.1%	1,267	0.1%	1,410	0.1%	1,164
Uterus	n/a	n/a	n/a	n/a	0.7%	137

Abbreviation: n/a means not applicable.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

MORTALITY BY SEX AND CANCER TYPE

In 2018, 29,712 people died from cancer in Ontario, for an age-standardized mortality rate of 185.2 per 100,000 (Table 5.2).

Table 5.2 Mortality counts and rates, by cancer type and sex, Ontario, 2018

CANCER TYPE	MALES AND FEMALES COMBINED DEATHS	MALES AND FEMALES COMBINED % OF DEATHS	MALES AND FEMALES COMBINED ASMR	MALES AND FEMALES COMBINED ASMR 95% CI	MALES DEATHS	MALES % OF DEATHS	MALES ASMR	MALES ASMR 95% CI	FEMALE DEATHS
All cancers	29,712	100.0%	185.2	183.0-187.3	15,706	100.0%	220.2	216.7-223.7	14,006
Bladder	854	2.9%	5.2	4.9-5.6	612	3.9%	8.9	8.2-9.6	242
Brain	844	2.8%	5.4	5.1-5.8	470	3.0%	6.5	5.9-7.1	374
Breast (female)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2,003
Cervix	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	145
Colorectal	3,099	10.4%	19.3	18.6-20.0	1,680	10.7%	23.8	22.7-25.0	1,419
Esophagus	847	2.9%	5.3	4.9-5.7	635	4.0%	8.7	8.1-9.4	212
Hodgkin lymphoma	35	0.1%	0.2	0.2-0.3	19	0.1%	0.3	0.2-0.4	16
Kidney	575	1.9%	3.6	3.3-3.9	368	2.3%	5.1	4.6-5.7	207
Larynx	148	0.5%	0.9	0.8-1.1	133	0.8%	1.8	1.5-2.2	15
Leukemia	1,077	3.6%	6.7	6.3-7.1	609	3.9%	8.6	7.9-9.3	468
Liver	1,210	4.1%	7.5	7.1-8.0	798	5.1%	10.9	10.2-11.7	412
Lung	6,971	23.5%	43.1	42.1-44.2	3,712	23.6%	51.1	49.5-52.8	3,259
Melanoma	487	1.6%	3.1	2.8-3.4	307	2.0%	4.4	3.9-4.9	180
Myeloma	586	2.0%	3.6	3.3-3.9	329	2.1%	4.6	4.2-5.2	257
Non-Hodgkin lymphoma	1,137	3.8%	7.1	6.7-7.5	644	4.1%	9.1	8.4-9.8	493
Oral cavity and pharynx	565	1.9%	3.6	3.3-3.9	388	2.5%	5.3	4.8-5.9	177
Ovary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	677

Pancreas	1,900	6.4%	11.8	11.2-12.3	984	6.3%	13.6	12.7-14.5	916
Prostate	n/a	n/a	n/a	n/a	1,657	10.6%	24.2	23.0-25.4	n/a
Stomach	799	2.7%	5.0	4.7-5.4	502	3.2%	7.0	6.4-7.6	297
Testis	n/a	n/a	n/a	n/a	22	0.1%	0.3	0.2-0.5	n/a
Thyroid	102	0.3%	0.6	0.5-0.8	51	0.3%	0.7	0.5-0.9	51
Uterus	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	495

Abbreviations: ASMR means age-standardized mortality rate; CI means confidence interval; n/a means not applicable.

Note: Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

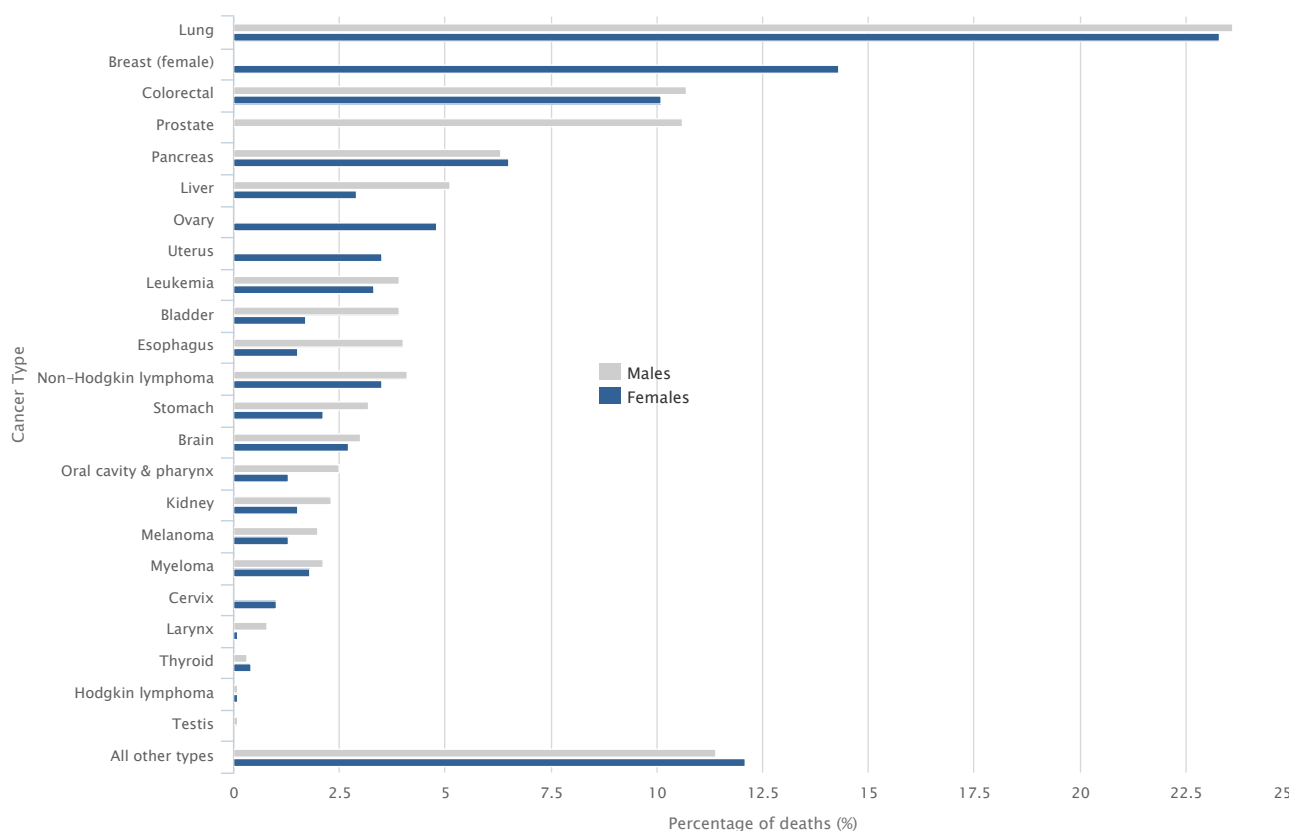
Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

The 4 most commonly diagnosed cancers (breast, colorectal, lung and prostate) were responsible for 46% of all cancer deaths in 2018. Lung, colorectal and prostate cancers accounted for 45% of all male cancer deaths, while lung, breast and colorectal cancers accounted for 48% of all female cancer deaths (Figure 5.2).

Figure 5.2

Proportion of cancer deaths by sex and cancer type, Ontario, 2018



Highcharts.com

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

Figure 5.2 Proportion of cancer deaths by sex and cancer type, Ontario, 2018

CANCER TYPE	MALES	FEMALES
Lung	23.6	23.3
Breast (female)	0	14.3
Colorectal	10.7	10.1
Prostate	10.6	0
Pancreas	6.3	6.5
Liver	5.1	2.9
Ovary	0	4.8
Uterus	0	3.5
Leukemia	3.9	3.3
Bladder	3.9	1.7
Esophagus	4	1.5
Non-Hodgkin lymphoma	4.1	3.5
Stomach	3.2	2.1
Brain	3	2.7
Oral cavity & pharynx	2.5	1.3
Kidney	2.3	1.5
Melanoma	2	1.3
Myeloma	2.1	1.8
Cervix	0	1
Larynx	0.8	0.1
Thyroid	0.3	0.4
Hodgkin lymphoma	0.1	0.1
Testis	0.1	0
All other types	11.4	12.1

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)**Data source:** Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

Some of the less commonly diagnosed cancers made a relatively large contribution to mortality because of their poor prognosis. For example, pancreatic cancer accounted for 6.4% of all cancer deaths in 2018, making it the third highest contributor to cancer deaths after lung and colorectal cancers (Table 5.2). By contrast,

Distribution of deaths for
selected cancers, 2018



pancreatic cancer accounted for only 2.4% of new cases in the same year (see **Chapter 4: Cancer Incidence** ([/node/72481](#))).

The highest age-standardized mortality rates for cancers occurring in males and females combined were for lung (43.1 per 100,000), colorectal (19.3 per 100,000) and pancreas (11.8 per 100,000).

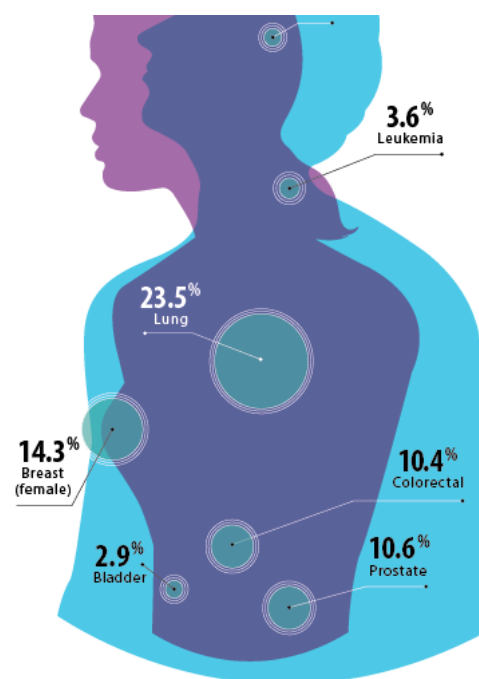
The age-standardized mortality rate for all cancers combined was significantly higher for males (220.2 per 100,000) than females (159.4 per 100,000). Among males, the highest age-standardized mortality rate was for lung (51.1 per 100,000), followed by colorectal (23.8 per 100,000) and prostate (24.2 per 100,000) cancers. For females, the highest age-standardized mortality rate was for lung (37.1 per 100,000), followed by breast (23.6 per 100,000) and colorectal (15.7 per 100,000) cancers.

Males had a consistently higher mortality rate than females for each type of cancer, except thyroid. Thyroid cancer mortality rates were similar for males and females.

The greatest differences between male and female cancer mortality rates were seen in:

- laryngeal cancer, which had a male rate that was 9 times higher than the female rate
- esophageal cancer, which had a male rate that was close to 4 times higher than the female rate
- bladder cancer, which had a male rate that was over 3 times higher than the female rate
- oral cavity and pharynx cancer, which had a male rate that was close to 3 times higher than the female rate

Tobacco use is a major risk factor for these 4 cancer types. The higher mortality rates in males likely result from their historically higher rates of tobacco use.^[2]



MORTALITY BY AGE

From 2016 to 2018, the median age at death for all cancers was 74 for males and 75 for females (Table 5.3). The median age at death varied by cancer type. Cancers with the lowest median age at death were testicular and cervical. The median age for most other cancer types was over 70.

Table 5.3 Median age at death, by cancer type and sex, Ontario, 2016 to 2018

CANCER TYPE	AGE (YEARS) MALES AND FEMALES COMBINED	AGE (YEARS) MALES	AGE (YEARS) FEMALES
All cancers	74	74	75
Bladder	81	81	82
Brain	67	65	68
Breast (female)	n/a	n/a	71
Cervix	n/a	n/a	61
Colorectal	77	75	80

Esophagus	71	70	75
Hodgkin lymphoma	73	70	78
Kidney	74	72	78
Larynx	72	72	77
Leukemia	77	76	78
Liver	72	70	75
Lung	74	74	74
Melanoma	73	73	74
Myeloma	77	76	78
Non-Hodgkin lymphoma	76	75	77
Oral cavity and pharynx	69	68	75
Ovary	n/a	n/a	71
Pancreas	74	72	75
Prostate	n/a	82	n/a
Stomach	73	72	74
Testis	n/a	43	n/a
Thyroid	73	69	79
Uterus	n/a	n/a	72

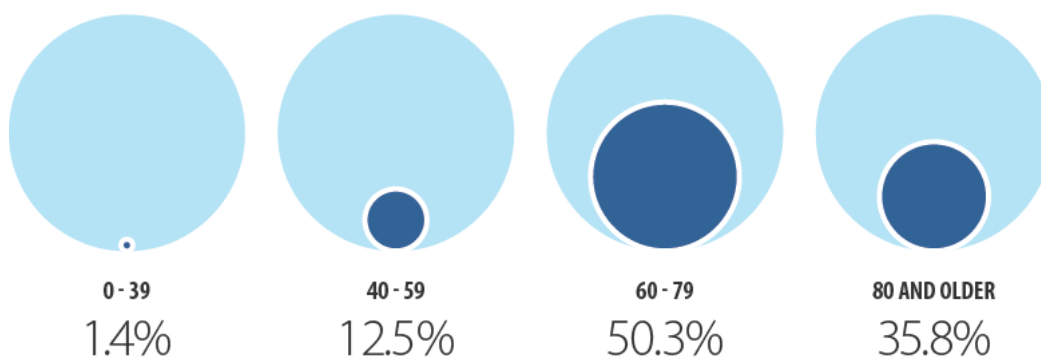
Abbreviation: n/a means not applicable.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

In 2018, 86% of all people in Ontario who died of cancer were age 60 or older (Table 5.4). Mortality was distributed differently by age group.

Distribution of cancer deaths by age group



Ages 0 to 39

People younger than age 40 made up 1.4% of all cancer deaths (compared with 5.1% of all new cases), with brain and breast cancers being the leading causes.

In 2018, 0.2% of all cancer deaths occurred in children with cancer (ages 0 to 14). From 1991 to 2019, the majority of deaths in children with cancer occurred in those with:

- central nervous system and miscellaneous intracranial and intraspinal neoplasms (36.5%)
- leukemias, myeloproliferative diseases and myelodysplastic diseases (25.9%)

For more information, please read the **Pediatric Oncology Group of Ontario Surveillance Report** https://www.pogo.ca/research-data/data-reports/?utm_source=outlook&utm_medium=email&utm_campaign=OCS_2022.

Ages 40 to 59

People ages 40 to 59 made up 12.5% of all cancer deaths (compared with 22.7% of all new cases), with lung and breast cancers being the leading causes.

Ages 60 to 79

People ages 60 to 79 made up 50.3% of all cancer deaths (compared with 53.9% of all new cases).

This age group represented the greatest proportion of cancer deaths for 19 of the 23 types of cancer examined in this report. The greatest proportions of cancer deaths were from lung (27.8%) and colorectal (8.9%) cancers.

Ages 80 and older

People age 80 and older made up 35.8% of all cancer deaths (compared with 18.3% of all new cases), with lung and colorectal cancers as the leading causes.

While prostate cancer was diagnosed most frequently in males ages 60 to 79, most deaths caused by prostate cancer were in males age 80 and older. The higher mortality rate in males age 80 and older reflects 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 6.1 per 100,000 in people age 39 or younger, to a rate of 1,702.4 per 100,000 in people age 80 or older (Table 5.4). Mortality varied by cancer type:

- There were significant increases in mortality with age for cancers of the bladder, breast, colorectum, kidney, stomach and thyroid, as well as leukemia, melanoma, Hodgkin lymphoma and non-Hodgkin lymphoma.
- There were non-significant increases in mortality with age for cancers of the brain, cervix, esophagus, larynx, liver, lung, oral cavity and pharynx, ovary, pancreas, prostate and uterus.
- Testicular cancer mortality was highest in people under age 60.

Table 5.4 Mortality counts and rates, by cancer type and age group, Ontario, 2018

CANCER TYPE	AGES 0 TO 39 DEATHS	AGES 0 TO 39 AGE-SPECIFIC RATE	AGES 0 TO 39 95% CI	AGES 40 TO 59 DEATHS	AGES 40 TO 59 95% CI	AGES 40 TO 59 AGE-SPECIFIC RATE	AGES 40 TO 59 95% CI	AGES 60 TO 79 DEATHS	AGES 60 TO 79 AGE-SPECIFIC RATE	AGES 60 TO 79 95% CI	AGES 80 YEA OR OLD DEA
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All cancers*	429	6.1	5.5-6.7	3,709	94.5	91.5-97.6	14,941	550.9	542.1-559.8	10,6
Bladder*	**	**	**	50	1.3	0.9-1.7	340	12.5	11.2-13.9	465
Brain	68	1	0.7-1.2	210	5.3	4.7-6.1	424	15.6	14.2-17.2	142
Breast (female)*	58	1.7	1.3-2.2	447	22.4	20.4-24.6	858	60.4	56.4-64.6	640
Cervix	11	0.3	0.2-0.6	60	3.0	2.3-3.9	45	3.2	2.3-4.2	29
Colorectal*	38	0.5	0.4-0.7	387	9.9	8.9-10.9	1,327	48.9	46.3-51.6	1,34
Esophagus	**	**	**	130	3.3	2.8-3.9	482	17.8	16.2-19.4	231
Hodgkin lymphoma*	**	**	**	**	**	**	19	0.7	0.4-1.1	7
Kidney*	**	**	**	80	2.0	1.6-2.5	286	10.5	9.4-11.8	207
Larynx	**	**	**	20	0.5	0.3-0.8	82	3.0	2.4-3.8	43
Leukemia*	51	0.7	0.5-1.0	107	2.7	2.2-3.3	473	17.4	15.9-19.1	446
Liver	10	0.1	0.1-0.3	153	3.9	3.3-4.6	704	26.0	24.1-27.9	343
Lung	17	0.2	0.1-0.4	704	17.9	16.6-19.3	4,155	153.2	148.6-157.9	2,09
Melanoma*	17	0.2	0.1-0.4	83	2.1	1.7-2.6	216	8.0	6.9-9.1	171
Myeloma	**	**	**	50	1.3	0.9-1.7	283	10.4	9.3-11.7	256
Non-Hodgkin lymphoma*	15	0.2	0.1-0.4	114	2.9	2.4-3.5	547	20.2	18.5-21.9	461
Oral cavity and pharynx	8	0.1	0.0-0.2	110	2.8	2.3-3.3	317	11.7	10.4-13.0	127
Ovary	15	0.4	0.2-0.7	137	6.9	5.8-8.1	351	24.7	22.2-27.4	174
Pancreas	7	0.1	0.0-0.2	212	5.4	4.7-6.2	1,052	38.8	36.5-41.2	629
Prostate	**	**	**	50	2.6	1.9-3.4	644	49.9	46.1-53.9	962
Stomach*	13	0.2	0.1-0.3	122	3.1	2.6-3.7	421	15.5	14.1-17.1	243
Testis	12	0.3	0.2-0.6	6	0.3	0.1-0.7	**	**	**	**
Thyroid*	**	**	**	20	0.5	0.3-0.8	53	2.0	1.5-2.6	33
Uterus	**	**	**	70	3.5	3.4-5.2	293	20.6	18.3-23.1	135

Abbreviation: CI means confidence interval.

Symbols:

*Significant increasing trend in age-specific rate with increasing age.

“Suppressed due to small case count (count less than 6).

†Count has been rounded to ensure confidentiality; the associated rate and confidence interval have been adjusted to reflect rounded count.

Notes:

1. Rates are per 100,000.
2. Excludes cases of unknown age.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

MORTALITY TRENDS BY CANCER TYPE

This section describes annual percent changes in the age-standardized mortality rates, which are used to examine short-term changes in the trend in rates over time (Table 5.5).

The age-standardized mortality rate for all cancers combined in Ontario has been decreasing over the past few decades, with the drop in mortality accelerating in recent years. From 1984 to 2001, the age-standardized mortality rate decreased by 0.5% per year and fell a further 1.5% per year from 2001 to 2018.

The decrease in mortality was greater for males than females. For males, the mortality rate decreased by 1.0% per year from 1988 to 2001 and then by 1.7% per year from 2001 to 2018. For females, the rate decreased by 0.3% per year from 1984 to 2001 and then decreased by 1.3% per year from 2001 to 2018. This section examines some of the reasons for these changes in mortality trends.

Recent mortality trends for the 4 most common cancers

PROSTATE CANCER

The prostate cancer age-standardized mortality rate decreased by 2.9% per year from 1994 to 2014 and then stabilized from 2014 to 2018 (Table 5.5). This decrease was likely due to early detection and improved treatments, which have increased prostate cancer survival.^[3]

BREAST CANCER

The age-standardized mortality rate for breast cancer decreased by 2.5% per year from 1994 to 2013 and was stable from 2013 to 2018 (Table 5.5). This decrease was likely due to:

- greater regular participation in mammography screening, especially after the introduction of Ontario's organized breast screening program ^[4,5]
- improved treatment ^[6,7]
- the use of more effective systemic therapies following breast cancer surgery ^[6,7]

COLORECTAL CANCER

The colorectal cancer age-standardized mortality rate consistently decreased in males and females combined from 1984 to 2018, with the greatest decrease being in recent years (Table 5.5). The mortality rate decreased 3.1% per year from 2005 to 2018 among males and by 2.7% per year from 2004 to 2018 among females.

Reasons for this decrease in mortality may be changes in risk and protective factors, including earlier diagnosis due

to greater uptake of screening and improvements in treatment.^[8]

LUNG CANCER

In males, the age-standardized mortality rate for lung cancer decreased by 2.2% per year from 1989 to 2011, followed by a steeper decrease of 3.1% from 2011 to 2018 (Table 5.5). Among females, the mortality rate was stable from 1999 to 2010 and then began a decrease of 1.8% per year from 2010 to 2018.

The drop in lung cancer mortality is largely due to less tobacco use, which began to decrease in the late 1950s for males and in the mid-1970s for females.^[2,9] This approximate 15-year gap in male and female peak smoking rates corresponds to the sex-based gap in the stabilization of lung cancer mortality rates.

Notable changes in trend for other cancers

LIVER CANCER

The liver cancer age-standardized mortality rate increased in all people from 1984 to 2018. The male rate increased by 2.2% per year from 1994 to 2018, following a previous rapid upward trend in the mortality rate (Table 5.5). The female mortality rate experienced a rapid increase from 2008 to 2013 before stabilizing from 2013 to 2018. This increase in mortality was probably at least partially due to a rise in incidence rate over the same period.

OVARIAN CANCER

The age-standardized mortality rate for ovarian cancer decreased significantly by 4.6% per year from 2003 to 2007 and then by 1.0% per year from 2007 to 2018 (Table 5.5). This pattern paralleled the decrease in the ovarian cancer incidence rate from 2002 to 2018.

Drops in ovarian cancer incidence and mortality likely resulted from changes in exposure to risk and protective factors, including the increasing use of oral contraceptives.^[10] Drops in mortality may also reflect increasing survival due to improvements in treatment for this cancer.^[11]

STOMACH CANCER

The stomach cancer age-standardized mortality rate decreased by 4.0% per year until 1993 and then by 2.2% per year from 1993 to 2018 (Table 5.5).

Reasons for this decrease include less exposure to *Helicobacter pylori* infection, improvements in food preservation and refrigeration, lifestyle changes and better treatment for this cancer.^[12]

Table 5.5 Annual percent change in age-standardized mortality rates, by cancer type and sex, Ontario, 1984 to 2018

CANCER TYPE	MALES AND FEMALES COMBINED PERIOD	MALES AND FEMALES COMBINED APC (%)	MALES PERIOD	MALES APC (%)	FEMALES PERIOD	FEMALES APC (%)
All cancers	1984-2001	-0.5*	1984-1988	0.5	1984-2001	-0.3*
	2001-2018	-1.5*	1988-2001	-1*	2001-2018	-1.3*
			2001-2018	-1.7*		

Bladder	1984-2018	-0.5*	1984-2018	-0.7*	1984-1997	-1.5*
					1997-2004	2.2
					2004-2018	-1.7*
Brain	1984-2006	-1.1*	1984-1995	-1.9*	1984-2006	-1.4*
	2006-2010	4.8	1995-2018	0.4	2006-2011	4.6
	2010-2018	-1			2011-2018	-1.3
Breast (female)	n/a	n/a	n/a	n/a	1984-1994	-0.8*
	n/a	n/a	n/a	n/a	1994-2013	-2.5*
	n/a	n/a	n/a	n/a	2013-2018	-0.7
Cervix	n/a	n/a	n/a	n/a	1984-2018	-2.6*
Colorectal	1984-2005	-1.6*	1984-2005	-1.5*	1984-2004	-1.8*
	2005-2018	-2.9*	2005-2018	-3.1*	2004-2018	-2.7*
Esophagus	1984-2000	0.5	1984-2001	0.8*	1984-2018	-0.9*
	2000-2018	-0.6*	2001-2018	-0.7*		
Hodgkin lymphoma	1984-2018	-3.4*	1984-2018	-3.5*	1984-2018	-3.3*
Kidney	1984-2008	-0.1	1984-2014	-0.3*	1984-2010	-0.3
	2008-2018	-1.9*	2014-2018	-4.8*	2010-2018	-2.9*
Larynx	1984-1988	3.2	1984-2001	-2*	1984-2018	-3.2*
	1988-2001	-2.5*	2001-2018	-4.5*		
	2001-2018	-4.2*				
Leukemia	1984-2018	-0.9*	1984-2018	-1*	1984-2018	-1*
Liver	1984-1994	4.7*	1984-1995	4.6*	1984-1991	6.3*
	1994-2008	1.8*	1995-2018	2.2*	1991-2008	1.4*
	2008-2012	5.6			2008-2013	6.6*
	2012-2018	0.5			2013-2018	-0.4
Lung	1984-1993	0.1	1984-1989	-0.3	1984-1999	2*
	1993-2010	-1*	1989-2011	-2.2*	1999-2010	-0.1
	2010-2018	-2.4*	2011-2018	-3.1*	2010-2018	-1.8*
Melanoma	1984-2014	1*	1984-2014	1.3*	1984-1995	2.1*
	2014-2018	-4	2014-2018	-4.7	1995-2018	-0.2
Myeloma	1984-1998	0.4	1984-2018	-0.7*	1984-1999	0.4

	1998-2018	-1.2*			1999-2018	-1.6*
Non-Hodgkin lymphoma	1984-1998	2.2*	1984-1999	2*	1984-1997	2.5*
	1998-2018	-1.8*	1999-2018	-1.7*	1997-2018	-2*
Oral cavity and pharynx	1984-2009	-1.9*	1984-2007	-2.3*	1984-2012	-1.6*
	2009-2018	1.7*	2007-2018	1.2*	2012-2018	2.8
Ovary	n/a	n/a	n/a	n/a	1984-1999	-0.9*
	n/a	n/a	n/a	n/a	1999-2003	2.2
	n/a	n/a	n/a	n/a	2003-2007	-4.6*
	n/a	n/a	n/a	n/a	2007-2018	-1*
Pancreas	1984-2002	-0.8*	1984-2005	-1.2*	1984-2018	-0.1
	2002-2018	0.4*	2005-2018	1*		
Prostate	n/a	n/a	1984-1994	1.5*	n/a	n/a
	n/a	n/a	1994-2014	-2.9*		
	n/a	n/a	2014-2018	-1	n/a	n/a
Stomach	1984-1993	-4*	1984-1993	-4.1*	1984-1997	-3.5*
	1993-2018	-2.2*	1993-2018	-2.5*	1997-2018	-1.8*
Testis	n/a	n/a	1984-2018	-2.3*	n/a	n/a
Thyroid	1984-2018	-0.1	1984-2018	0.9*	1984-2018	-0.7*
Uterus	n/a	n/a	n/a	n/a	1984-1993	-1.7
	n/a	n/a	n/a	n/a	1993-2018	1.2*

Abbreviations: APC means annual percent change; n/a means not applicable.

Symbol: *Statistically significant trend.

Note: Rates are standardized to the 2011 Canadian Standard population

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

Thirty-five year trend in mortality by cancer type

The age-standardized mortality rate from 1984 to 2018 for breast, colorectal, lung, oral cavity and pharynx, pancreatic, prostate and uterus cancers are shown in Figure 5.3. These cancers represent the 4 most common cancers, plus those with an increasing trend in mortality in recent years.

Figure 5.3A

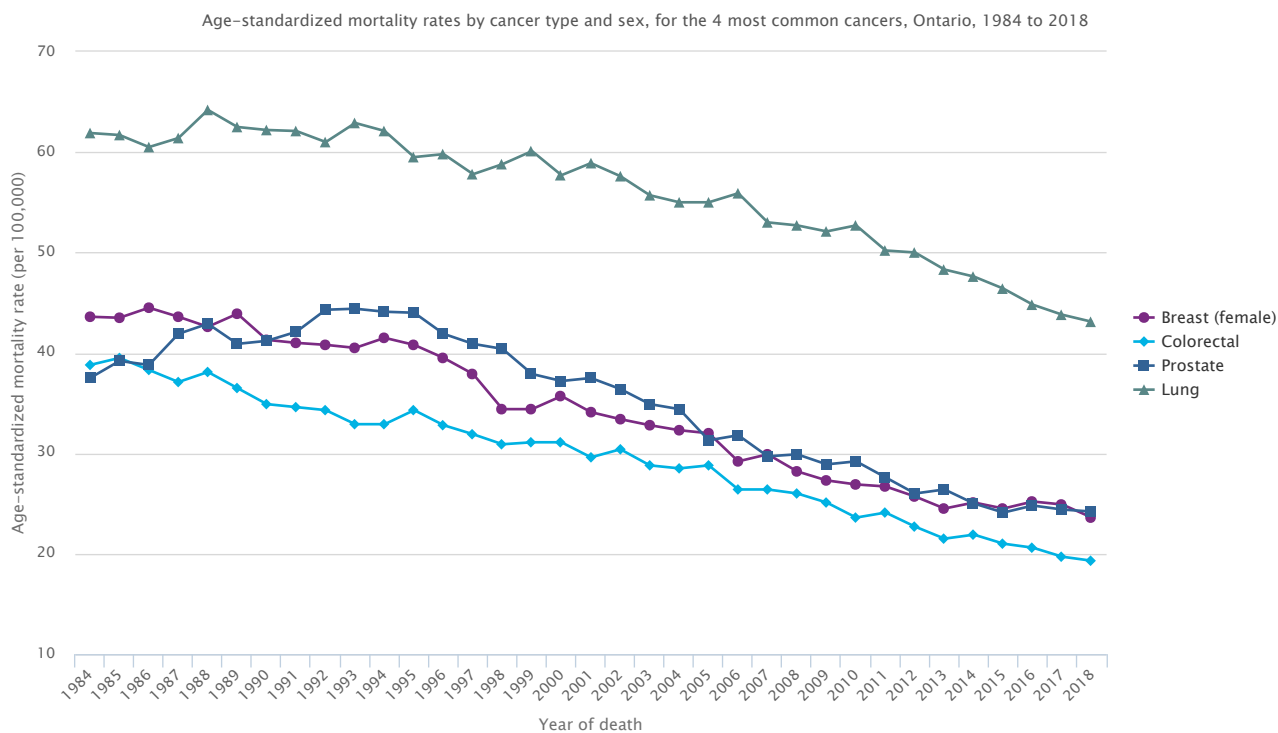
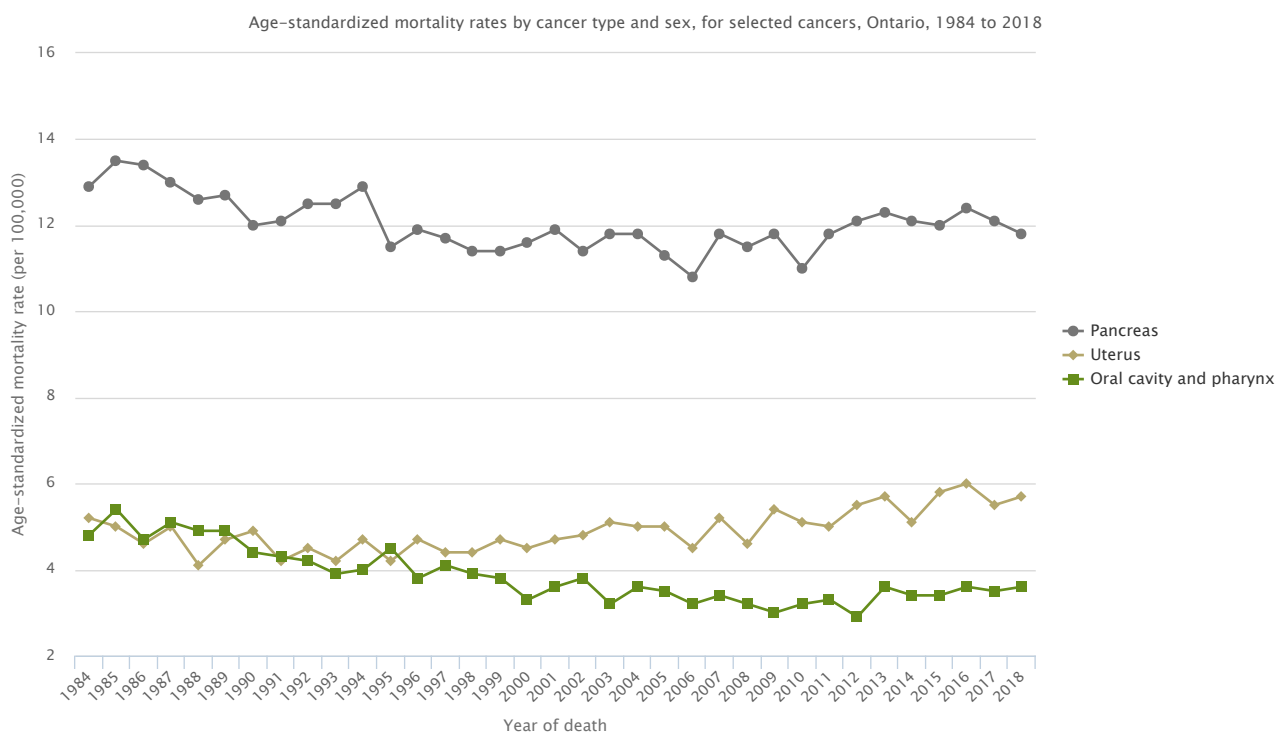


Figure 5.3B



Note: Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

Figure 5.3A Age-standardized mortality rates by cancer type and sex, for the 4 most common cancers, Ontario, 1984 to 2018

YEAR OF DEATH	BREAST (FEMALE)	COLORECTAL	PROSTATE	LUNG
1984	43.6	38.8	37.5	61.9
1985	43.5	39.5	39.2	61.7
1986	44.5	38.3	38.8	60.5
1987	43.6	37.1	41.9	61.4
1988	42.6	38.1	42.9	64.2
1989	43.9	36.5	40.9	62.5
1990	41.3	34.9	41.2	62.2
1991	41	34.6	42.1	62.1
1992	40.8	34.3	44.3	61
1993	40.5	32.9	44.4	62.9
1994	41.5	32.9	44.1	62.1
1995	40.8	34.3	44	59.5
1996	39.5	32.8	41.9	59.8
1997	37.9	31.9	40.9	57.8
1998	34.4	30.9	40.4	58.8
1999	34.4	31.1	37.9	60.1
2000	35.7	31.1	37.2	57.7
2001	34.1	29.6	37.5	58.9
2002	33.4	30.4	36.4	57.6
2003	32.8	28.8	34.9	55.7
2004	32.3	28.5	34.4	55
2005	32	28.8	31.3	55
2006	29.2	26.4	31.8	55.9
2007	29.9	26.4	29.7	53
2008	28.2	26	29.9	52.7
2009	27.3	25.1	28.9	52.1
2010	26.9	23.6	29.2	52.7
2011	26.7	24.1	27.6	50.2
2012	25.7	22.7	26	50

2013	24.5	21.5	26.4	48.3
2014	25.1	21.9	25	47.6
2015	24.5	21	24.1	46.4
2016	25.2	20.6	24.8	44.8
2017	24.9	19.7	24.4	43.8
2018	23.6	19.3	24.2	43.1

Figure 5.3B Age-standardized mortality rates by cancer type and sex, for selected cancers, Ontario, 1984 to 2018

YEAR OF DEATH	PANCREAS	UTERUS	ORAL CAVITY AND PHARYNX
1984	12.9	5.2	4.8
1985	13.5	5	5.4
1986	13.4	4.6	4.7
1987	13	5	5.1
1988	12.6	4.1	4.9
1989	12.7	4.7	4.9
1990	12	4.9	4.4
1991	12.1	4.2	4.3
1992	12.5	4.5	4.2
1993	12.5	4.2	3.9
1994	12.9	4.7	4
1995	11.5	4.2	4.5
1996	11.9	4.7	3.8
1997	11.7	4.4	4.1
1998	11.4	4.4	3.9
1999	11.4	4.7	3.8
2000	11.6	4.5	3.3
2001	11.9	4.7	3.6
2002	11.4	4.8	3.8
2003	11.8	5.1	3.2
2004	11.8	5	3.6
2005	11.3	5	3.5
2006	10.8	4.5	3.2

2007	11.8	5.2	3.4
2008	11.5	4.6	3.2
2009	11.8	5.4	3
2010	11	5.1	3.2
2011	11.8	5	3.3
2012	12.1	5.5	2.9
2013	12.3	5.7	3.6
2014	12.1	5.1	3.4
2015	12	5.8	3.4
2016	12.4	6	3.6
2017	12.1	5.5	3.5
2018	11.8	5.7	3.6

Note: Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

From 1984 to 2018, the average annual percent change in the age-standardized mortality rate for males (Figure 5.4):

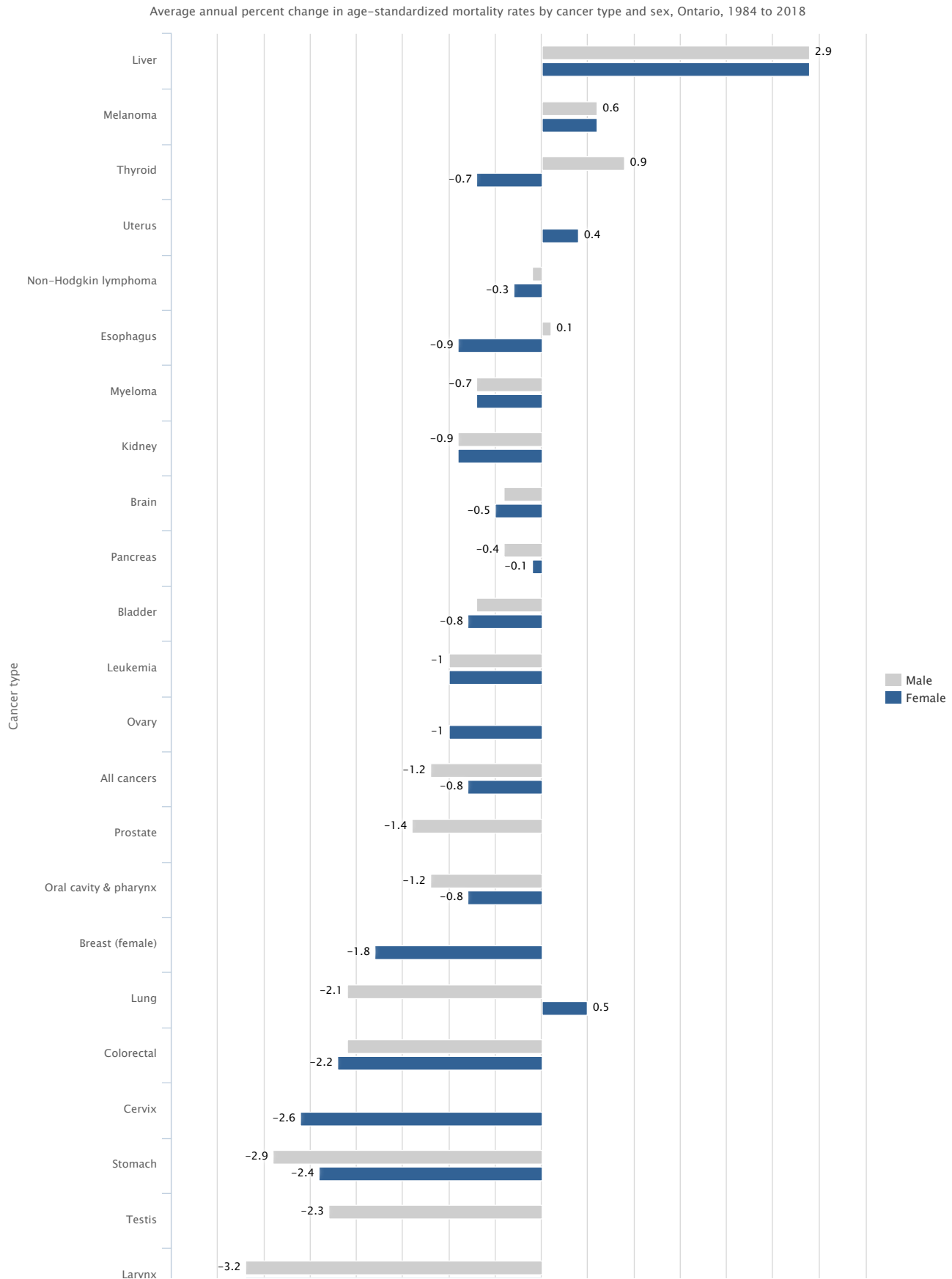
- decreased for most types of cancer, including Hodgkin lymphoma (3.5% per year), laryngeal cancer (3.2%) and stomach cancer (2.9%)
- increased for liver cancer (2.9% per year) and thyroid cancer (0.9% per year)
- was stable for brain and esophageal cancers, as well as melanoma and non-Hodgkin lymphoma

Over the same period, the average annual percent change in the age-standardized mortality rate for females:

- decreased for most types of cancer, including Hodgkin lymphoma (3.3% per year), and cervical (2.6%) and laryngeal (3.2%) cancers
- increased for liver (2.9% per year) and lung (0.5%) cancers
- was stable for bladder, brain, oral cavity and pharynx, pancreatic and uterine cancers, as well as non-Hodgkin lymphoma and melanoma

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

Figure 5.4



Notes:

1. Rates are standardized to the age distribution of the 2011 Canadian Standard population.
2. The average annual percent change for the following cancer types was not statistically significant among males: brain, esophagus, melanoma and non-Hodgkin lymphoma.
3. The average annual percent change for the following cancer types was not statistically significant among females: bladder, brain, melanoma, non-Hodgkin lymphoma, oral cavity and pharynx, pancreas and uterus.

.com

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)**Data source:** Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

Figure 5.4 Average annual percent change in age-standardized mortality rates by cancer type and sex, Ontario, 1984 to 2018

YEAR OF DEATH	MALE	FEMALE
Liver	2.9	2.9
Melanoma	0.6	0.6
Thyroid	0.9	-0.7
Uterus		0.4
Non-Hodgkin lymphoma	-0.1	-0.3
Esophagus	0.1	-0.9
Myeloma	-0.7	-0.7
Kidney	-0.9	-0.9
Brain	-0.4	-0.5
Pancreas	-0.4	-0.1
Bladder	-0.7	-0.8
Leukemia	-1	-1
Ovary		-1
All cancers	-1.2	-0.8
Prostate	-1.4	
Oral cavity & pharynx	-1.2	-0.8
Breast (female)		-1.8
Lung	-2.1	0.5
Colorectal	-2.1	-2.2
Cervix		-2.6
Stomach	-2.9	-2.4
Testis	-2.3	
Larynx	-3.2	-3.2

Hodgkin lymphoma	-3.5	-3.3
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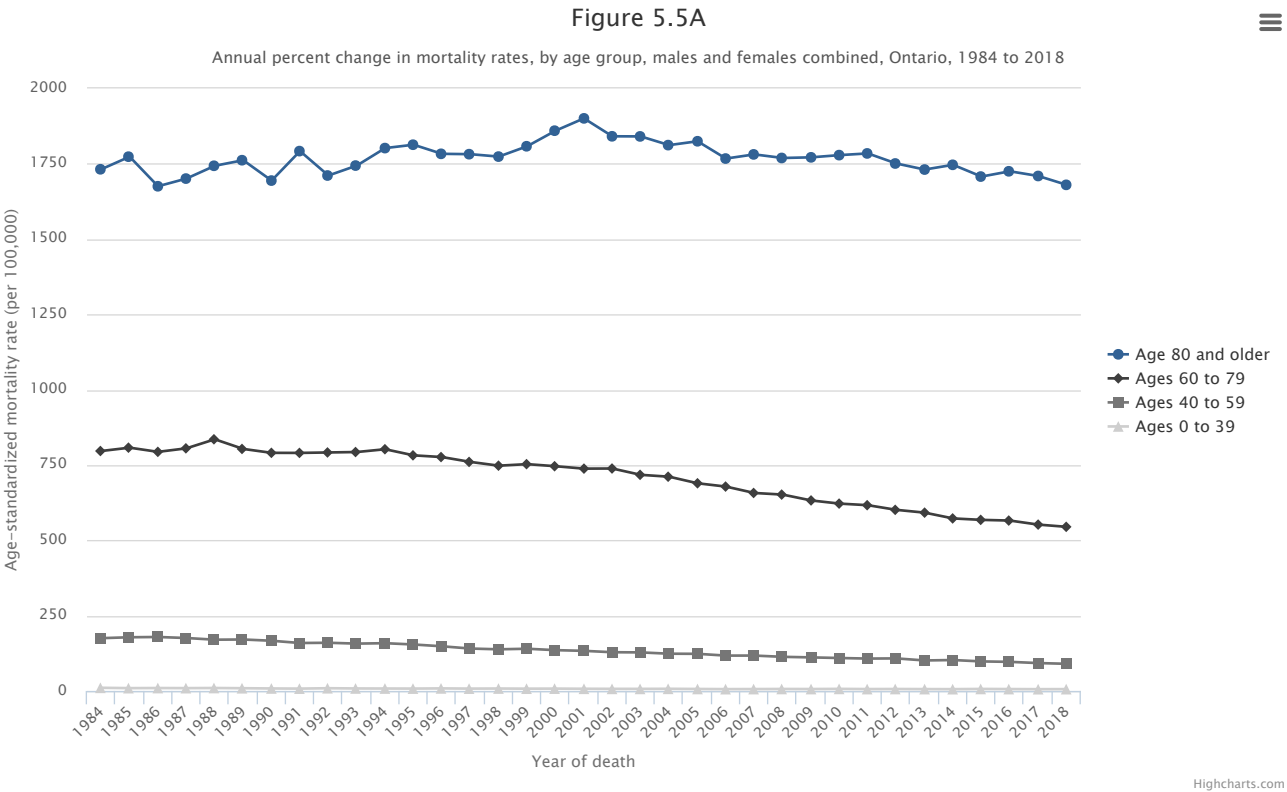
Notes:

1. Rates are standardized to the age distribution of the 2011 Canadian Standard population.
2. The average annual percent change for the following cancer types was not statistically significant among males: brain, esophagus, melanoma and non-Hodgkin lymphoma.
3. The average annual percent change for the following cancer types was not statistically significant among females: bladder, brain, melanoma, non-Hodgkin lymphoma, oral cavity and pharynx, pancreas and uterus.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)
Data source: Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

MORTALITY TRENDS BY AGE

Mortality rates across all age groups have been decreasing in recent decades. In younger people, they have decreased fairly equally for males and females. However, among people age 60 and older, the decreases in mortality have been greater among males (Figure 5.5).

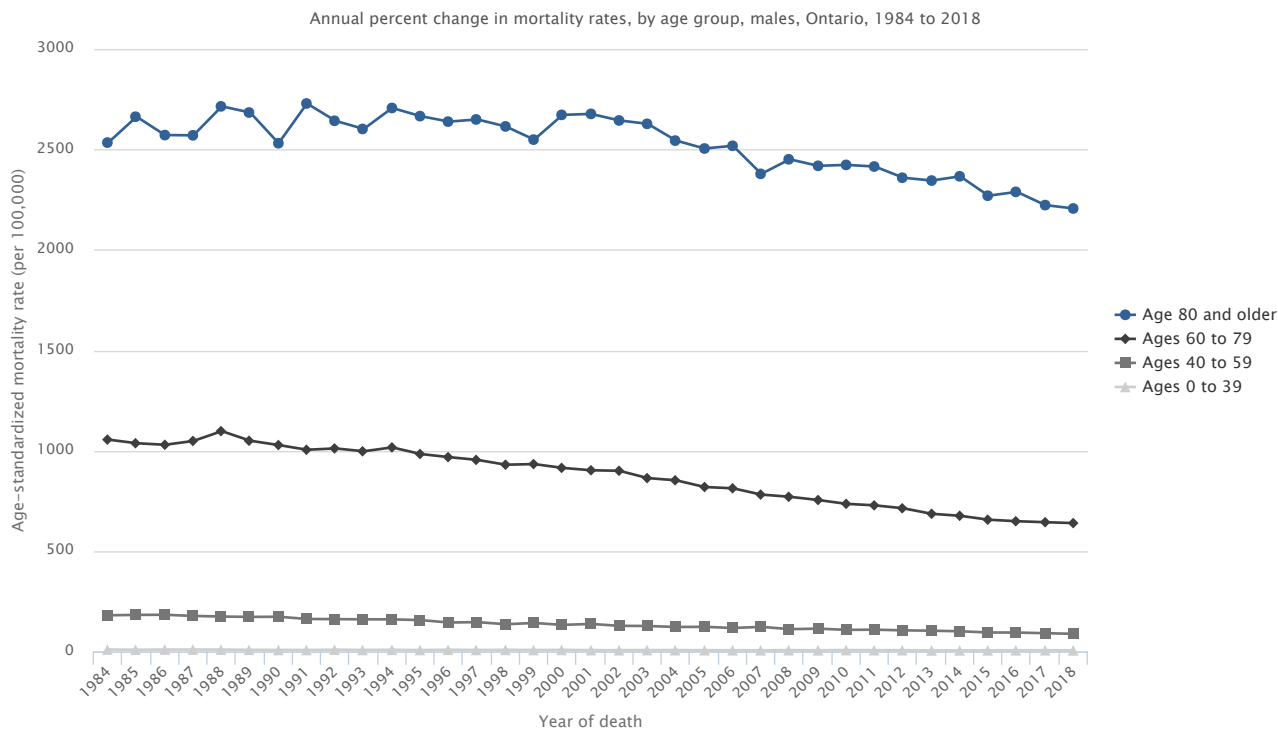


Both Sexes APCs (Annual percentage change (%))

Ages 0 to 39		Ages 40 to 59		Ages 60 to 79		Age 80 or older	
PERIOD	APC	PERIOD	APC	PERIOD	APC	PERIOD	APC
1984-2006	-1.9*	1984-1989	-0.8	1984-1988	0.7	1984-2001	0.5*

2006-2018	-0.6	1989-2018	-2.1*	1988-2001	-0.7*	2001-2018	-0.5*
				2001-2018	-1.9*		

Figure 5.5B

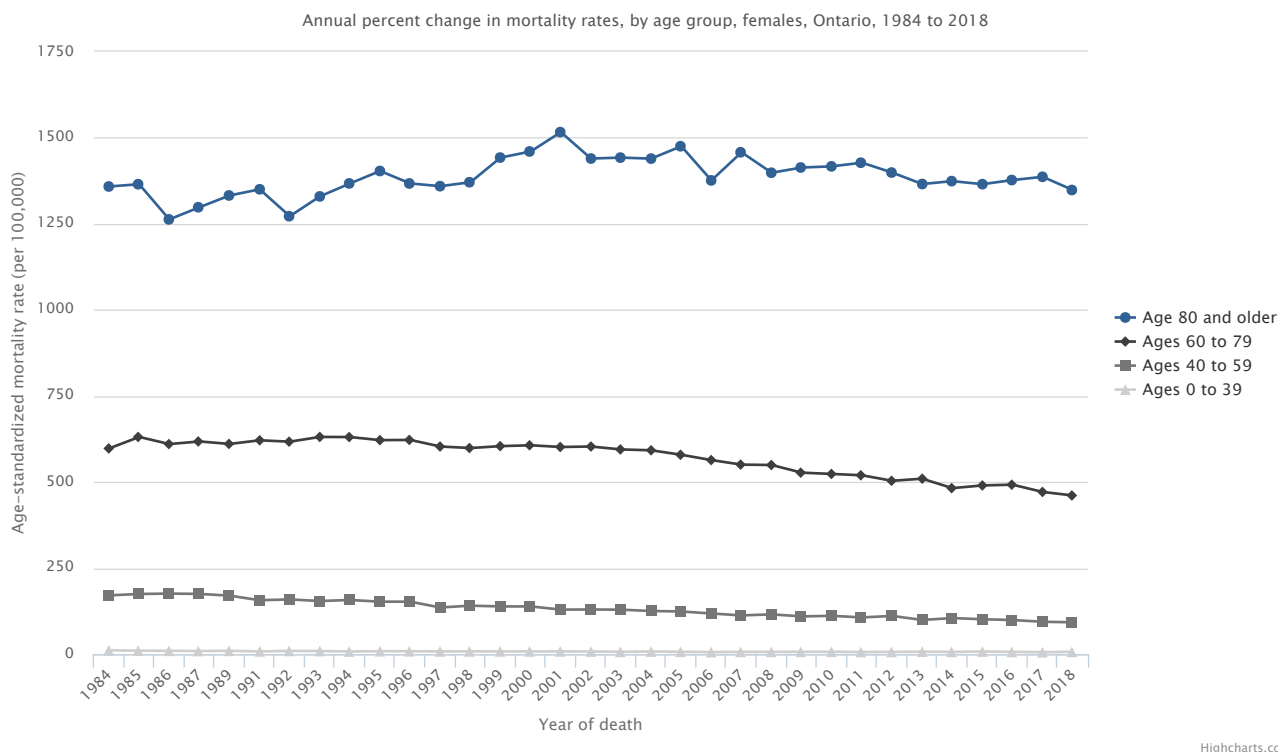


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Males APCs (Annual percentage change (%))

Ages 0 to 39		Ages 40 to 59		Ages 60 to 79		Age 80 or older	
PERIOD	APC	PERIOD	APC	PERIOD	APC	PERIOD	APC
1984-2018	-1.6*	1984-2018	-2.1*	1984-1988	0.7	1984-2001	0.0
				1988-2001	-1.2*	2001-2018	-1.0*
				2001-2014	-2.3*		
				2014-2018	-1.4*		

Figure 5.5C



Females APCs (Annual percentage change (%))

Ages 0 to 39		Ages 40 to 59		Ages 60 to 79		Age 80 or older	
PERIOD	APC	PERIOD	APC	PERIOD	APC	PERIOD	APC
1984-2006	-1.9*	1984-2018	-1.9*	1984-2002	-0.2	1984-1992	-0.2
2006-2018	-0.2			2002-2018	-1.7*	1992-2001	1.3*
						2001-2018	-0.5*

Abbreviation: APC means annual percent change.

Symbol: *Statistically significant annual percent change.

Notes: Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

Figure 5.5A (Males and females combined)

YEAR OF DEATH	AGE 80 AND OLDER	AGES 60 TO 79	AGES 40 TO 59	AGES 0 TO 39
1984	1731.8	796.5	175.2	10.4
1985	1773.6	807.6	178.2	9.3
1986	1675.4	793.7	179.1	9.6
1987	1700.9	805.4	175.7	9.3
1988	1743.4	835.4	170.1	9.7

1989	1761.9	803.4	170.8	9.0
1990	1694.3	790.4	166.6	8.2
1991	1792.1	790.2	159.1	7.7
1992	1711.1	791.7	159.9	9.0
1993	1744.1	793.1	157.1	8.2
1994	1802.1	802.4	158.5	8.0
1995	1813.3	782.1	154.2	7.8
1996	1783.1	776.4	148.2	8.4
1997	1781.9	760.3	140.7	7.7
1998	1773.9	747.8	138.2	8.0
1999	1808.2	752.9	140.1	7.5
2000	1859.9	746.0	135.4	7.7
2001	1900.8	738.0	133.1	7.2
2002	1841.3	738.4	128.5	6.9
2003	1840.9	717.4	127.9	6.8
2004	1812.0	711.2	123.6	7.1
2005	1824.8	689.4	123.2	6.5
2006	1767.4	678.4	117.3	6.0
2007	1781.2	657.2	117.4	6.2
2008	1769.3	651.8	113.2	6.5
2009	1771.4	632.4	111.4	6.3
2010	1778.8	621.9	109.3	6.8
2011	1784.4	616.6	107.4	6.2
2012	1751.0	601.2	108.0	6.4
2013	1730.9	591.9	101.2	6.1
2014	1746.6	572.7	102.6	5.9
2015	1707.6	567.9	98.0	6.6
2016	1725.1	565.6	96.5	6.2
2017	1709.5	552.2	92.5	5.8
2018	1680.1	544.8	90.1	6.0

Figure 5.5B (Males)

YEAR OF DEATH	AGE 80 AND OLDER	AGES 60 TO 79	AGES 40 TO 59	AGES 0 TO 39
1984	2534.0	1054.9	180.1	9.7
1985	2662.7	1036.8	182.0	8.6
1986	2571.4	1029.1	182.6	9.5
1987	2570.2	1048.2	176.8	9.5
1988	2714.3	1097.1	173.8	9.2
1989	2683.7	1049.2	171.9	8.3
1990	2530.8	1027.8	172.9	7.5
1991	2728.6	1004.3	161.7	7.4
1992	2642.4	1011.0	160.8	8.7
1993	2601.9	996.8	160.0	7.5
1994	2706.3	1016.1	159.7	8.2
1995	2665.7	983.2	156.1	7.1
1996	2638.4	967.6	144.0	8.4
1997	2649.2	953.9	146.0	7.5
1998	2614.4	929.9	135.5	8.0
1999	2548.7	932.9	141.8	7.2
2000	2671.9	914.1	132.2	7.7
2001	2676.8	902.2	137.0	6.5
2002	2644.2	899.6	127.5	6.3
2003	2627.3	863.2	126.7	6.8
2004	2543.9	852.3	121.8	6.6
2005	2504.4	818.9	122.6	6.2
2006	2518.0	812.4	116.8	6.0
2007	2378.3	781.1	122.5	5.8
2008	2450.7	770.2	111.0	6.4
2009	2418.2	754.1	113.5	5.8
2010	2422.8	735.0	107.5	6.8
2011	2414.7	727.4	108.4	6.2
2012	2358.9	712.9	105.0	6.3

2013	2344.9	685.4	103.3	5.1
2014	2366.0	675.6	100.4	5.2
2015	2269.4	656.0	94.5	5.7
2016	2288.6	648.4	94.0	5.8
2017	2222.6	643.6	90.9	6.0
2018	2205.9	639.1	87.7	5.3

Figure 5.5C (Females)

YEAR OF DEATH	AGE 80 AND OLDER	AGES 60 TO 79	AGES 40 TO 59	AGES 0 TO 39
1984	1358.4	597.5	170.7	11.2
1985	1365	630.9	174.7	10
1986	1262.8	610.2	175.9	9.6
1987	1298.1	617.8	174.9	9
1989	1332.3	610.6	169.9	9.6
1991	1350.2	621.1	156.6	8
1992	1272.1	617.2	159	9.3
1993	1329.6	630.9	154.2	8.9
1994	1367.3	630.6	157.3	7.7
1995	1403.4	621.6	152.4	8.5
1996	1367.2	622.2	152.3	8.4
1997	1359.3	603.1	135.5	7.9
1998	1370.8	598.7	140.8	8
1999	1442.4	604.2	138.5	7.9
2000	1460.1	606.7	138.6	7.8
2001	1516.3	601.7	129.3	7.9
2002	1439.6	603.1	129.7	7.6
2003	1442.3	594.6	129.1	6.8
2004	1439.4	592.1	125.3	7.6
2005	1475.3	579.1	123.9	6.8
2006	1376.1	563.7	118	5.9
2007	1457.8	550.5	112.5	6.6
2008	1398.4	549.4	115.5	6.6

2009	1413.5	527.1	109.6	6.7
2010	1416.9	523.4	111.2	6.9
2011	1427.5	519.5	106.6	6.1
2012	1398.9	503.5	111	6.5
2013	1365.6	509.6	99.3	7.1
2014	1374	482.2	104.7	6.5
2015	1365.1	490	101.4	7.5
2016	1377.1	492.2	99	6.5
2017	1386.5	471.1	94	5.6
2018	1348.2	460.9	92.5	6.7

Abbreviation: APC means annual percent change.

Symbol: *Statistically significant annual percent change.

Notes: Rates are per 100,000 and standardized to the age distribution of the 2011 Canadian Standard population.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (December 2020), Ontario Health (Cancer Care Ontario)

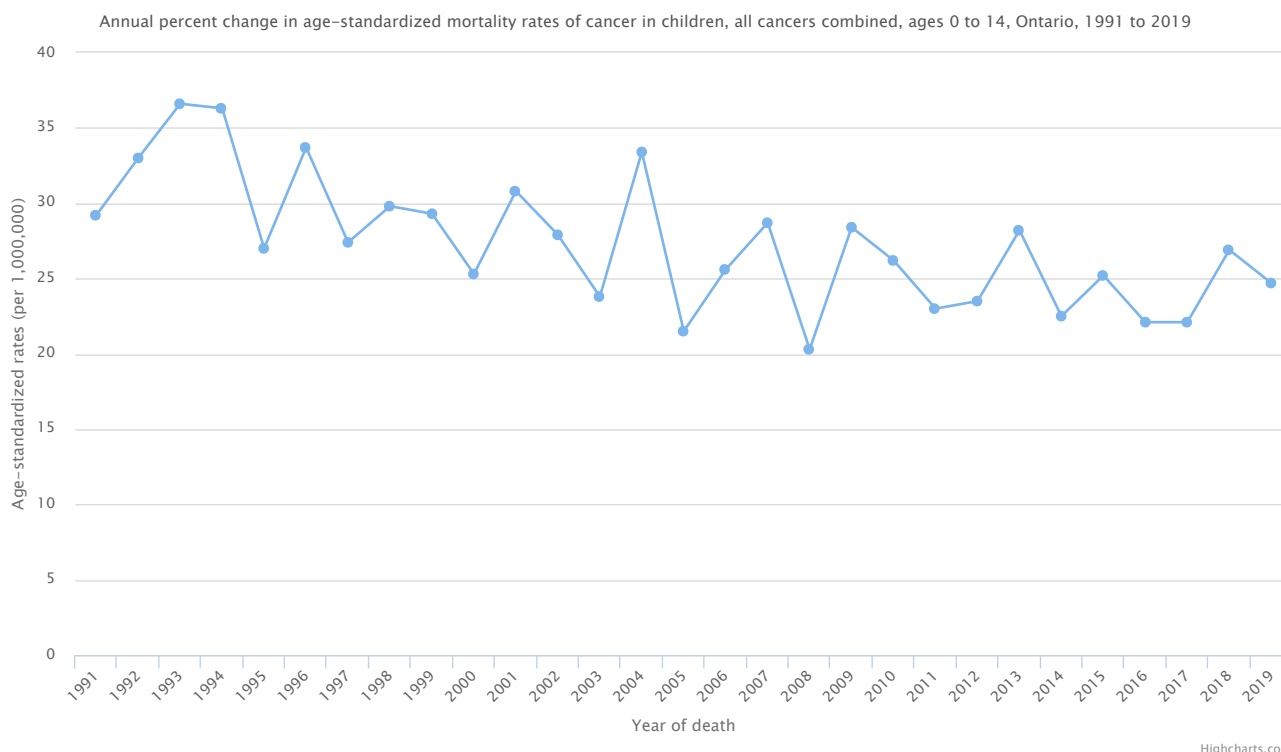
Ages 0 to 39

While incidence rates have been increasing among younger people, mortality rates have been stable or decreasing. Among males under 40, the mortality rate decreased by 1.6% per year from 1984 to 2018. Among females in this age group, mortality rates decreased by 1.9% per year from 1984 to 2006, and were stable from 2006 to 2018.

Age-standardized mortality rates among children with cancer (ages 0 to 14) decreased from 1991 to 2019 by an average of 1.2% per year (see Spotlight: Childhood Cancer Mortality Trend, Figure 5.S1).

SPOTLIGHT: Childhood Cancer Mortality Trends

Figure 5.S1



Symbol: * Means significant changing APC

Abbreviation: APC means annual percent change

Notes:

1. Rates are per 1,000,000.
2. Includes cases diagnosed since 1986 to align with Pediatric Oncology Group of Ontario Networked Information System data capture.

Analysis by: Health Analytics, Pediatric Oncology Group of Ontario

Data source: Pediatric Oncology Group of Ontario Networked Information System (April 7, 2021), Pediatric Oncology Group of Ontario

TIME PERIOD	APC (%)
1991-2019	-1.2*

Figure 5.S1: Annual percent change in age-standardized mortality rates of cancer in children, all cancers combined, ages 0 to 14, Ontario, 1991 to 2019

YEAR OF DEATH	ASMR
1991	29.2
1992	33
1993	36.6
1994	36.3
1995	27

1996	33.7
1997	27.4
1998	29.8
1999	29.3
2000	25.3
2001	30.8
2002	27.9
2003	23.8
2004	33.4
2005	21.5
2006	25.6
2007	28.7
2008	20.3
2009	28.4
2010	26.2
2011	23
2012	23.5
2013	28.2
2014	22.5
2015	25.2
2016	22.1
2017	22.1
2018	26.9
2019	24.7

Symbol: * Means significant changing APC

Abbreviation: APC means annual percent change

Notes:

1. Rates are per 1,000,000.
2. Includes cases diagnosed since 1986 to align with Pediatric Oncology Group of Ontario Networked Information System data capture.

Analysis by: Health Analytics, Pediatric Oncology Group of Ontario

Data source: Pediatric Oncology Group of Ontario Networked Information System (April 7, 2021), Pediatric Oncology Group of Ontario

For more details on childhood cancer mortality trends, read the **Pediatric Oncology Group of Ontario Surveillance Report** https://www.pogo.ca/research-data/data-reports/?utm_source=outlook&utm_medium=email&utm_campaign=OCS_2022.

Ages 40 to 59

For people ages 40 to 59, the mortality rate was stable until 1989, when it started to decrease by 2.1% per year until 2018. Similar trends were seen separately for males and for females.

Ages 60 to 79

Among people ages 60 to 79, the mortality rate was stable until 1988. The mortality rate then decreased by 0.7% per year from 1988 to 2001 and by 1.9% per year from 2001 to 2018. The rate of decrease in the most recent decades has been greater for males (2.3% per year from 2001 to 2014 and 1.4% per year from 2014 to 2018) than females (1.7% per year from 2002 to 2018).

Ages 80 and older

Mortality among people age 80 and older increased by 0.5% per year from 1984 to 2001 and then decreased by 0.5% per year from 2001 to 2018. The decrease in mortality was greater for males, at 1.0% per year from 2001 to 2018. Among females, the mortality rate increased by 1.3% from 1992 to 2001 and then decreased by 0.5% per year.

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Ontario Cancer Statistics 2022

Ch 6: Cancer Survival

Relative survival measures the likelihood of someone diagnosed with cancer surviving for a certain amount of time compared with similar people in the general population. This chapter focuses on 5-year relative cancer survival for adults and overall cancer survival proportion for children in Ontario.

Survival statistics are a key indicator of prognosis, as well as the effectiveness of control programs and cancer treatment.⁽¹⁾ Relative survival ratios show the likelihood of surviving for a certain amount of time (e.g., 1, 3 or 5 years) after diagnosis compared with similar people (i.e., same age and sex) in the general population.

The first 5 years after diagnosis are critical for examining survival because it is when someone is most likely to access healthcare services, including primary treatment and clinical assessment for recurrence. After 5 years, use of the healthcare system and the chance of recurrence decrease.

Cancer survival depends on factors such as cancer type, sex, age at diagnosis, stage at diagnosis and type of treatment. Relative survival ratios represent the average survival expected for a group of people with a certain type of cancer, so these statistics will not reflect the prognosis of every individual. Someone's survival can also depend on their health status, the presence of comorbidities, and other personal and tumour-related factors. Survival estimates are based on data from people diagnosed in the past, which means they may not reflect the impact of more recent advances in cancer detection and treatment. Relative survival also does not distinguish between people who have no evidence of cancer and those who have relapsed or are still in treatment.

Survival improves over time due to better methods for (and the greater use of) early detection and more effective treatments. Even small improvements in survival rates can, at the population level, represent large numbers of people who avoid premature deaths.⁽²⁾ Improvements in survival may also be the result of increased incidence through improved early detection. Catching cancers earlier than they would normally be found results in a "lead time bias."⁽³⁾ Lead time bias is when cancers are detected that would never have caused harm if left untreated (i.e., over-diagnosis) and causes an artificial improvement in population-level cancer survival.

SURVIVAL BY SEX AND CANCER TYPE

From 2014 to 2018, the 5-year relative survival ratio for all cancers combined was 67.2% (Table 6.1), which means people diagnosed with cancer during this period were 67.2% as likely to survive at least 5 years after diagnosis compared with similar people without cancer in the general population.

People diagnosed with cancer during this period were 67.2% as likely to survive at least 5 years after diagnosis compared with similar people without cancer in the general population

5-year relative survival ratios for selected cancers, 2014-2018



For cancer types that occur in males and females, 5-year survival was:

- highest for thyroid cancer (98.9%), melanoma (88.7%) and Hodgkin lymphoma (88.2%)
- lowest for pancreatic (12.6%), esophageal (17.3%), liver (22.8%) and lung (24.8%) cancers, mainly because most cases of these cancers (with the exception of liver cancer) are diagnosed at an advanced stage ⁽⁴⁾

For cancers with high mortality rates (particularly pancreatic cancer), relative survival estimates are generally higher in Ontario than in other provinces, possibly due to differences in survival methodology. Ontario's methodology assumes that people who are lost to follow-up are still alive at the cut-off date of 5 years after diagnosis, which can result in an overestimation of survival.⁽⁵⁾

For high-mortality cancers, being alive longer than 5 years is very unlikely. This assumption that people lost to follow-up are still alive at the cut-off date is particularly problematic for Ontario because evidence shows that the loss to follow-up rate is higher in Ontario than in other provinces. The reasons for this higher rate are unclear. Therefore, survival estimates for pancreatic, esophageal, liver and lung cancers should be interpreted with caution, especially when comparing with other jurisdictions.

There was wide variation in 5-year relative survival ratio for the following cancers (Table 6.1):

- malignant compared with non-malignant brain cancers
- different subtypes of leukemia
- cutaneous compared with non-cutaneous melanoma
- endometrial compared with uterine sarcoma
- small cell compared with other types of lung cancer

Male survival from 2014 to 2018 (65.3%) was significantly lower than female survival (69.1%), which is a gap that has been widening over time. This difference likely results from generally higher survival rates in females than males for cancer types found in all people, particularly for lung cancer, which is the leading cause of cancer death in Ontario.

For males, 5-year survival was:

- highest for thyroid (97.7%), testicular (97.1%) and prostate (94.0%) cancers
- lowest for pancreatic (12.7%), esophageal (18.2%) and lung (20.8%) cancers

For females, 5-year survival was:

- highest for thyroid cancer (99.2%), melanoma (90.7%) and breast cancer (89.3%)
- lowest for pancreatic (12.5%), esophageal (14.5%) and liver (18.0%) cancers

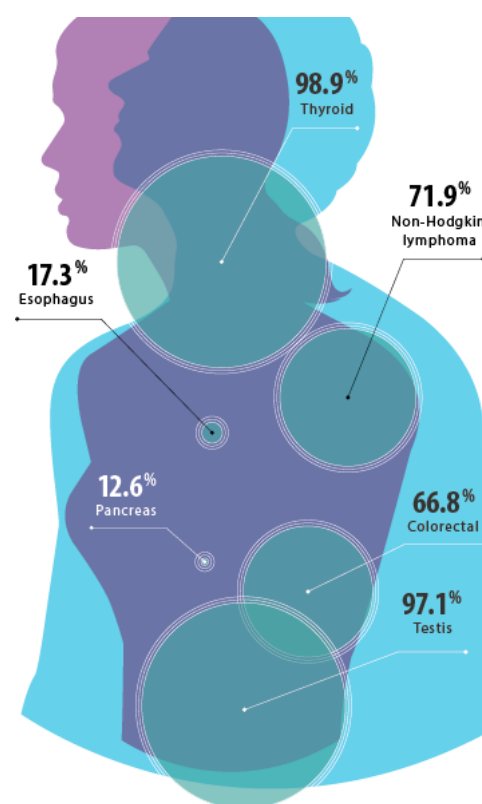


Table 6.1 Five-year relative survival ratios by cancer type and sex, Ontario, 2014 to 2018

CANCER TYPE	MALES AND FEMALES COMBINED	MALES	FEMALES
-------------	----------------------------	-------	---------

	RSR	95% CI	RSR	95% CI	RSR	95% CI
All cancers	67.2	67.0 - 67.5	65.3	65.0 - 65.7	69.1	68.8 - 69.5
Brain and nervous system						
Brain and other nervous system - malignant	28.6	26.8 - 30.5	27.1	24.8 - 29.5	30.7	27.9 - 33.5
Glioblastoma	7.8	6.3 - 9.4	8.2	6.3 - 10.4	7.2	5.1 - 9.8
All other gliomas	55.9	52.1 - 59.5	51.1	46.1 - 56.0	62.5	56.7 - 67.7
Brain and other nervous system - non-malignant	85.7	84.4 - 86.8	83.7	81.7 - 85.5	87.0	85.4 - 88.4
Meningiomas	92.1	90.0 - 93.8	86.7	82.0 - 90.2	94.4	92.0 - 96.2
Pituitary, pineal and craniopharyngeal duct	92.3	90.0 - 94.1	91.5	87.9 - 94.1	92.7	89.7 - 94.9
Breast and genital system						
Breast (female)	n/a	n/a	n/a	n/a	89.3	88.7 - 89.8
Cervix	n/a	n/a	n/a	n/a	73.5	70.6 - 76.1
Ovary	n/a	n/a	n/a	n/a	47.7	45.7 - 49.7
Prostate	n/a	n/a	94.0	93.4 - 94.6	n/a	n/a
Testis	n/a	n/a	97.1	95.6 - 98.0	n/a	n/a
Uterine	n/a	n/a	n/a	n/a	82.7	81.6 - 83.8
Uterus - endometrial	n/a	n/a	n/a	n/a	85.6	84.5 - 86.7
Uterus - uterine sarcoma	n/a	n/a	n/a	n/a	48.9	40.9 - 56.5
Digestive system						
Colorectal	66.8	65.9 - 67.6	66.7	65.5 - 67.8	67.0	65.7 - 68.2
Colon excluding rectum	65.5	64.5 - 66.6	65.7	64.2 - 67.2	65.3	63.8 - 66.8
Colon - left sided	69.5	67.9 - 71.1	69.4	67.1 - 71.5	69.8	67.2 - 72.1
Colon - right sided	66.8	65.4 - 68.2	66.9	64.8 - 68.9	66.7	64.8 - 68.6
Rectum and rectosigmoid junction	69.5	68.1 - 70.9	68.4	66.5 - 70.1	71.4	69.1 - 73.5
Rectosigmoid junction	65.0	62.0 - 67.8	64.3	60.4 - 68.0	66.0	61.3 - 70.3
Rectum	70.9	69.2 - 72.4	69.4	67.3 - 71.5	73.1	70.5 - 75.5
Esophagus	17.3	15.4 - 19.3	18.2	15.9 - 20.6	14.5	11.2 - 18.1
Esophagus - adenocarcinoma	18.3	15.8 - 21.0	19.2	16.4 - 22.1	14.4	9.6 - 20.1

Esophagus - squamous cell carcinoma	16.6	13.2 - 20.4	17.0	12.6 - 22.0	15.8	10.8 - 21.7
Liver	22.8	21.2 - 24.5	24.9	22.9 - 27.0	18.0	15.4 - 20.7
Pancreas	12.6	11.5 - 13.7	12.7	11.2 - 14.2	12.5	11.0 - 14.1
Stomach	34.4	32.5 - 36.2	32.2	29.9 - 34.4	38.0	35.0 - 41.1
Head and neck						
Larynx	63.4	59.5 - 67.0	64.4	60.2 - 68.4	57.4	47.6 - 66.0
Oral cavity and pharynx	63.7	62.0 - 65.4	63.9	61.8 - 65.9	63.3	60.1 - 66.4
Lip and oral cavity	65.1	62.5 - 67.6	65.0	61.6 - 68.1	65.3	61.1 - 69.3
Hypopharynx	30.1	23.0 - 37.5	26.9	19.6 - 34.7	44.8	23.9 - 63.7
Nasopharynx	68.4	61.9 - 74.0	67.3	59.6 - 73.8	71.4	58.4 - 80.9
Oropharynx	67.6	64.8 - 70.2	68.7	65.5 - 71.6	63.3	56.9 - 69.0
Thyroid	98.9	98.5 - 99.1	97.7	96.2 - 98.6	99.2	98.8 - 99.5
Thyroid - anaplastic	5.9	1.3 - 15.7	†	†	†	†
Thyroid - follicular	98.4	92.1 - 99.7	95.6	84.0 - 98.9	99.1	85.8 - 99.9
Thyroid - medullary	90.4	79.6 - 95.6	86.6	66.5 - 95.0	93.2	79.4 - 97.9
Thyroid - papillary	99.9	99.7 - 100.0	99.9	99.3 - 100.0	99.9	99.5 - 100.0
Hematological						
Leukemia	64.9	63.4 - 66.3	65.4	63.4 - 67.4	64.0	61.7 - 66.2
Acute lymphocytic leukemia	76.6	72.6 - 80.1	78.3	73.1 - 82.7	74.2	67.6 - 79.6
Acute monocytic leukemia	91.1	88.8 - 93.0	90.9	87.8 - 93.3	91.4	87.7 - 94.0
Acute myeloid leukemia	25.8	18.0 - 34.3	23.5	14.0 - 34.5	27.9	15.5 - 41.6
Chronic lymphocytic leukemia	28.4	25.7 - 31.1	26.5	23.0 - 30.2	30.6	26.7 - 34.7
Chronic myeloid leukemia	62.9	58.7 - 66.8	59.9	54.3 - 65.1	67.0	60.5 - 72.6
Lymphoma	73.4	72.4 - 74.4	72.4	71.0 - 73.8	74.7	73.2 - 76.1
Hodgkin lymphoma	88.2	85.8 - 90.3	89.2	85.8 - 91.8	87.1	83.2 - 90.2
Non-Hodgkin lymphoma	71.9	70.7 - 72.9	70.7	69.2 - 72.2	73.3	71.7 - 74.9
Non-Hodgkin lymphoma - extranodal	71.4	69.9 - 73.0	70.4	68.2 - 72.5	72.4	70.1 - 74.6
Non-Hodgkin lymphoma - nodal	72.3	70.7 - 73.8	70.9	68.7 - 72.9	74.0	71.7 - 76.2
Myeloma	54.8	52.6 - 56.9	53.8	50.9 - 56.6	56.0	52.9 - 59.1

Melanoma						
Melanoma of the skin	88.7	87.6 - 89.7	87.0	85.3 - 88.4	90.7	89.2 - 92.1
Melanoma (non-cutaneous)	73.3	67.3 - 78.3	75.2	66.0 - 82.2	71.5	63.2 - 78.3
Melanoma - mucosal	47.0	34.1 - 58.9	50.7	26.6 - 70.5	44.6	29.8 - 58.4
Melanoma - ocular	80.5	73.8 - 85.6	78.1	68.2 - 85.3	82.9	73.1 - 89.5
Thoracic system						
Lung	24.8	24.1 - 25.4	20.8	19.9 - 21.7	28.6	27.7 - 29.6
Lung - adenocarcinoma	32.6	31.5 - 33.7	27.4	25.8 - 29.0	36.7	35.2 - 38.2
Lung - large cell	21.5	16.7 - 26.8	21.2	14.7 - 28.6	21.7	14.7 - 29.5
Lung - small cell	6.9	5.9 - 8.1	5.8	4.5 - 7.4	8.0	6.5 - 9.7
Lung - squamous cell	24.9	23.3 - 26.5	23.7	21.7 - 25.7	26.9	24.3 - 29.5
Urinary system						
Bladder	79.1	77.8 - 80.2	79.7	78.3 - 81.0	77.0	74.6 - 79.2
Kidney	79.0	77.7 - 80.3	79.5	77.8 - 81.1	78.1	75.7 - 80.2

Abbreviations: CI means confidence interval; RSR means relative survival ratio; n/a means not applicable.

Symbol: †Estimate could not be calculated.

Notes:

1. The analysis was restricted to people ages 15 to 99.
2. Bladder cancer includes carcinoma *in situ* cases.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

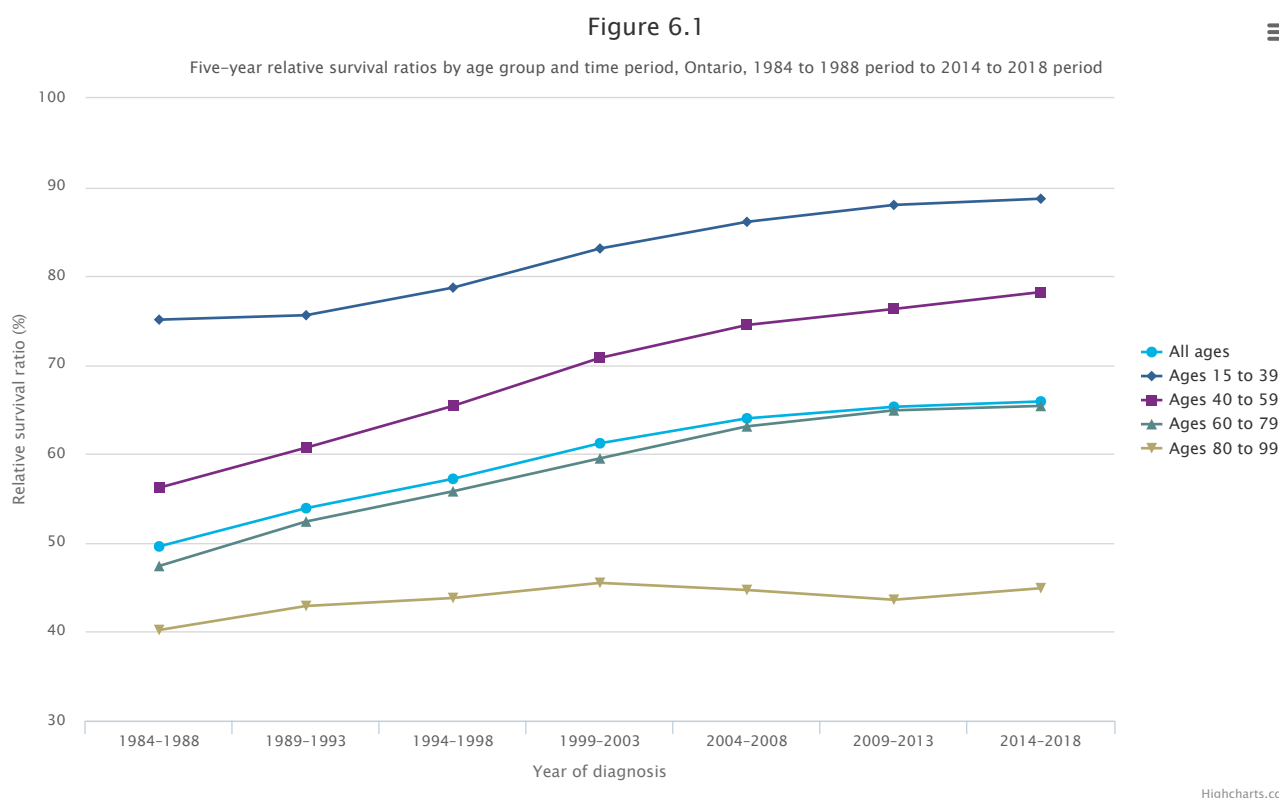
Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

There were differences between males and females in 5-year survival for the following cancer types:

- Lung cancer survival was significantly higher in females (28.6%) than males (20.8%). One reason for this difference may be that males are more likely to have more aggressive lung cancer types, which have lower survival and are more likely to be diagnosed at a later stage.^(6,7)
- Survival for melanoma was significantly higher in females (90.7%) than males (87.0%). Lower survival among males is due to biological differences that make this cancer more likely to spread in males.⁽⁸⁻¹⁰⁾ Recent research has also suggested that the expression of the PR70 protein, which is linked to the X-chromosome and expressed in higher doses among females, may suppress melanoma tumours.⁽¹¹⁾
- Lower bladder cancer survival in females (77.0% versus 79.7% in males) may be because:
 - Females are typically diagnosed at a more advanced stage than males.
 - There are differences in how males and females metabolize carcinogens.
 - There is a greater presence of sex steroids in females that could affect the progression of this cancer.^(12,13)

SURVIVAL BY AGE

From the 1984 to 1988 period to the 2014 to 2018 period, the 5-year age-standardized relative survival ratio for all ages and cancers combined rose from 49.6% to 65.9% (Figure 6.1).



Notes:

1. Analysis was restricted to ages 15 to 99.
2. The period method was used to derive relative survival ratios for the 2014 to 2018 period. The cohort method was used for all other periods.
3. International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules used when presenting trends over time.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 6.1 Five-year relative survival ratios by age group and time period, Ontario, from the 1984 to 1988 period to the 2014 to 2018 period

YEAR OF DIAGNOSIS	ALL AGES	AGES 15 - 39	AGES 40 - 59	AGES 60 - 79	AGES 80 - 99
1984-1988	49.6	75.1	56.2	47.4	40.2
1989-1993	53.9	75.6	60.7	52.4	42.9
1994-1998	57.2	78.7	65.4	55.8	43.8

1999-2003	61.2	83.1	70.8	59.5	45.5
2004-2008	64	86.1	74.5	63.1	44.7
2009-2013	65.3	88	76.3	64.9	43.6
2014-2018	65.9	88.7	78.2	65.4	44.9

Notes:

1. Analysis was restricted to ages 15 to 99.
2. The period method was used to derive relative survival ratios for the 2014 to 2018 period. The cohort method was used for all other periods.
3. International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules used when presenting trends over time.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

As in previous periods, the 5-year relative survival ratio for all cancers combined in the 2014 to 2018 period decreased with advancing age. For example, the relative survival ratio was 88.7% for people diagnosed from ages 15 to 39, but just 44.9% for those diagnosed from ages 80 to 99.

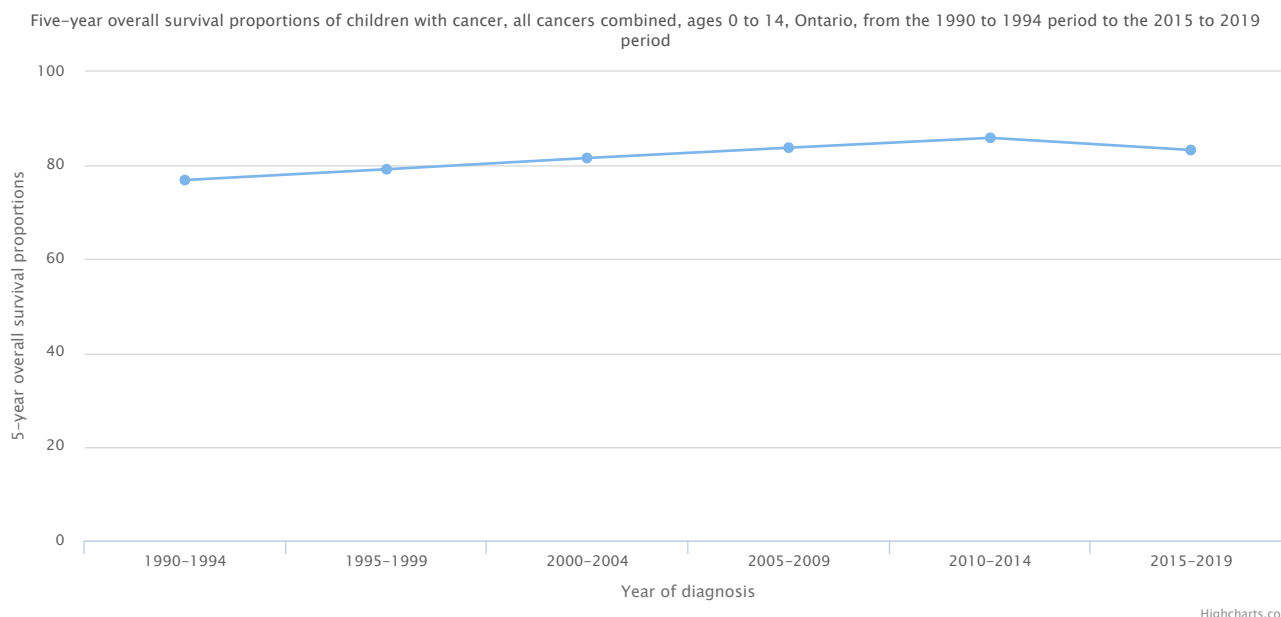
People diagnosed at ages 80 to 99 saw little improvement in 5-year survival from the 1984 to 1988 period to the 2014 to 2018 period. This lack of improvement is mainly because people in this age group are more likely to have comorbidities and less likely to receive aggressive treatment for cancer. People diagnosed at ages 40 to 79 showed the greatest improvement in 5-year relative survival. As a result, the gap in survival between the oldest age group and the younger age groups widened over time. A European study comparing people ages 55 to 69 with those ages 70 to 84 showed that the greater improvements in survival among people under age 80 may partly be due to the greater use of population-based screening programs for breast and colorectal cancers, and use of the prostate specific antigen test for prostate cancer.⁽¹⁴⁾

In Ontario, 83.3% of children ages 0 to 14 diagnosed with cancer from 2015 to 2019 were estimated to survive 5 years (i.e., 5-year overall survival proportion). Overall survival proportion is an estimate of the probability of surviving all causes of death. Children with cancer continued to experience gains in survival, with the 5-year overall survival proportion increasing from 76.9% during the 1990 to 1994 period to 83.3% in the latest 5-year period (2015 to 2019) (see **Spotlight: Childhood Cancer Survival Trend, Figure 6.S1** ([#spotlight-childhood-cancer-survival-trends](#))).

For more details on childhood cancer survival trends, read the **Pediatric Oncology Group of Ontario Surveillance Report** (https://www.pogo.ca/research-data/data-reports/?utm_source=outlook&utm_medium=email&utm_campaign=OCS_2022).

SPOTLIGHT: Childhood Cancer Survival Trends

Figure 6.S1

**Notes:**

1. The cohort method was used to derive 5-year overall survival proportions for cases with a first primary cancer diagnosed from 1990 to 2014; the period method was used to derive 5-year overall survival proportions for cases diagnosed from 2015 to 2019.
2. Overall survival proportions do not adjust for the expected survival of the general population of children in Ontario of the same age and sex during the same period.

Analysis by: Health Analytics, Pediatric Oncology Group of Ontario

Data source: Pediatric Oncology Group of Ontario Networked Information System (April 7, 2021), Pediatric Oncology Group of Ontario

Figure 6.S1. Five-year overall survival proportions of children with cancer, all cancers combined, ages 0 to 14, Ontario, from the 1990 to 1994 period to the 2015 to 2019 period

YEAR OF DIAGNOSIS	5-YEAR OSP
1990-1994	76.9
1995-1999	79.2
2000-2004	81.6
2005-2009	83.8
2010-2014	85.9
2015-2019	83.3

Notes:

1. The cohort method was used to derive 5-year overall survival proportions for cases with a first primary cancer diagnosed from 1990 to 2014; the period method was used to derive 5-year overall survival proportions for cases diagnosed from 2015 to 2019.
2. Overall survival proportions do not adjust for the expected survival of the general population of children in Ontario of the same age and sex during the same period.

Analysis by: Health Analytics, Pediatric Oncology Group of Ontario

Data source: Pediatric Oncology Group of Ontario Networked Information System (April 7, 2021), Pediatric Oncology Group of Ontario

SURVIVAL TRENDS BY CANCER TYPE

The relative survival ratio for all cancers combined in Ontario increased each decade from 1984 to 2018, but the rate of increase dropped from 2008 to 2018 compared with previous periods. More specifically, of the 16.5 percentage point increase from 1984 to 2018, the largest improvement in survival occurred from the 1984 to 1988 period to the 1994 to 1998 period (7.4 percentage points), compared with only 2.5 percentage points from the 2004 to 2008 period to the 2014 to 2018 period (Table 6.2).

Table 6.2 Age-standardized five-year relative survival ratios by cancer type and time period, Ontario, 1984 to 1988 period to the 2014 to 2018 period

CANCER TYPE	1984 TO 1988		1994 TO 1998		2004 TO 2008		2014 TO 2018	
	RSR (%)	95% CI	RSR (%)	95% CI	RSR (%)	95% CI	RSR (%)	95% CI
All cancers	49.5	49.2-49.8	56.9	56.7-57.2	63.5	63.3-63.7	66.0	65.7-66.3
Brain and nervous system								
Brain and other nervous system - malignant	26.4	25.0-27.9	29.8	28.4-31.2	34.0	32.7-35.4	30.8	29.0-32.6
Glioblastoma	6.6	5.0-8.6	7.8	6.3-9.6	9.3	7.4-11.4	13.7	11.0-16.8
All other gliomas	27.4	25.1-29.7	33.4	30.7-36.2	39.7	37.3-42.1	44.6	41.0-48.2
Brain and other nervous system - non-malignant	†	†	†	†	†	†	†	†
Meningiomas	†	†	†	†	†	†	†	†
Pituitary, pineal and craniopharyngeal duct	†	†	†	†	†	†	†	†
Breast and genital system								
Breast (female)	75.0	74.2-75.9	84.2	83.6-84.9	86.7	86.1-87.2	89.3	88.6-89.9
Cervix	64.5	62.4-66.6	67.1	65.0-69.1	67.7	65.5-69.8	70.4	67.3-73.2
Ovary	31.0	29.3-32.7	36.7	35.2-38.3	42.2	40.7-43.7	43.1	41.1-45.1
Prostate	70.4	69.1-71.7	88.2	87.5-88.9	94.7	94.2-95.1	92.1	91.4-92.8
Testis	83.9	79.1-87.6	88.6	83.5-92.1	93.4	89.6-95.9	92.6	84.5-96.6
Uterine	81.0	79.3-82.6	82.2	80.8-83.6	81.7	80.5-82.9	80.5	79.0-81.8
Uterus - endometrial	83.6	81.7-85.3	84.8	83.3-86.2	84.7	83.4-85.9	83.6	82.2-84.9

Uterus - uterine sarcoma	45.3	33.5-56.3	41.8	33.5-49.8	39.9	32.4-47.2	36.3	27.2-45.4
Digestive system								
Colorectal	52.1	51.3-52.8	57.2	56.5-57.9	65.5	64.9-66.1	68.2	67.3-69.0
Colon excluding rectum	54.1	53.2-55.0	57.3	56.5-58.2	65.6	64.9-66.3	67.3	66.3-68.3
Colon - left sided	55.4	53.9-56.8	60.6	59.2-61.9	69.6	68.5-70.7	70.2	68.6-71.8
Colon - right sided	54.7	53.3-56.0	57.5	56.2-58.7	64.6	63.6-65.6	67.9	66.5-69.2
Rectum and rectosigmoid junction	48.4	47.1-49.8	57.6	56.3-58.8	65.5	64.4-66.5	69.2	67.7-70.6
Rectosigmoid junction	44.0	41.3-46.7	58.2	55.9-60.4	63.5	61.5-65.3	65.1	62.2-67.9
Rectum	50.0	48.4-51.5	57.2	55.7-58.7	66.2	64.9-67.4	70.4	68.7-72.0
Esophagus	13.5	11.6-15.5	15.6	14.0-17.4	16.2	14.7-17.7	20.9	18.7-23.2
Esophagus - adenocarcinoma	12.6	9.3-16.5	12.5	10.3-14.9	14.6	12.7-16.5	21.8	19.1-24.6
Esophagus - squamous cell carcinoma	12.1	9.8-14.7	17.3	14.6-20.2	18.0	15.3-20.9	19.2	14.9-24.0
Liver	8.3	6.5-10.4	14.0	12.3-15.8	23.8	22.2-25.4	23.3	21.6-25.1
Pancreas	7.3	6.4-8.2	9.0	8.1-9.9	10.9	10.0-11.8	15.0	13.8-16.3
Stomach	20.0	18.7-21.3	23.9	22.6-25.2	29.3	28.0-30.6	35.8	34.0-37.6
Head and neck								
Larynx	63.4	60.1-66.5	64.9	62.0-67.7	65.5	62.8-68.1	63.6	59.4-67.6
Oral cavity & pharynx	54.6	52.6-56.5	55.5	53.6-57.2	60.1	58.5-61.7	60.7	58.8-62.6
Lip and oral cavity	68.2	65.6-70.6	66.7	64.3-69.1	67.4	65.2-69.5	63.9	61.2-66.4
Hypopharynx	19.4	15.0-24.2	24.6	19.7-29.8	33.2	27.8-38.7	†	†
Nasopharynx	47.8	42.1-53.3	60.3	55.1-65.1	65.7	61.1-69.9	66.9	59.7-73.2
Oropharynx	32.5	28.9-36.1	41.1	37.5-44.7	54.1	51.0-57.0	62.4	58.8-65.8
Thyroid	84.6	82.0-86.8	90.7	88.7-92.4	96.1	95.1-96.9	98.0	97.4-98.5
Thyroid - anaplastic	21.4	8.3-38.5	5.5	1.6-12.8	36.0	30.1-42.0	†	†
Thyroid - follicular	88.8	83.9-92.3	90.4	84.9-93.9	94.9	89.1-97.6	97.6	93.5-99.1
Thyroid - medullary	67.8	57.8-75.9	81.0	68.2-89.0	82.9	74.0-89.0	91.1	81.2-95.9
Thyroid - papillary	93.5	89.0-96.2	96.8	93.2-98.5	98.8	98.0-99.3	99.7	99.1-99.9

Hematological								
Leukemia	39.2	37.6-40.7	44.3	42.9-45.7	55.9	54.7-57.1	64.0	62.5-65.5
Acute lymphocytic leukemia	27.7	22.5-33.2	29.5	24.5-34.8	52.5	47.4-57.3	62.9	57.0-68.3
Acute monocytic leukemia	68.0	65.2-70.5	72.5	70.3-74.6	81.0	79.4-82.5	91.1	88.9-92.9
Acute myeloid leukemia	4.1	0.8-12.3	14.8	9.1-22.0	14.4	8.8-21.5	25.4	18.3-33.2
Chronic lymphocytic leukemia	11.1	9.3-13.1	13.5	11.8-15.4	16.3	14.8-17.9	26.3	23.8-29.0
Chronic myeloid leukemia	27.9	24.1-31.7	33.2	29.8-36.7	59.4	55.8-62.8	61.0	57.0-64.7
Lymphoma	50.3	48.8-51.8	52.0	50.8-53.2	64.0	63.0-65.0	72.5	71.4-73.5
Hodgkin lymphoma	72.4	69.9-74.6	79.9	77.7-81.9	82.9	80.9-84.7	86.5	84.1-88.5
Non-Hodgkin lymphoma	49.9	48.3-51.5	50.7	49.5-52.0	63.6	62.6-64.5	72.2	71.1-73.3
Non-Hodgkin lymphoma - extranodal	48.6	47.0-50.2	49.2	47.9-50.5	61.4	60.4-62.5	71.2	69.6-72.7
Non-Hodgkin lymphoma - nodal	81.5	71.7-88.2	71.9	66.3-76.7	79.5	76.5-82.1	73.2	71.7-74.7
Myeloma	31.9	29.7-34.1	34.9	33.1-36.8	44.2	42.5-45.9	58.1	56.1-60.1
Melanoma								
Melanoma of the skin	83.6	82.2-85.0	84.4	83.3-85.5	87.7	86.8-88.4	91.4	90.5-92.2
Melanoma (non-cutaneous)	76.2	70.6-80.8	83.6	78.3-87.7	79.2	74.7-82.9	76.7	70.8-81.6
Melanoma - mucosal	73.5	52.9-86.2	58.8	37.7-74.9	52.9	35.1-67.9	51.4	34.8-65.8
Melanoma - ocular	76.2	70.3-81.0	85.8	80.4-89.8	81.8	77.5-85.4	83.3	77.3-87.8
Thoracic system								
Lung	14.4	13.9-14.9	16.5	16.0-16.9	18.9	18.4-19.3	26.8	26.0-27.6
Lung - adenocarcinoma	19.7	18.4-21.0	21.9	20.8-22.9	25.5	24.6-26.4	32.5	31.2-33.7
Lung - large cell	9.6	7.9-11.5	8.8	7.3-10.3	13.9	11.7-16.3	†	†
Lung - small cell	6.5	5.3-7.7	7.4	6.4-8.5	7.3	6.3-8.3	†	†
Lung - squamous cell	17.9	16.8-19.1	19.2	18.1-20.4	23.9	22.4-25.5	†	†
Urinary system								

Bladder	75.9	74.6-77.2	73.1	71.8-74.4	69.2	68.0-70.4	65.2	63.4-67.0
Kidney	52.6	50.5-54.6	61.8	60.0-63.5	68.7	67.3-70.0	77.4	75.8-79.0

Abbreviations: CI means confidence interval; RSR means relative survival ratio.

Symbol: †Statistic could not be calculated.

Notes:

1. Analysis was restricted to ages 15 to 99.
2. The period method was used to derive relative survival ratios for the 2014 to 2018 period. The cohort method was used for all other periods.
3. International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules used when presenting trends over time.
4. Relative survival ratios were age-standardized using the International Cancer Survival Standards.
5. Bladder cancer includes malignant cases only (bladder carcinoma *in situ* cases are excluded).

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

From the 1984 to 1988 period to the 2014 to 2018 period, most cancers experienced increases in survival (Figure 6.2). The gains in survival were greatest for the following cancers:

- myeloma (a 26.2 percentage point increase)
- kidney cancer (24.8)
- leukemia (24.8) and several subtypes
- lymphoma (22.2) and several subtypes
- prostate (21.7)
- rectum and rectosigmoid junction (20.8)
- nasopharynx (19.1) and oropharynx (29.9)

Notable increases were also seen for the following cancers:

- colorectal (including its subsites) (a 16.1 percentage point increase)
- stomach (15.8)
- liver (15.0)
- breast (14.3)
- thyroid (13.4)
- lung (12.4)

Smaller gains in survival occurred for cervical, endometrial and laryngeal cancers, and melanoma of the skin. A downward trend in survival was observed for the following cancers:

- mucosal melanoma (a 22.1 percentage point decrease)
- squamous cell lung (17.9) and small cell lung (6.5)
- bladder (10.7, for malignant cases only)
- lip and oral cavity (4.3)

When comparing colorectal cancer subsites, the rectal cancer survival rate was lower than the colon cancer survival rate in the 1984 to 1988 period. Survival for both subsites increased over time, but the disparity in survival between the subsites decreased, with rectal cancer survival nearly catching up to colon cancer survival by the 2014 to 2018 period. Similarly, survival rates for the subsites for oral cavity and pharynx cancers became increasingly similar over time and were approximately the same by the 2014 to 2018 period, with the exception of hypopharynx.

In the 2014 to 2018 period, non-Hodgkin lymphoma survival also approached the survival of Hodgkin lymphoma, even though Hodgkin lymphoma still had a higher relative survival ratio.

Figure 6.2 (Low survival cancers)

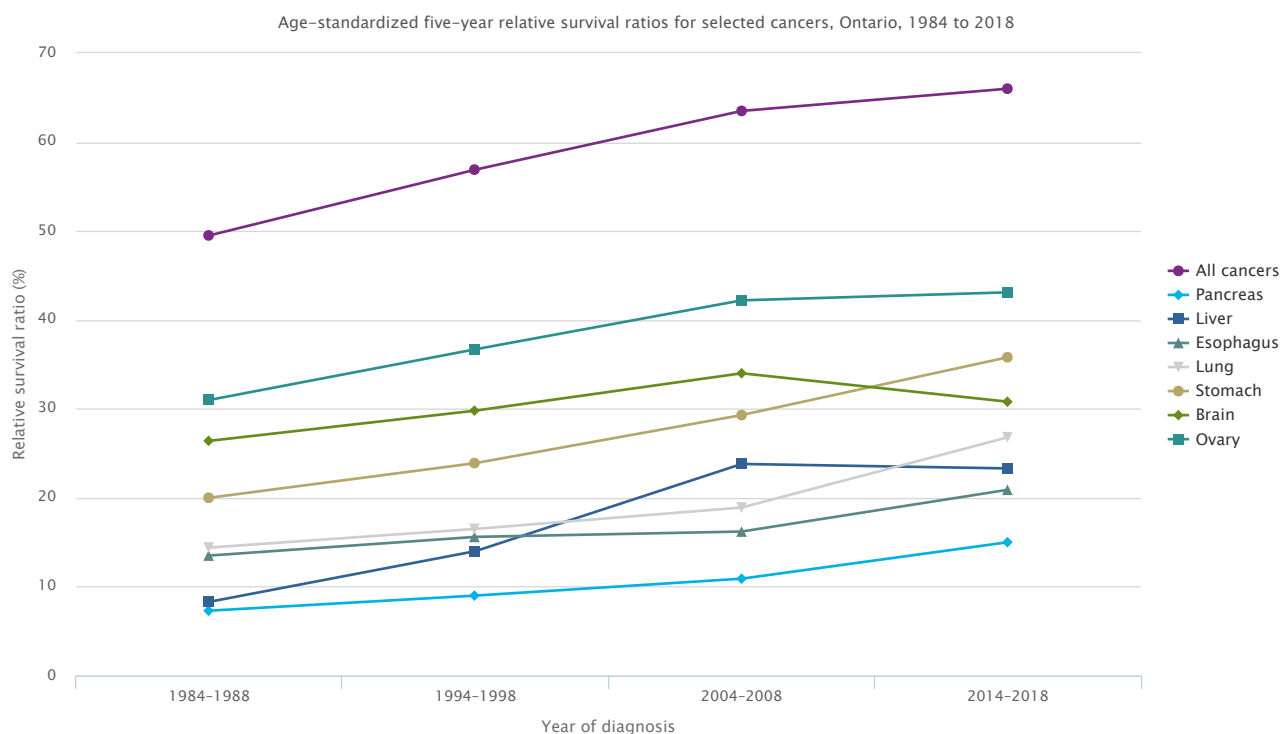


Figure 6.2 (Medium survival cancers)

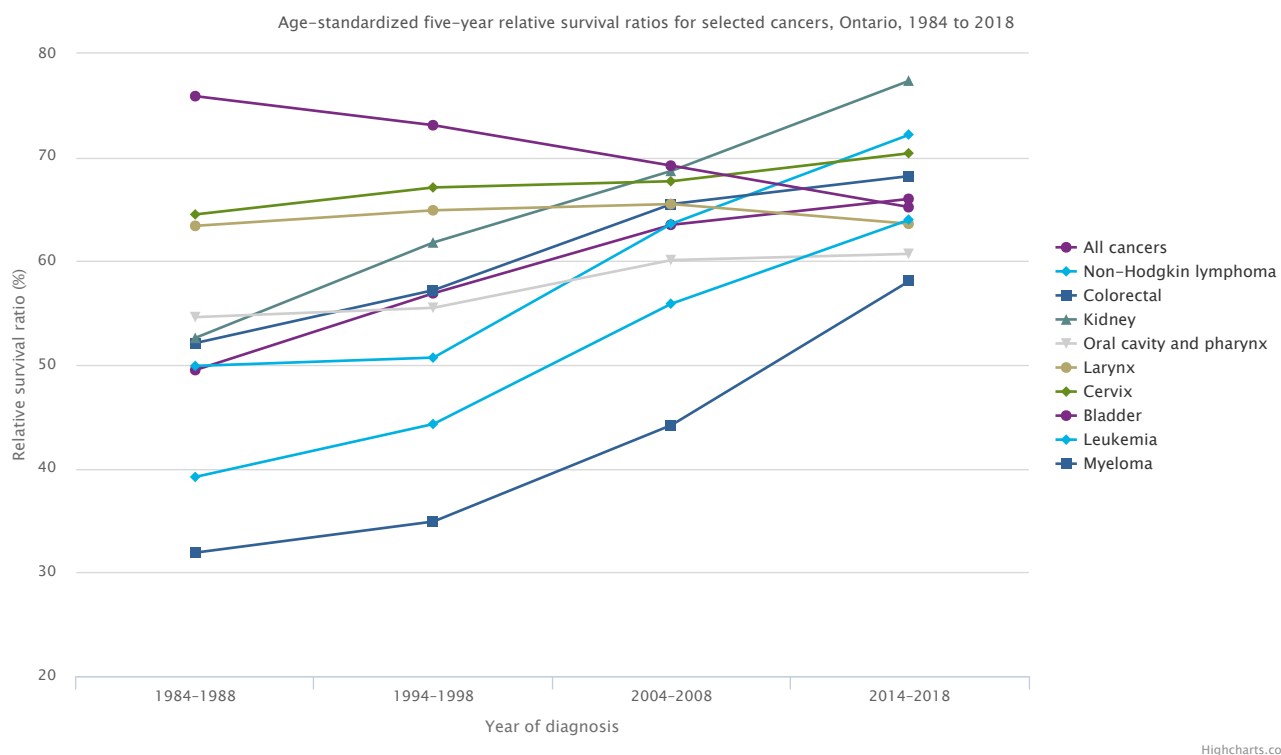
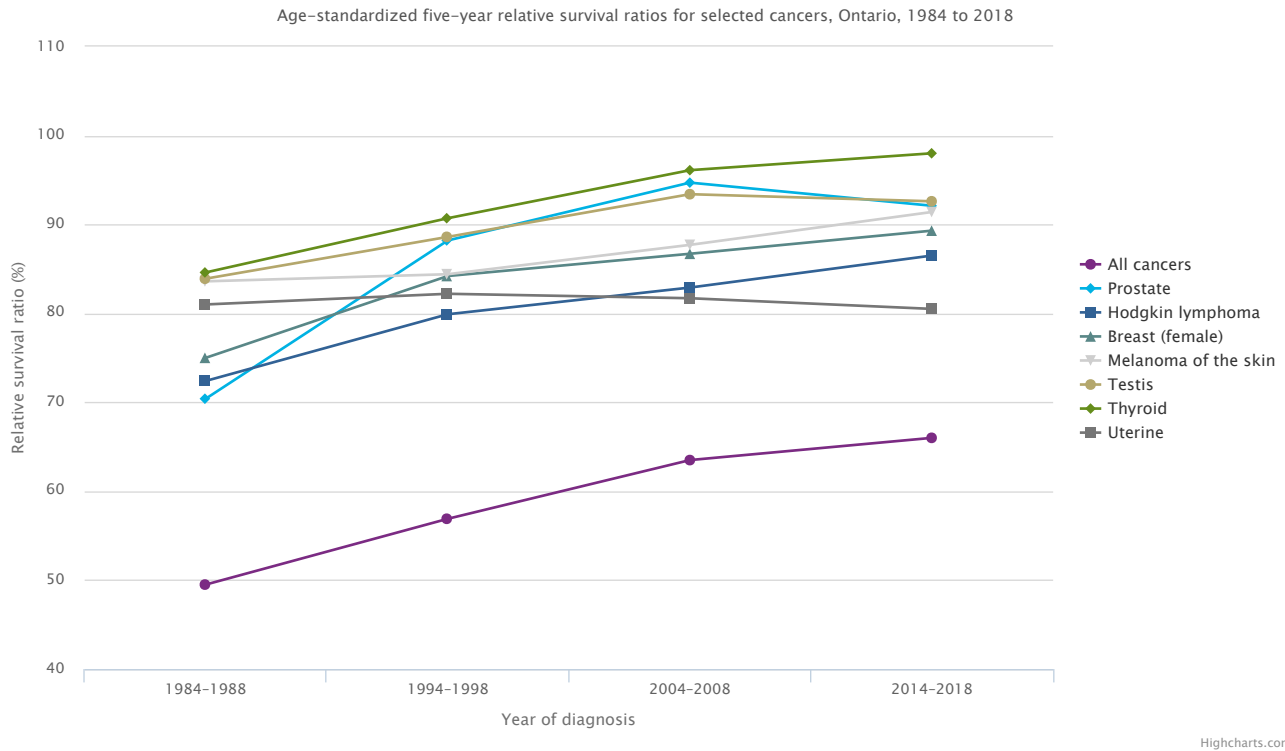


Figure 6.2 (High survival cancers)

**Notes:**

1. Analysis was restricted to ages 15 to 99.
2. The period method was used to derive relative survival ratios for the 2014 to 2018 period. The cohort method was used for all other periods.
3. International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules used when presenting trends over time.
4. Relative survival ratios were age-standardized using the International Cancer Survival Standards.
5. Bladder cancer includes malignant cases only (bladder carcinoma *in situ* cases are excluded).

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)**Data source:** Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 6.2 (Low survival cancers)

YEAR OF DIAGNOSIS	ALL CANCERS	PANCREAS	LIVER	ESOPHAGUS	LUNG	STOMACH	BRAIN	OVARY
1984-1988	49.5	7.3	8.3	13.5	14.4	20	26.4	31
1994-1998	56.9	9	14	15.6	16.5	23.9	29.8	36.7
2004-2008	63.5	10.9	23.8	16.2	18.9	29.3	34	42.2
2014-2018	66	15	23.3	20.9	26.8	35.8	30.8	43.1

Figure 6.2 (Medium survival cancers)

YEAR OF DIAGNOSIS	ALL CANCERS	NON-HODGKIN LYMPHOMA	COLORECTAL	KIDNEY	ORAL CAVITY AND	LARYNX	CERVIX	BLADDER	LEUKE
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PHARYNX									
1984-1988	49.5	49.9	52.1	52.6	54.6	63.4	64.5	75.9	39.2
1994-1998	56.9	50.7	57.2	61.8	55.5	64.9	67.1	73.1	44.3
2004-2008	63.5	63.6	65.5	68.7	60.1	65.5	67.7	69.2	55.9
2014-2018	66	72.2	68.2	77.4	60.7	63.6	70.4	65.2	64

Figure 6.2 (High survival cancers)

YEAR OF DIAGNOSIS	ALL CANCERS	PROSTATE	HODGKIN LYMPHOMA	BREAST (FEMALE)	MELANOMA OF THE SKIN	TESTIS	THYROID	UTERINE
1984-1988	49.5	70.4	72.4	75	83.6	83.9	84.6	81
1994-1998	56.9	88.2	79.9	84.2	84.4	88.6	90.7	82.2
2004-2008	63.5	94.7	82.9	86.7	87.7	93.4	96.1	81.7
2014-2018	66	92.1	86.5	89.3	91.4	92.6	98	80.5

Notes:

1. Analysis was restricted to ages 15 to 99.
2. The period method was used to derive relative survival ratios for the 2014 to 2018 period. The cohort method was used for all other periods.
3. International Agency for Research on Cancer/International Association of Cancer Registries multiple primary rules used when presenting trends over time.
4. Relative survival ratios were age-standardized using the International Cancer Survival Standards.
5. Bladder cancer includes malignant cases only (bladder carcinoma *in situ* cases are excluded).

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)**Data source:** Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

SURVIVAL BY DURATION

In the 2014 to 2018 period, the relative survival ratio for all cancers combined was 80.8% after 1 year, 67.4% after 5 years, 63.2% after 10 years and 61.7% after 15 years (Figure 6.3).

As for most individual cancer types, survival for all cancers combined decreased most during the first year after diagnosis, followed by progressively smaller decreases in survival as the time from diagnosis progressed. Some of the largest drops in survival in the first year after diagnosis were for pancreatic, liver, esophageal, lung, brain, stomach and ovarian cancers, as well as leukemia.

For the 4 most common cancers, the following trends were observed for relative survival by duration:

- For breast cancer, the relative survival ratio 1 year after diagnosis was very high at 97.5%. At 5 years, the relative survival ratio fell to 89.5%. Survival at 10 years decreased slightly to 83.9% and at 15 years to 81.2%.
- For colorectal cancer, the relative survival ratio 1 year after diagnosis was 82.9%, but fell to 67.1% at 5 years. There was no significant difference between the 10-year and 15-year relative survival ratios for colorectal cancer.
- Lung cancer had one of the greatest drops in survival from 1 to 5 years after diagnosis, falling from 50.9% to

just 24.8%. Survival continued to decrease significantly to 17.9% at 10 years and 15.1% at 15 years.

- Prostate cancer survival decreased by a small, but significant, amount from 1 to 5 years after diagnosis, but there was no significant difference between 5-year, 10-year and 15-year survival. In fact, the 10-year and 15-year relative survival ratios were nearly the same (93.1% and 93.0%, respectively).

For 2014-2018 the relative survival ratio
for all cancers combined was

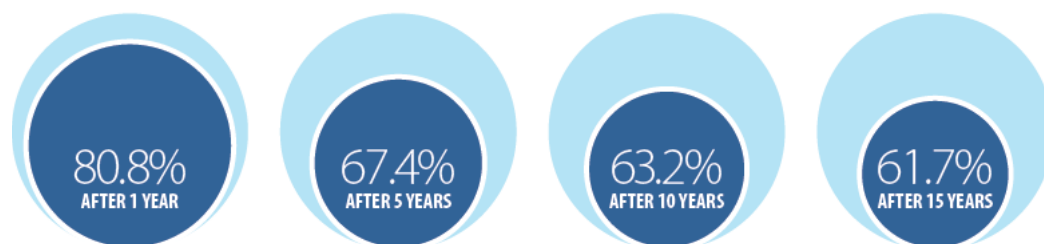
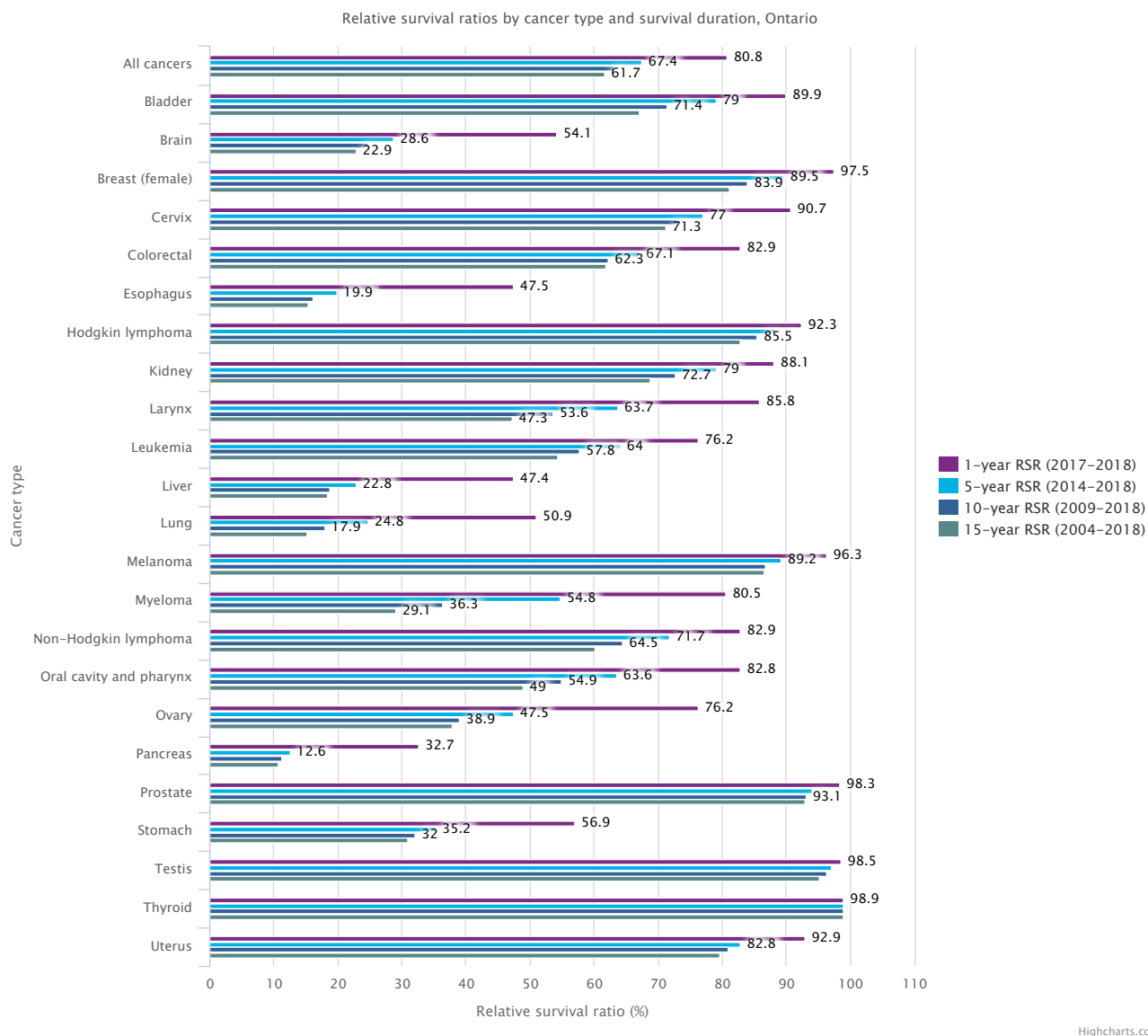


Figure 6.3



Abbreviation: RSR means relative survival ratio.

Notes:

1. Analysis was restricted to ages 15 to 99.
2. Bladder cancer includes carcinoma *in situ*.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 6.3 Relative survival ratios by cancer type and survival duration, Ontario

CANCER TYPE	1-YEAR RSR (2017-2018)	5-YEAR RSR (2014-2018)	10-YEAR RSR (2009-2018)	15-YEAR RSR (2004-2018)
All cancers	80.8	67.4	63.2	61.7
Bladder	89.9	79	71.4	67.1

Brain	54.1	28.6	24.7	22.9
Breast (female)	97.5	89.5	83.9	81.2
Cervix	90.7	77	73.1	71.3
Colorectal	82.9	67.1	62.3	61.9
Esophagus	47.5	19.9	16.2	15.3
Hodgkin lymphoma	92.3	88.3	85.5	82.9
Kidney	88.1	79	72.7	68.8
Larynx	85.8	63.7	53.6	47.3
Leukemia	76.2	64	57.8	54.4
Liver	47.4	22.8	18.8	18.4
Lung	50.9	24.8	17.9	15.1
Melanoma	96.3	89.2	86.7	86.5
Myeloma	80.5	54.8	36.3	29.1
Non-Hodgkin lymphoma	82.9	71.7	64.5	60.1
Oral cavity and pharynx	82.8	63.6	54.9	49
Ovary	76.2	47.5	38.9	37.8
Pancreas	32.7	12.6	11.2	10.6
Prostate	98.3	94.1	93.1	93
Stomach	56.9	35.2	32	31
Testis	98.5	97.1	96.4	95.2
Thyroid	98.9	98.9	98.9	98.9
Uterus	92.9	82.8	81	79.7

Abbreviation: RSR means relative survival ratio.

Notes:

1. Analysis was restricted to ages 15 to 99.
2. Bladder cancer includes carcinoma *in situ*.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

SURVIVAL BY STAGE

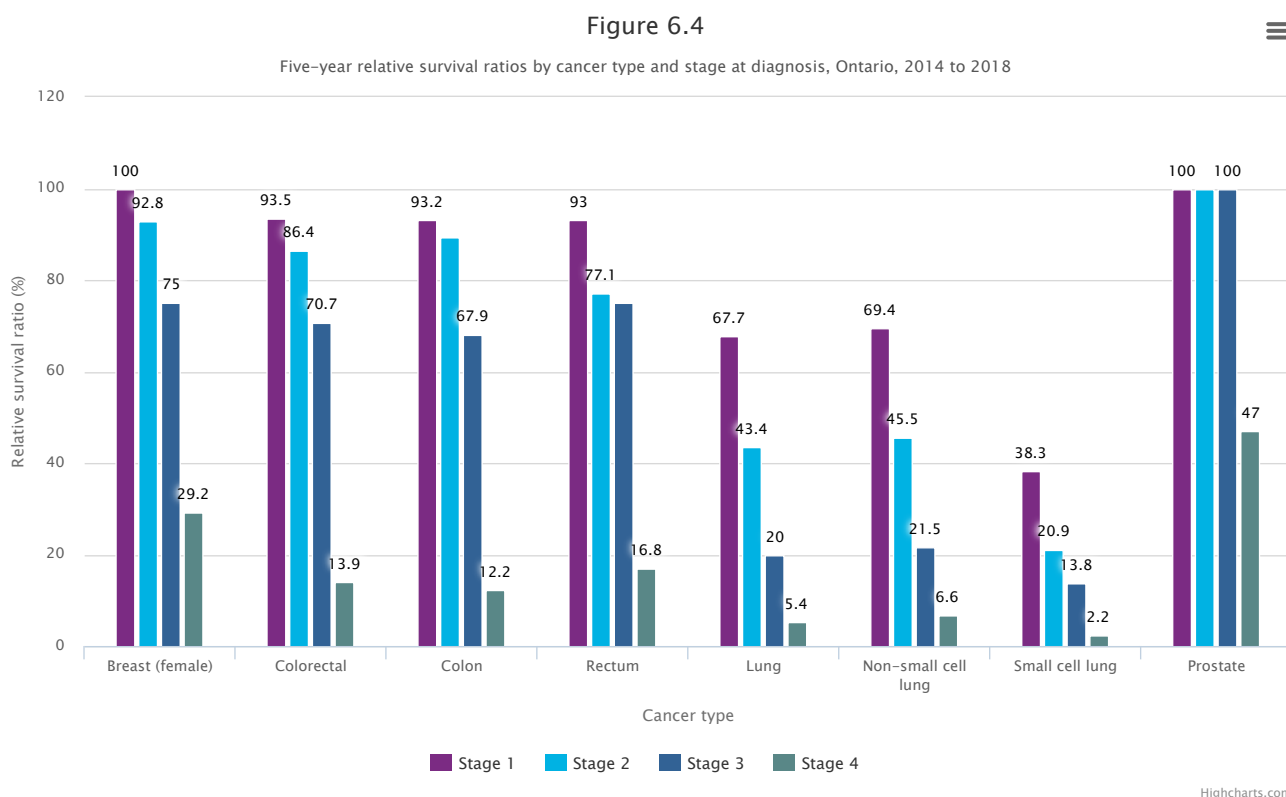
Stage at diagnosis is one of the most important predictors of cancer survival. Population-level stage data in Ontario were available from 2010 to 2018 for the 4 most common cancers (breast, colorectal, lung and prostate) and

cervical cancer, as well as for a limited number of years for thyroid cancer and melanoma. This section focuses on the 4 most common cancers.

Five-year relative survival from 2014 to 2018 tended to decrease with advancing stage at diagnosis (Figure 6.4). The level of decrease varied by cancer type:

- While breast cancer cases diagnosed at stage 1 had a 5-year relative survival ratio of 100.0%, the relative survival ratio decreased to just 29.2% for cases diagnosed at stage 4.
- Colorectal cancer cases diagnosed at stage 1 had a 5-year relative survival ratio of 93.5%, which decreased to 86.4% for cases diagnosed at stage 2, 70.7% at stage 3 and just 13.9% at stage 4.
- Of the 4 most common cancers, lung cancer had the lowest survival at every stage. Even at stage 1, 5-year survival was just 67.7%, decreasing to 5.4% at stage 4.
- Stage at diagnosis had the least effect on prostate cancer. Five-year survival for stages 1 to 3 was 100.0%; however, survival dropped to 47.0% for cases diagnosed at stage 4.

Five-year relative survival from 2014 to 2018 tended to decrease with advancing stage at diagnosis (Figure 6.4). The level of decrease varied by cancer type.



Notes:

1. Analysis was restricted to ages 15 to 99.
2. Cases with no stage group data were excluded from this analysis.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

6.4 Five-year relative survival ratios by cancer type and stage at diagnosis, Ontario, 2014 to 2018

CANCER TYPE	STAGE 1	STAGE 2	STAGE 3	STAGE 4
Breast (female)	100	92.8	75	29.2
Colorectal	93.5	86.4	70.7	13.9
Colon	93.2	89.4	67.9	12.2
Rectum	93	77.1	74.9	16.8
Lung	67.7	43.4	20	5.4
Non-small cell lung	69.4	45.5	21.5	6.6
Small cell lung	38.3	20.9	13.8	2.2
Prostate	100	100	100	47

Notes:

1. Analysis was restricted to ages 15 to 99.
2. Cases with no stage group data were excluded from this analysis.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

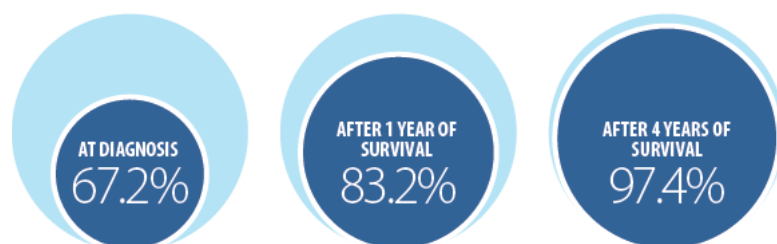
Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

CONDITIONAL SURVIVAL

Relative survival ratios represent the likelihood of surviving a specific number of years after diagnosis. However, sometimes it is useful to measure survival starting at a time other than the date of diagnosis. Because people are more likely to die in the first year following diagnosis, survival after the first year (also called 1-year conditional survival) may be very different from survival measured at diagnosis. Table 6.3 presents survival at 5 years after diagnosis after already having survived 0 (the equivalent of non-conditional survival), 1, 2, 3 and 4 years.

While the 5-year relative survival ratio measured from diagnosis for all cancers combined from 2014 to 2018 was 67.2%, the 5-year relative survival ratio increased to 83.2% for people who survived the first year after diagnosis. The 5-year relative survival ratio increased for each year someone survived until 4 years after diagnosis, when it was 97.4%.

Five year conditional relative survival ratios for all cancers combined



In general, once someone has survived the first year after diagnosis, their chance of surviving 5 years continues to increase, but that increase gets smaller for each year they survive. For example, the 5-year survival for colorectal cancer increases by 13.6% after surviving the first year (66.8% to 80.4%), but only increases by 7% after surviving the second year (from 80.4% to 87.1%).

People who have cancers with a poor prognosis (e.g., pancreatic, esophageal, liver, lung, stomach, brain) showed the highest relative gain in survival once they survived the first year after diagnosis. For example, while the 5-year relative survival ratio for pancreatic cancer was only 12.6% at diagnosis, it rose to 38.8% for people who survived their first year. Cancers with a good prognosis (e.g., thyroid, testicular, prostate, breast) showed only a small difference in 1-year conditional relative survival ratio because survival at diagnosis was already high.

Table 6.3 Conditional five-year relative survival ratios by cancer type and years survived, Ontario, 2014 to 2018

CANCER TYPE	0 YEARS SURVIVED†		1 YEARS SURVIVED		2 YEARS SURVIVED		3 YEARS SURVIVED		4 YEARS SURVIVED	
	RSR (%)	95% CI	RSR (%)	95% CI	RSR (%)	95% CI	RSR (%)	95% CI	RSR (%)	95% CI
All cancers	67.2	67.0-67.5	83.2	83.0-83.5	90.0	89.7-90.2	94.3	94.1-94.4	97.4	97.3-97.5
Brain and nervous system										
Brain and other nervous system - malignant	28.6	26.8-30.5	52.4	49.6-55.0	75.4	72.4-78.1	87.9	85.4-90.0	95.2	93.4-96.5
Glioblastoma	7.8	6.3-9.4	18.4	15.1-22.0	41.0	34.3-47.5	65.3	56.4-72.8	83.5	74.6-89.6
All other gliomas	55.9	52.1-59.5	71.9	67.9-75.4	83.6	80.0-86.7	91.0	88.0-93.3	96.4	94.2-97.8
Brain and other nervous system - non-malignant	85.7	84.4-86.8	94.1	93.0-95.0	95.8	94.8-96.6	97.3	96.5-97.9	98.8	98.2-99.2
Meningiomas	92.1	90.0-93.8	95.7	93.7-97.1	96.5	94.6-97.7	97.4	95.8-98.4	98.6	97.3-99.3
Pituitary, pineal and craniopharyngeal duct	92.3	90.0-94.1	96.5	94.4-97.9	98.4	96.2-99.3	98.8	96.9-99.5	99.3	97.7-99.8
Breast and genital system										

Breast (female)	89.3	88.7-89.8	91.6	91.1-92.1	93.8	93.4-94.2	95.9	95.5-96.3	97.9	97.6-98.2
Cervix	73.5	70.6-76.1	82.6	79.9-85.0	89.9	87.5-91.9	94.4	92.4-95.8	97.6	96.1-98.5
Ovary	47.7	45.7-49.7	62.3	60.0-64.5	73.7	71.3-75.8	85.0	82.9-86.8	92.6	90.9-94.0
Prostate	94.0	93.4-94.6	95.6	95.0-96.1	97.2	96.6-97.6	98.4	97.9-98.7	99.3	99.0-99.6
Testis	97.1	95.6-98.0	98.5	97.2-99.2	99.1	97.9-99.6	99.7	98.6-99.9	99.9	99.2-100.0
Uterine	82.7	81.6-83.8	89.0	87.9-89.9	93.4	92.5-94.2	96.2	95.4-96.8	98.5	97.9-98.9
Uterus - endometrial	85.6	84.5-86.7	90.1	89.1-91.1	94.0	93.1-94.8	96.4	95.6-97.1	98.6	98.0-99.0
Uterus - uterine sarcoma	48.9	40.9-56.5	64.5	54.9-72.6	77.7	67.2-85.2	86.4	75.5-92.7	94.0	82.6-98.0
Digestive system										
Colorectal	66.8	65.9-67.6	80.4	79.6-81.3	87.1	86.3-87.9	92.8	92.1-93.4	96.6	96.1-97.1
Colon excluding rectum	65.5	64.5-66.6	80.8	79.7-81.9	87.8	86.8-88.8	93.5	92.6-94.2	97.0	96.4-97.6
Colon - left sided	69.5	67.9-71.1	81.5	79.8-83.0	87.0	85.5-88.4	92.4	91.1-93.5	96.2	95.2-97.0
Colon - right sided	66.8	65.4-68.2	81.2	79.7-82.5	88.7	87.4-90.0	94.4	93.2-95.4	97.7	96.8-98.4
Rectum and rectosigmoid junction	69.5	68.1-70.9	79.7	78.3-81.1	85.8	84.5-87.0	91.5	90.4-92.5	95.8	95.0-96.6
Rectosigmoid junction	65.0	62.0-67.8	79.0	76.0-81.6	85.0	82.3-87.4	90.4	88.0-92.3	94.6	92.7-96.1
Rectum	70.9	69.2-72.4	80.0	78.4-81.5	86.1	84.6-87.5	92.0	90.7-93.1	96.3	95.3-97.1
Esophagus	17.3	15.4-19.3	37.7	33.9-41.5	63.2	58.0-67.9	80.7	75.5-84.9	92.6	88.3-95.3
Esophagus - adenocarcinoma	18.3	15.8-21.0	36.8	32.2-41.3	63.1	56.6-68.8	81.8	75.2-86.7	93.7	88.4-96.7
Esophagus - squamous cell carcinoma	16.6	13.2-20.4	37.8	30.7-44.8	60.9	50.9-69.4	77.0	66.4-84.6	89.4	79.7-94.6
Liver	22.8	21.2-24.5	48.9	45.9-51.8	64.9	61.5-68.1	78.0	74.6-80.9	91.8	89.0-93.8
Pancreas	12.6	11.5-13.7	38.8	36.0-41.6	63.3	59.4-66.9	80.9	77.0-84.3	92.9	89.7-95.2
Stomach	34.4	32.5-36.2	61.1	58.5-63.7	80.2	77.4-82.6	89.9	87.4-92.0	95.8	93.8-97.2
Head and neck										
Larynx	63.4	59.5-67.0	73.2	69.2-76.8	81.8	77.9-85.1	88.2	84.6-91.0	94.1	91.1-96.1
Oral cavity and pharynx	63.7	62.0-65.4	76.4	74.6-78.0	85.1	83.5-86.6	91.6	90.1-92.8	96.6	95.5-97.4

Lip and oral cavity	65.1	62.5-67.6	77.9	75.3-80.3	86.6	84.1-88.7	92.6	90.4-94.2	97.2	95.6-98.3
Hypopharynx	30.1	23.0-37.5	49.7	39.2-59.3	69.3	57.1-78.7	79.7	67.6-87.6	94.4	81.6-98.4
Nasopharynx	68.4	61.9-74.0	78.6	72.0-83.8	84.9	78.4-89.6	91.6	85.8-95.2	97.0	92.1-98.9
Oropharynx	67.6	64.8-70.2	78.3	75.5-80.8	85.7	83.1-88.0	91.9	89.5-93.7	96.5	94.7-97.8
Thyroid	98.9	98.5-99.1	100.0	99.7-100.0	99.9	98.8-100.0	99.9	99.7-100.0	100.0	‡
Thyroid - anaplastic	5.9	1.3-15.7	32.6	7.2-61.9	84.2	25.3-97.9	100.0	‡	100.0	‡
Thyroid - follicular	98.4	92.1-99.7	99.5	73.2-100.0	99.6	85.6-100.0	99.7	96.3-100.0	100.0	‡
Thyroid - medullary	90.4	79.6-95.6	89.7	79.3-95.0	91.6	81.7-96.3	94.7	85.7-98.1	100.0	‡
Thyroid - papillary	99.9	99.7-100.0	100.0	‡	100.0	‡	100.0	99.2-100.0	100.0	‡
Hematological										
Leukemia	64.9	63.4-66.3	83.3	81.8-84.7	90.2	88.8-91.4	94.5	93.3-95.5	97.2	96.3-97.9
Acute lymphocytic leukemia	76.6	72.6-80.1	89.1	85.6-91.8	93.4	90.4-95.5	96.6	94.0-98.1	98.7	96.5-99.5
Acute monocytic leukemia	91.1	88.8-93.0	94.8	92.6-96.3	95.4	93.4-96.8	96.7	94.9-97.9	98.1	96.6-99.0
Acute myeloid leukemia	25.8	18.0-34.3	58.3	41.8-71.6	78.1	56.4-89.8	90.2	68.7-97.2	96.8	76.5-99.6
Chronic lymphocytic leukemia	28.4	25.7-31.1	55.0	50.7-59.2	73.9	69.0-78.2	87.3	82.7-90.7	94.7	90.9-97.0
Chronic myeloid leukemia	62.9	58.7-66.8	75.5	71.1-79.3	84.6	80.3-88.0	92.6	88.9-95.2	96.8	93.7-98.4
Lymphoma	73.4	72.4-74.4	87.3	86.3-88.2	92.3	91.4-93.1	95.4	94.7-96.1	97.9	97.3-98.3
Hodgkin lymphoma	88.2	85.8-90.3	95.1	93.0-96.6	96.9	95.0-98.1	98.5	96.8-99.3	99.4	97.8-99.8
Non-Hodgkin lymphoma	71.9	70.7-72.9	86.4	85.3-87.4	91.7	90.7-92.5	95.0	94.2-95.7	97.7	97.1-98.2
Non-Hodgkin lymphoma - extranodal	72.3	70.7-73.8	87.0	85.5-88.4	91.7	90.2-92.9	95.0	93.7-96.0	97.5	96.6-98.2
Non-Hodgkin lymphoma - nodal	71.4	69.9-73.0	85.7	84.2-87.1	91.7	90.3-92.9	95.0	93.8-96.0	97.9	97.0-98.5
Myeloma	54.8	52.6-56.9	67.8	65.4-70.1	73.7	71.3-75.9	81.5	79.2-83.6	89.5	87.5-91.2
Melanoma										
Melanoma of the skin	88.7	87.6-89.7	92.1	91.0-93.0	94.9	94.0-95.7	96.8	96.1-97.5	98.3	97.7-98.8

Melanoma (non-cutaneous)	73.3	67.3-78.3	77.6	71.7-82.5	82.0	76.1-86.5	90.2	84.8-93.7	95.4	90.6-97.7
Melanoma - mucosal	47.0	34.1-58.9	59.1	43.4-71.7	67.5	50.5-79.8	82.8	63.1-92.5	89.8	68.5-97.0
Melanoma - ocular	80.5	73.8-85.6	81.7	75.2-86.7	85.0	78.6-89.6	91.5	85.7-95.0	96.2	91.1-98.4
Thoracic system										
Lung	24.8	24.1-25.4	49.8	48.7-50.9	66.4	65.1-67.6	79.0	77.7-80.2	90.0	89.0-91.0
Lung - adenocarcinoma	32.6	31.5-33.7	54.6	53.0-56.1	69.6	67.9-71.2	80.3	78.7-81.9	89.9	88.5-91.1
Lung - large cell	21.5	16.7-26.8	46.2	36.8-55.0	65.0	53.8-74.1	81.2	69.9-88.5	93.2	83.4-97.3
Lung - small cell	6.9	5.9-8.1	21.4	18.4-24.6	45.1	39.5-50.4	69.2	62.2-75.1	89.1	83.0-93.1
Lung - squamous cell	24.9	23.3-26.5	45.6	43.0-48.1	61.6	58.5-64.5	75.7	72.5-78.5	88.0	85.2-90.3
Urinary system										
Bladder	79.1	77.8-80.2	88.0	86.9-89.1	92.3	91.3-93.3	95.2	94.3-96.0	97.5	96.8-98.1
Kidney	79.0	77.7-80.3	89.8	88.5-90.9	93.0	91.9-94.0	95.3	94.3-96.1	97.9	97.1-98.4

Abbreviations: CI means confidence interval; RSR means relative survival ratio.

Symbols:

†Zero years survived is the equivalent of non–conditional survival.

*Estimate could not be calculated.

Notes:

1. Analysis was restricted to ages 15 to 99.
2. Bladder cancer includes carcinoma *in situ* cases.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

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Ontario Cancer Statistics 2022

Ch 7: Cancer Prevalence

Cancer prevalence measures the number of people diagnosed with cancer who are still alive. This chapter presents prevalence counts and proportions for people diagnosed with cancer within a specific timeframe who were still alive on January 1, 2019.

- **Prevalence by Sex and Cancer Type** ([#prevalence-by-sex-and-cancer-type](#))
- **Prevalence Trends by Cancer Type** ([#prevalence-trends-by-cancer-type](#))
- **Prevalence by Age** ([#prevalence-by-age](#))
- **References** ([#references](#))

There are more people living with a diagnosis of cancer in Ontario than there were 20 years ago. Cancer prevalence – the number of people previously diagnosed with cancer who are alive at a given point in time – is a function of the incidence of and survival for cancer. With increasing incidence and improving survival, the prevalence of cancer over time has also been increasing in Ontario, a province with an estimated population of 14.7 million in 2020.

Because trends in cancer prevalence reflect the increase, decrease or stability of cancer incidence and mortality rates in the population, they can help determine how best to distribute diagnostic, treatment and care resources.⁽¹⁾

This chapter presents limited-duration, person-based prevalence counts. “Limited-duration” cancer prevalence describes the number of people alive on a certain date (called the index date) who were diagnosed with cancer within a specified previous number of years (e.g., 2 years, 5 years, 10 years, 30 years). This information is directly measured from the registry's observations and does not include prevalent cases diagnosed before the start of the limited-duration period. This report uses an index date (i.e., a reference date) of January 1, 2019, and focuses on long-term prevalence (10 and 30 years). “Person-based” prevalence counts are when a person with cancer is counted only once even if they have had more than 1 cancer diagnosis.

Prevalence counts based on duration are important for understanding the impacts of cancer on the healthcare system. In the first 2 years after their cancer diagnosis, the main healthcare services someone would use are related to primary treatment. During the next 3 years, healthcare services would mainly consist of clinical assessment to see if the cancer has returned. In the next 5 years, follow-up services would mainly be accessed.

People living with cancer (prevalent cases) whose cancer diagnosis occurred in the previous 10 or more years are considered long-term survivors. Their cancer experiences are often important for understanding the long-term (or late) effects of a cancer diagnosis and the associated use of healthcare services. A 30-year period provides a reasonable time window for accounting for all adult cancer survivors and most childhood cancer survivors.

PREVALENCE BY SEX AND CANCER TYPE

At the end of 2018 (on the index date of January 1, 2019), an estimated 411,158 people (29 per 100,000 people) living in Ontario had been diagnosed with cancer in the previous 10 years (since 2009) (Table 7.1).

Looking back at those diagnosed in the previous 30 years (since 1989), 676,509 people in Ontario were still alive at the end of 2018, which is a prevalence proportion of 4,689.3 per 100,000. Of these people, 52.5% who were diagnosed in the previous 10 years and 53.8% who were diagnosed in the previous 30 years were female, even though the overall cancer incidence rates were higher among males (see Chapter 1: Estimated Current Cancer Incidence and Chapter 4: Cancer Incidence). This discrepancy largely reflects the higher prevalence of thyroid and lung cancers in female survivors because they have a higher incidence of thyroid cancer and higher survival for lung cancer than males. Breast cancer also contributes to this discrepancy due to the high incidence and survival for breast cancer among females.

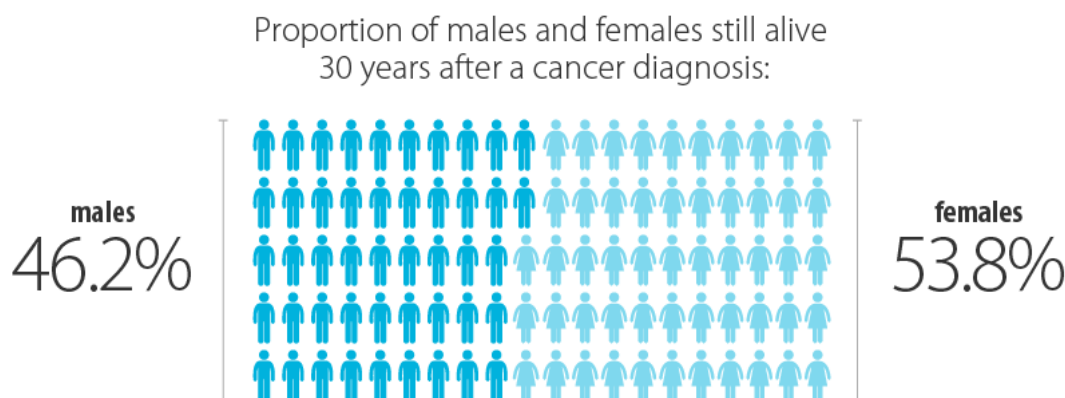


Table 7.1 Limited duration prevalence by cancer type and sex, Ontario, 2018

CANCER TYPE	MALES AND FEMALES COMBINED				MALES		
	10-YEAR PREVALENCE COUNT	10-YEAR PREVALENCE PROPORTION	30-YEAR PREVALENCE COUNT	30-YEAR PREVALENCE PROPORTION	10-YEAR PREVALENCE COUNT	10-YEAR PREVALENCE PROPORTION	30-YEAR PREVALENCE COUNT
All cancers	411,158	2,850.0	676,509	4,689.3	195,257	2,741.0	312,842
Brain and nervous system							
Brain and other nervous system - malignant	3,513	24.4	7,024	48.7	1,939	27.2	3,724
Glioblastoma	846	5.9	1,025	7.1	493	6.9	589
All other gliomas	1,720	11.9	3,383	23.5	938	13.2	1,786
Brain and other nervous system - non-malignant†	15,910	110.3	15,916	110.3	6,443	90.5	6,446
Meningiomas†	5,113	35.4	5,115	35.5	1,468	20.6	1,468
Pituitary, pineal and craniopharyngeal duct†	4,119	28.6	4,120	28.6	1,996	28.0	1,997
Breast and genital system							
Breast (female)	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Cervix	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ovary	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Prostate	n/a	n/a	n/a	n/a	72,124	1,012.5	125,8
Testis	n/a	n/a	n/a	n/a	3,835	53.8	9,087
Uterine	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uterus - endometrial	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uterus - uterine sarcoma	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Digestive system							
Colorectal	45,542	315.7	74,831	518.7	24,836	348.7	39,98
Colon excluding rectum	30,158	209.0	49,572	343.6	15,586	218.8	25,03
Colon - left sided	12,366	85.7	21,417	148.5	7,082	99.4	11,78
Colon - right sided	17,199	119.2	26,490	183.6	8,178	114.8	12,35
Rectum and rectosigmoid junction	16,306	113.0	26,547	184.0	9,826	137.9	15,68
Rectosigmoid junction	4,077	28.3	7,290	50.5	2,441	34.3	4,167
Rectum	12,229	84.8	19,257	133.5	7,385	103.7	11,52
Esophagus	1,828	12.7	2,354	16.3	1,390	19.5	1,740
Esophagus - adenocarcinoma	1,152	8.0	1,397	9.7	992	13.9	1,198
Esophagus - squamous cell carcinoma	544	3.8	746	5.2	308	4.3	404
Liver	2,992	20.7	3,955	27.4	2,186	30.7	2,884
Pancreas	2,963	20.5	3,787	26.3	1,524	21.4	1,901
Stomach	4,864	33.7	7,120	49.4	2,997	42.1	4,303
Head and neck							
Larynx	2,306	16.0	3,943	27.3	1,967	27.6	3,328
Oral cavity and pharynx	9,534	66.1	14,908	103.3	6,694	94.0	10,25
Lip and oral cavity	4,664	32.3	7,566	52.4	2,870	40.3	4,722

Hypopharynx	299	2.1	404	2.8	244	3.4	318
Nasopharynx	742	5.1	1,455	10.1	515	7.2	986
Oropharynx	3,679	25.5	5,155	35.7	2,958	41.5	4,032
Thyroid	27,856	193.1	46,896	325.1	6,443	90.5	10,051
Thyroid - anaplastic	23	0.2	35	0.2	8	0.1	10
Thyroid - follicular	897	6.2	2,051	14.2	226	3.2	465
Thyroid - medullary	315	2.2	587	4.1	129	1.8	223
Thyroid - papillary	26,251	182.0	42,507	294.6	5,988	84.1	9,013
Hematological							
Leukemia	12,906	89.5	20,792	144.1	7,546	105.9	11,941
Acute lymphocytic leukemia	1,556	10.8	3,350	23.2	908	12.8	1,924
Acute monocytic leukemia	6,623	45.9	9,716	67.4	4,012	56.3	5,747
Acute myeloid leukemia	110	0.8	168	1.2	52	0.7	82
Chronic lymphocytic leukemia	1,588	11.0	2,591	18.0	810	11.4	1,294
Chronic myeloid leukemia	1,746	12.1	2,741	19.0	990	13.9	1,537
Lymphoma	26,749	185.4	43,277	300.0	14,461	203.0	22,933
Hodgkin lymphoma	3,269	22.7	7,762	53.8	1,737	24.4	4,065
Non-Hodgkin lymphoma	23,517	163.0	35,569	246.6	12,747	178.9	18,900
Non-Hodgkin lymphoma - extranodal	12,254	84.9	22,546	156.3	6,605	92.7	11,871
Non-Hodgkin lymphoma - nodal	11,282	78.2	13,049	90.5	6,155	86.4	7,052
Myeloma	6,170	42.8	7,489	51.9	3,417	48.0	4,095
Melanoma							
Melanoma of the skin	24,312	168.5	41,635	288.6	12,762	179.2	20,661

Melanoma (non-cutaneous)	1,016	7.0	1,711	11.9	503	7.1	857
Melanoma - mucosal	171	1.2	209	1.5	57	0.8	60
Melanoma - ocular	845	5.9	1,502	10.4	446	6.3	797
Thoracic system							
Lung	23,488	162.8	30,246	209.7	10,217	143.4	13,361
Lung - adenocarcinoma	12,243	84.9	15,007	104.0	4,714	66.2	5,721
Lung - large cell	347	2.4	543	3.8	172	2.4	267
Lung - small cell	1,304	9.0	1,628	11.3	576	8.1	738
Lung - squamous cell	4,262	29.5	5,447	37.8	2,526	35.5	3,295
Urinary system							
Bladder	11,312	78.4	18,908	131.1	8,915	125.2	14,451
Kidney	14,701	101.9	22,655	157.0	9,396	131.9	13,951

Symbols:

** Suppressed due to small cell count (count less than 6).

†Prevalence counts are based on the Surveillance, Epidemiology and End Results Program rules for counting multiple primary cancers and only reflects 9-year prevalence (2010 to 2018).

Notes:

1. Prevalence counts are based on incidence using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.
2. Prevalence proportions are per 100,000.
3. Only the first cancer of a given type in an individual is counted (for people who have multiple episodes of cancer).
4. Counts for cancer subsites may not sum to total because not all subsites are included.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March, 2021), Ontario Health (Cancer Care Ontario)

Female breast cancer was the largest contributor to 30-year prevalence, accounting for 141,829 survivors at the end of 2018 (Figure 7.1). Prostate (125,804) and colorectal (74,831) cancers were the next most prevalent types. Lung cancer, despite being the third most commonly diagnosed cancer, ranked only eighth in terms of prevalence because of its low survival. It was surpassed by several higher-survival cancers, despite their lower annual incidence: thyroid cancer, lymphoma, melanoma and uterine cancer.

Number of 30-year prevalent cases
for selected cancers, 2018

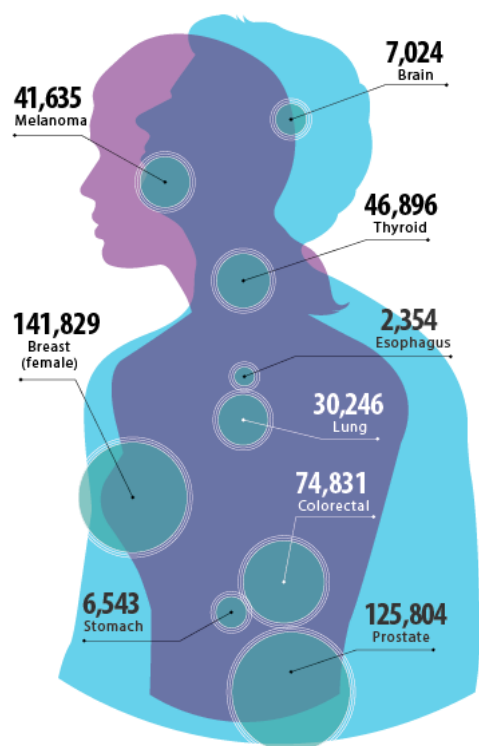
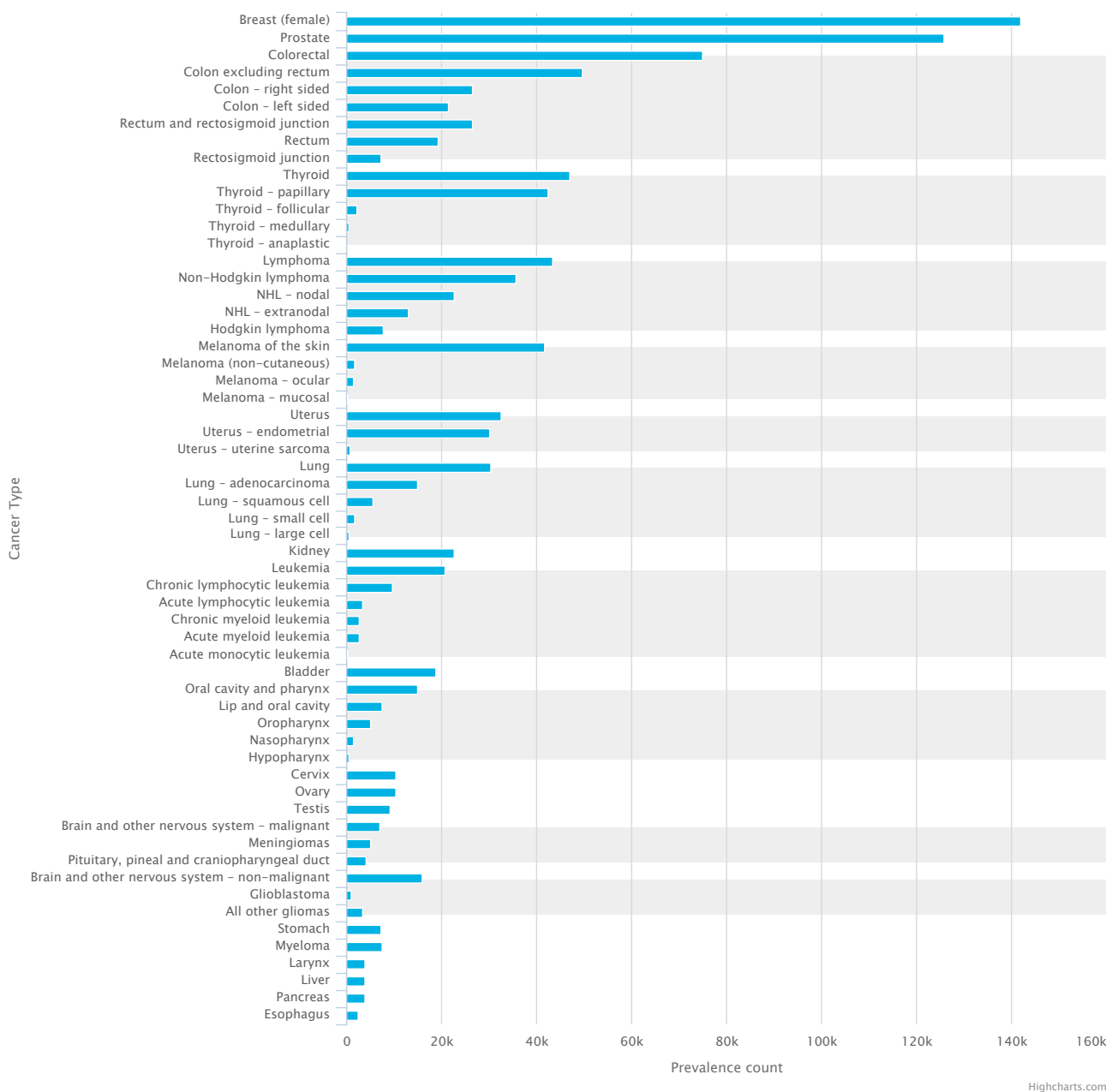


Figure 7.1 Thirty-year prevalence by cancer type, Ontario, 2018



Notes:

1. Prevalence for all cancers is 676,509.
2. Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 7.1 Thirty-year prevalence by cancer type, Ontario, 2018

CANCER TYPE	PREVALENCE COUNT
-------------	------------------

Breast (female)	141829
Prostate	125804
Colorectal	74831
Colon excluding rectum	49572
Colon - right sided	26490
Colon - left sided	21417
Rectum and rectosigmoid junction	26547
Rectum	19257
Rectosigmoid junction	7290
Thyroid	46896
Thyroid - papillary	42507
Thyroid - follicular	2051
Thyroid - medullary	587
Thyroid - anaplastic	35
Lymphoma	43277
Non-Hodgkin lymphoma	35569
NHL - nodal	22546
NHL - extranodal	13049
Hodgkin lymphoma	7762
Melanoma of the skin	41635
Melanoma (non-cutaneous)	1711
Melanoma - ocular	1502
Melanoma - mucosal	209
Uterus	32438
Uterus - endometrial	30104
Uterus - uterine sarcoma	790
Lung	30246
Lung - adenocarcinoma	15007
Lung - squamous cell	5447
Lung - small cell	1628
Lung - large cell	543

Kidney	22655
Leukemia	20792
Chronic lymphocytic leukemia	9716
Acute lymphocytic leukemia	3350
Chronic myeloid leukemia	2741
Acute myeloid leukemia	2591
Acute monocytic leukemia	168
Bladder	18908
Oral cavity and pharynx	14908
Lip and oral cavity	7566
Oropharynx	5155
Nasopharynx	1455
Hypopharynx	404
Cervix	10306
Ovary	10277
Testis	9087
Brain and other nervous system - malignant	7024
Meningiomas	5115
Pituitary, pineal and craniopharyngeal duct	4120
Brain and other nervous system - non-malignant	15916
Glioblastoma	1025
All other gliomas	3383
Stomach	7120
Myeloma	7489
Larynx	3943
Liver	3955
Pancreas	3787
Esophagus	2354

Notes:

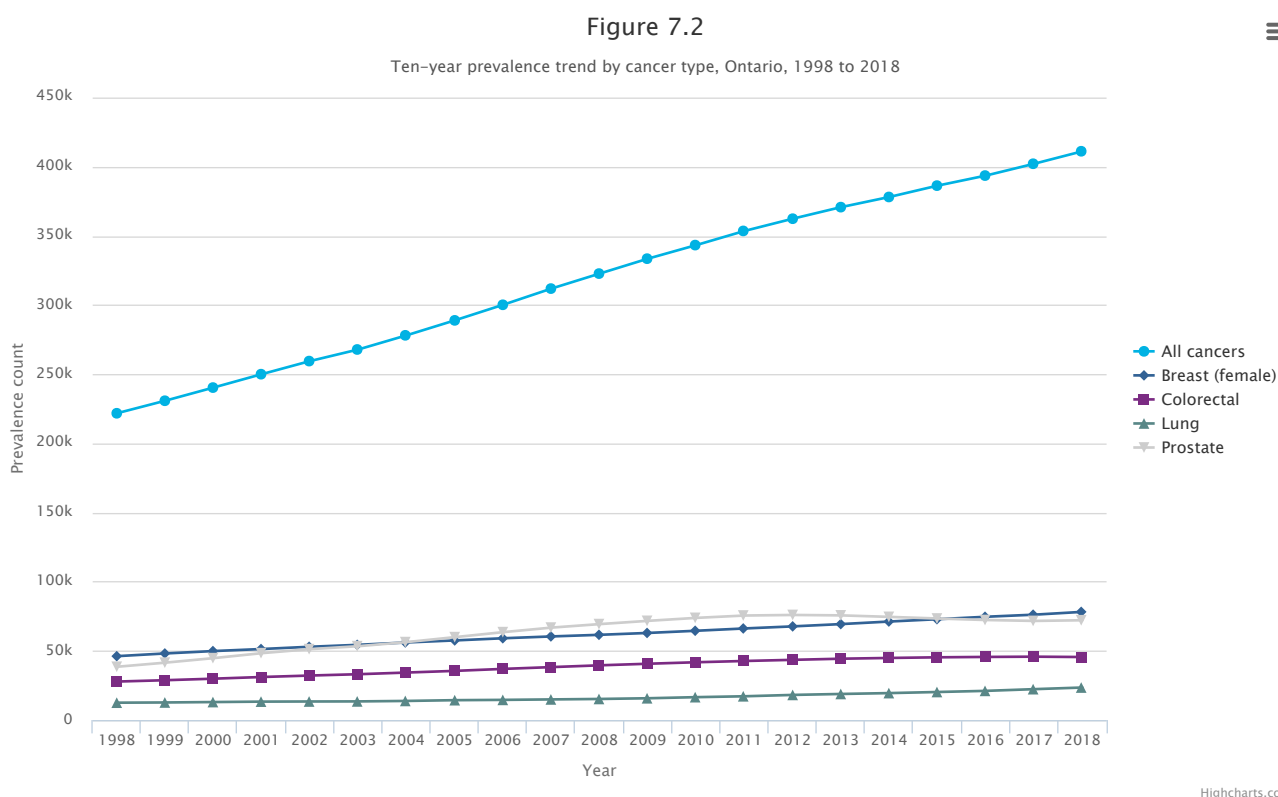
1. Prevalence for all cancers is 676,509.
2. Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

PREVALENCE TRENDS BY CANCER TYPE

The increase over time in 10-year prevalence for the most common cancers and all cancers combined is shown in Figure 7.2. The rate of increase in prevalence varied greatly by cancer type. The highest increases were for prostate and female breast cancers, which had higher survival, while the lowest were for colorectal and lung cancers.



Note: Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Figure 7.2 Ten-year prevalence over time by cancer type, Ontario, 1998 to 2018

YEAR	ALL CANCERS	BREAST (FEMALE)	COLORECTAL	LUNG	PROSTATE
1998	221749	46149	27793	12530	38483
1999	230797	48117	28768	12685	41452
2000	240318	49849	29875	12985	44728
2001	250003	51323	31087	13298	48328

2002	259473	52956	32152	13392	51227
2003	267863	54360	33105	13452	53367
2004	278099	56067	34315	13793	56312
2005	288905	57531	35516	14344	59903
2006	300167	59101	36948	14557	63514
2007	311876	60421	38243	14889	66790
2008	322726	61593	39536	15222	69338
2009	333508	62939	40673	15726	71682
2010	343322	64520	41756	16525	73829
2011	353554	66188	42672	17160	75530
2012	362393	67682	43498	18147	75945
2013	370764	69341	44321	18830	75643
2014	378107	71194	44861	19459	74558
2015	386304	72874	45330	20252	73378
2016	393578	74641	45603	21073	72297
2017	402127	76146	45788	22307	71629
2018	411158	78182	45542	23488	72124

Note: Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Overall, the prevalence of all cancer types, except laryngeal, increased each decade from 1998 to 2008 to 2018 (Table 7.2). However, by sex, prevalence for some cancers was relatively stable.

Among females, prevalence of cervical and bladder cancers changed very little over the 3 periods, but for different reasons. For bladder cancer, incidence increased, while survival decreased. For cervical cancer, survival changed little over time (see Chapter 6: Cancer Survival).

Among males, the prevalence of laryngeal, lip and oral cavity cancers, as well as squamous cell carcinoma of the lung were relatively stable.

Table 7.2 Ten-year prevalence by cancer type, sex and time period, Ontario, 1998, 2008, and 2018

CANCER TYPE	MALES AND FEMALES COMBINED						MALES	
	COUNT (1998)	PROPORTION (1998)	COUNT (2008)	PROPORTION (2008)	COUNT (2018)	PROPORTION (2018)	COUNT (1998)	PROPORTION (1998)
All Cancers	221,749	1,939.2	322,726	2,493.8	411,158	2,850.0	105,988	1,879.1
Brain and nervous system								

Brain and other nervous system - malignant	2,862	25.0	3,499	27.0	3,513	24.4	1,529	27.1
Glioblastoma	366	3.2	519	4.0	846	5.9	213	3.8
All other gliomas	1,336	11.7	1,574	12.2	1,720	11.9	739	13.1
Brain and other nervous system - non-malignant†	n/a	n/a	n/a	n/a	15,910	110.3	n/a	n/a
Meningiomas†	n/a	n/a	n/a	n/a	5,113	35.4	n/a	n/a
Pituitary, pineal and craniopharyngeal duct†	n/a	n/a	n/a	n/a	4,119	28.6	n/a	n/a
Breast and genital system								
Breast (female)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cervix	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ovary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Prostate	n/a	n/a	n/a	n/a	n/a	n/a	38,483	682.3
Testis	n/a	n/a	n/a	n/a	n/a	n/a	2,545	45.1
Uterine	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uterus - endometrial	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uterus - uterine sarcoma	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Digestive system								
Colorectal	27,793	243.1	39,536	305.5	45,542	315.7	14,296	253.5
Colon excluding rectum	18,935	165.6	26,083	201.6	30,158	209.0	9,128	161.8
Colon - left sided	8,216	71.9	11,307	87.4	12,366	85.7	4,353	77.2
Colon - right sided	9,414	82.3	13,712	106.0	17,199	119.2	4,105	72.8
Rectum and rectosigmoid junction	8,991	78.6	13,685	105.8	16,306	113.0	5,240	92.9
Rectosigmoid junction	2,821	24.7	4,268	33.0	4,077	28.3	1,573	27.9
Rectum	6,170	54.0	9,417	72.8	12,229	84.8	3,667	65.0
Esophagus	837	7.3	1,176	9.1	1,828	12.7	560	9.9

Esophagus - adenocarcinoma	341	3.0	626	4.8	1,152	8.0	288	5.1
Esophagus - squamous cell carcinoma	403	3.5	415	3.2	544	3.8	222	3.9
Liver	613	5.4	1,638	12.7	2,992	20.7	421	7.5
Pancreas	1,099	9.6	1,663	12.9	2,963	20.5	519	9.2
Stomach	2,528	22.1	3,202	24.7	4,864	33.7	1,549	27.5
Head and neck								
Larynx	2,395	20.9	2,337	18.1	2,306	16.0	1,978	35.1
Oral cavity and pharynx	5,557	48.6	6,711	51.9	9,534	66.1	3,778	67.0
Lip and oral cavity	3,358	29.4	3,429	26.5	4,664	32.3	2,297	40.7
Hypopharynx	259	2.3	260	2.0	299	2.1	202	3.6
Nasopharynx	489	4.3	666	5.2	742	5.1	326	5.8
Oropharynx	1,113	9.7	2,057	15.9	3,679	25.5	756	13.4
Thyroid	5,785	50.6	15,599	120.5	27,856	193.1	1,271	22.5
Thyroid - anaplastic	8	0.1	14	0.1	23	0.2	1	0.0
Thyroid - follicular	653	5.7	808	6.2	897	6.2	156	2.8
Thyroid - medullary	134	1.2	223	1.7	315	2.2	55	1.0
Thyroid - papillary	4,515	39.5	13,448	103.9	26,251	182.0	954	16.9
Hematological								
Leukemia	6,090	53.3	9,506	73.5	12,906	89.5	3,419	60.6
Acute lymphocytic leukemia	944	8.3	1,133	8.8	1,556	10.8	526	9.3
Acute monocytic leukemia	2,976	26.0	5,146	39.8	6,623	45.9	1,676	29.7
Acute myeloid leukemia	40	0.4	54	0.4	110	0.8	19	0.3
Chronic lymphocytic leukemia	702	6.1	1,095	8.5	1,588	11.0	334	5.9

Chronic myeloid leukemia	707	6.2	1,121	8.7	1,746	12.1	426	7.6
Lymphoma	11,629	101.7	17,211	133.0	26,749	185.4	6,013	106.6
Hodgkin lymphoma	2,649	23.2	2,917	22.5	3,269	22.7	1,422	25.2
Non-Hodgkin lymphoma	8,980	78.5	14,299	110.5	23,517	163.0	4,591	81.4
Non-Hodgkin lymphoma - extranodal	8,236	72.0	12,176	94.1	12,254	84.9	4,186	74.2
Non-Hodgkin lymphoma - nodal	744	6.5	2,125	16.4	11,282	78.2	405	7.2
Myeloma	2,160	18.9	3,243	25.1	6,170	42.8	1,098	19.5
Melanoma								
Melanoma of the skin	10,318	90.2	15,691	121.3	24,312	168.5	5,066	89.8
Melanoma (non-cutaneous)	561	4.9	728	5.6	1,016	7.0	276	4.9
Melanoma - mucosal	34	0.3	48	0.4	171	1.2	5	0.1
Melanoma - ocular	527	4.6	680	5.3	845	5.9	271	4.8
Thoracic system								
Lung	12,530	109.6	15,222	117.6	23,488	162.8	6,970	123.6
Lung - adenocarcinoma	4,590	40.1	6,052	46.8	12,243	84.9	2,099	37.2
Lung - large cell	467	4.1	403	3.1	347	2.4	251	4.5
Lung - small cell	972	8.5	1,080	8.4	1,304	9.0	514	9.1
Lung - squamous cell	3,291	28.8	2,984	23.1	4,262	29.5	2,313	41.0
Urinary system								
Bladder	9,581	83.8	10,795	83.4	11,312	78.4	7,175	127.2
Kidney	5,729	50.1	9,025	69.7	14,701	101.9	3,408	60.4

Symbols:

“ Suppressed due to small cell count (count less than 6).

†Prevalence counts are based on the Surveillance, Epidemiology and End Results Program rules for counting multiple primary cancers and only reflects 9-year prevalence (2010 to 2018).

Notes:

1. Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.
2. Prevalence proportions are per 100,000.
3. Only the first cancer of a given type in an individual is counted (for people who have multiple episodes of cancer).
4. Counts for cancer subsites may not sum to total because not all subsites are included.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)**Data source:** Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

PREVALENCE BY AGE

The majority (51.7%) of 30-year prevalent cancers in 2018 were among people in Ontario ages 60 to 79, followed by those age 80 and older (22.3%) (Table 7.3). However, prevalence patterns differed according to sex. Although males had the same pattern as males and females combined, the second-highest prevalence for females was among people ages 40 to 59. This difference is largely due to the higher prevalence of melanoma, as well as breast, cervical, thyroid and ovarian cancers among females in that age group.

Among people ages 0 to 39, females were more likely than males to be living with cancer. Notable patterns in this age group include a higher prevalence than people over age 39 of brain cancer, which has a higher survival rate in younger people.

Table 7.3 Thirty-year prevalence by cancer type, sex and age group, Ontario, 2018

MALES AND FEMALES COMBINED

CANCER TYPE	COUNTS (AGES 0 TO 39)	PROPORTION (AGES 0 TO 39)	COUNTS (AGES 40 TO 59)	PROPORTION (AGES 40 TO 59)	COUNTS (AGES 60 TO 79)	PROPORTION (AGES 60 TO 79)	COUNTS (AGE 80 AND OLDER)	PROPORTION (AGE 80 AND OLDER)
All cancers	31,938	448.9	143,646	3,664.5	349,824	12,678.9	151,101	23,872.6
Bladder	76	1.1	1,420	36.2	9,704	351.7	7,708	1,217.8
Brain	2,648	37.2	2,205	56.3	1,750	63.4	421	66.5
Breast (female)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cervix	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Colorectal	684	9.6	10,009	255.3	37,945	1,375.3	26,193	4,138.3
Esophagus	17	0.2	389	9.9	1,439	52.2	509	80.4
Hodgkin lymphoma	2,709	38.1	3,340	85.2	1,434	52.0	279	44.1
Kidney	909	12.8	5,306	135.4	12,405	449.6	4,035	637.5
Larynx	22	0.3	473	12.1	2,354	85.3	1,094	172.8
Leukemia	4,000	56.2	3,699	94.4	9,157	331.9	3,936	621.9

Liver	179	2.5	668	17.0	2,392	86.7	716	113.1
Lung	217	3.1	3,263	83.2	18,542	672.0	8,224	1,299.3
Melanoma	2,034	28.6	10,932	278.9	20,326	736.7	8,343	1,318.1
Myeloma	50	0.7	1,240	31.6	4,301	155.9	1,898	299.9
Non-Hodgkin lymphoma	2,161	30.4	7,863	200.6	18,038	653.8	7,507	1,186.0
Oral cavity and pharynx	306	4.3	3,677	93.8	8,483	307.5	2,442	385.8
Ovary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pancreas	99	1.4	787	20.1	2,126	77.1	775	122.4
Prostate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Stomach	95	1.3	1,208	30.8	3,657	132.5	2,160	341.3
Testis	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thyroid	5,368	75.5	21,267	542.5	17,317	627.6	2,944	465.1
Uterus	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

MALES

CANCER TYPE	COUNTS (AGES 0 TO 39)	PROPORTION (AGES 0 TO 39)	COUNTS (AGES 40 TO 59)	PROPORTION (AGES 40 TO 59)	COUNTS (AGES 60 TO 79)	PROPORTION (AGES 60 TO 79)	COUNTS (AGE 80 AND OLDER)	PROPORTION (AGE 80 AND OLDER)
All cancers	14,077	388.1	50,366	2,610.7	170,875	13,003.5	77,482	30,654.3
Bladder	43	1.2	1,087	56.3	7,550	574.6	5,814	2,300.2
Brain	1,456	40.1	1,194	61.9	897	68.3	177	70.0
Breast (female)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cervix	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Colorectal	345	9.5	5,373	278.5	21,656	1,648.0	12,577	4,975.9
Esophagus	15	0.4	292	15.1	1,102	83.9	331	131.0
Hodgkin lymphoma	1,385	38.2	1,755	91.0	780	59.4	145	57.4
Kidney	456	12.6	3,439	178.3	7,801	593.7	2,263	895.3
Larynx	12	0.3	376	19.5	2,007	152.7	930	367.9

Leukemia	2,256	62.2	2,116	109.7	5,531	420.9	2,044	808.7
Liver	114	3.1	475	24.6	1,838	139.9	457	180.8
Lung	95	2.6	1,298	67.3	8,100	616.4	3,868	1,530.3
Melanoma	688	19.0	4,615	239.2	10,826	823.9	4,552	1,800.9
Myeloma	27	0.7	677	35.1	2,415	183.8	980	387.7
Non-Hodgkin lymphoma	1,313	36.2	4,366	226.3	9,728	740.3	3,499	1,384.3
Oral cavity and pharynx	176	4.9	2,585	134.0	6,082	462.8	1,410	557.8
Ovary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pancreas	36	1.0	381	19.8	1,130	86.0	354	140.1
Prostate	14	0.4	7,272	376.9	78,675	5,987.1	39,843	15,763.1
Stomach	39	1.1	694	36.0	2,305	175.4	1,265	500.5
Testis	2,719	75.0	4,773	247.4	1,497	113.9	98	38.8
Thyroid	1,038	28.6	4,143	214.8	4,149	315.7	727	287.6
Uterus	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

FEMALES

CANCER TYPE	COUNTS (AGES 0 TO 39)	PROPORTION (AGES 0 TO 39)	COUNTS (AGES 40 TO 59)	PROPORTION (AGES 40 TO 59)	COUNTS (AGES 60 TO 79)	PROPORTION (AGES 60 TO 79)	COUNTS (AGE 80 AND OLDER)	PROPORTION (AGE 80 AND OLDER)
All cancers	17,861	512.2	93,280	4,685.6	178,949	12,383.7	73,619	19,363.9
Bladder	33	1.0	333	16.7	2,154	149.1	1,894	498.2
Brain	1,192	34.2	1,011	50.8	853	59.0	244	64.2
Breast (female)	1,974	56.6	34,592	1,737.6	76,473	5,292.1	28,790	7,572.6
Cervix	956	27.4	4,915	246.9	3,691	255.4	744	195.7
Colorectal	339	9.7	4,636	232.9	16,289	1,127.2	13,616	3,581.4
Esophagus	2	0.1	97	4.9	337	23.3	178	46.8
Hodgkin lymphoma	1,324	38.0	1,585	79.6	654	45.3	134	35.3
Kidney	453	13.0	1,867	93.8	4,604	318.6	1,772	466.1

Larynx	10	0.3	97	4.9	347	24.0	164	43.1
Leukemia	1,744	50.0	1,583	79.5	3,626	250.9	1,892	497.7
Liver	65	1.9	193	9.7	554	38.3	259	68.1
Lung	122	3.5	1,965	98.7	10,442	722.6	4,356	1,145.8
Melanoma	1,346	38.6	6,317	317.3	9,500	657.4	3,791	997.1
Myeloma	23	0.7	563	28.3	1,886	130.5	918	241.5
Non-Hodgkin lymphoma	848	24.3	3,497	175.7	8,310	575.1	4,008	1,054.2
Oral cavity and pharynx	130	3.7	1,092	54.9	2,401	166.2	1,032	271.5
Ovary	710	20.4	3,184	159.9	4,965	343.6	1,418	373.0
Pancreas	63	1.8	406	20.4	996	68.9	421	110.7
Prostate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Stomach	56	1.6	514	25.8	1,352	93.6	895	235.4
Testis	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thyroid	4,330	124.2	17,124	860.2	13,168	911.3	2,217	583.1
Uterus	264	7.6	5,670	284.8	19,798	1,370.1	6,706	1,763.9

Abbreviation: n/a means not applicable

Notes:

1. Prevalence counts are based on incidence counts using International Agency for Research on Cancer/International Association of Cancer Registries rules for counting multiple primaries.
2. Prevalence proportions are per 100,000

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

References

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Ontario Cancer Statistics 2022

About This Report

This report provides comprehensive information about cancer incidence, mortality, survival and prevalence in Ontario. A special focus chapter explores the estimated future prevalence of cancer in the province (Chapter 3).

DATA SOURCES AND METHODS

Data for this report came from the following sources. For details, see **Appendix 1: Data Sources** (</node/72816>).

- Ontario Cancer Registry
- Other provincial and territorial cancer registries
- Office of the Registrar General for Ontario
- Ontario Ministry of Finance
- Statistics Canada
- Pediatric Oncology Group of Ontario Networked Information System



Information on the methodology used in this report can be found in **Appendix 2: Analysis** (</node/72821>).

DATA NOTES

- The data in this report pre-date the COVID-19 pandemic. Therefore, the projected statistics do not account for the pandemic's effects. More information about the impact of the COVID-19 pandemic on Ontario's cancer system is available on the Cancer Quality Council of Ontario **website** (<https://www.csqi.on.ca/en>).
- This report examines statistics by sex, age group, cancer type (including all cancers combined) and over time.
- Statistics by sex include female and male terms, which refer to the sex that is recorded in the Ontario Cancer Registry.

- This report focuses mainly on cancer in adults, but it also includes several statistics related to incidence, mortality and survival for selected childhood cancers (ages 0 to 14) contributed by our partner, the **Pediatric Oncology Group of Ontario** https://www.pogo.ca/about-us/?utm_source=outlook&utm_medium=email&utm_campaign=OCS_2022. For additional in-depth statistics on childhood cancers in Ontario, read the **Pediatric Oncology Group of Ontario Surveillance Report** https://www.pogo.ca/research-data/data-reports/?utm_source=outlook&utm_medium=email&utm_campaign=OCS_2022.
- This report includes actual (non-projected) and projected statistics, and makes distinctions between them where applicable. Statistics presented in Chapter 1 (Estimated Current Cancer Incidence), Chapter 2 (Estimated Current Cancer Mortality) and Chapter 3 (Estimated Future Cancer Prevalence) report on projected data. The statistics in the rest of the report use actual data.
- This report uses shortened forms of the names of cancer types. See Table A.5 in **Appendix 1: Data Sources** [\(/node/72816\)](#) for the corresponding full names and definitions.
- The Ontario Cancer Registry and Pediatric Oncology Group of Ontario Networked Information System routinely receive new case information and updates to existing records. As a result, statistics in this report should be considered accurate only at the time of analysis.
- Use caution when comparing the statistics in this report to those in previous reports. The Ontario Cancer Registry adopted new coding rules for multiple primary cancers in 2010 that increased reported incidence for some cancers. More recently, changes were made to cancer staging, coding and case creation standards for cases diagnosed from January 1, 2018, onward. This change affected the incidence in 2018 of some cancer subtypes and resulted in a shift in stage distribution (particularly an increase in unknown stage) for certain cancer types, compared with previous years. For details, see **Appendix 1: Data Sources** [\(/node/72816\)](#).
- The use of the word “significant” throughout this report refers to statistical significance. See **Appendix 2: Analysis** [\(/node/72821\)](#) for details.

Inclusions and exclusions

MALIGNANT VERSUS NON-MALIGNANT CANCERS

- Statistics included in this report almost always refer to malignant (i.e., cancerous) tumours. The exceptions are for bladder, brain and other nervous system, and selected childhood cancers.
 - Similar to other jurisdictions, *Ontario Cancer Statistics* reports bladder carcinoma *in situ* jointly with malignant bladder cases to monitor incidence due to the clinical significance of *in situ* bladder cancer cases. The Ontario Cancer Registry began routinely registering bladder carcinoma *in situ* cases in 2010. In this report, bladder carcinoma *in situ* cases are handled as follows:
 - Incidence: included in all analyses (see “Trends in age-standardized rates” in Appendix 2: Analysis for information on how these cases are handled in incidence trend analyses)
 - Mortality: included in all analyses, although deaths due to *in situ* bladder cancer are relatively rare
 - Survival: included only in analyses for 2010 or later, unless otherwise specified
 - Prevalence: excluded from all analyses
 - Statistics on the incidences of malignant and non-malignant brain and other nervous system tumours are included in this report because of the similarity of symptoms and common treatment sometimes required for these tumours. Non-malignant cases include benign and borderline tumours. Because the registry began routinely registering non-malignant brain and other nervous system tumours in 2010, incidence and survival statistics on these cases are only provided for 2010 to 2018. Also, they are excluded from all mortality analyses.

- For childhood cancers, selected benign tumours and neoplasms of indeterminate behaviour (central nervous system and germ cell tumours) are included, as classified according to the International Classification of Childhood Cancer.

CANCER SUBSITES AND HISTOLOGICAL TYPES

- Because the Ontario Cancer Registry does not collect non-melanoma skin cancer (basal and squamous cell) records, this report excludes statistics for these cases, including for statistics on all cancers combined. Non-melanoma skin cancers represent the most common type of cancer in most jurisdictions.
- Statistics on incidence, survival and prevalence are provided for all cancers combined, 23 major cancer types and for certain anatomical (topographical) subsites and histological subtypes of these cancers, which were selected based on consultation with clinical experts.
- Statistics on mortality are reported for all cancers combined and the 23 major cancer types because limited details exist about topography and histology for cancer deaths, which makes it challenging to produce mortality statistics.
- Childhood cancer statistics on incidence, mortality and survival are provided for all cancers combined. Childhood cancer incidence is also reported by cancer type. For additional in-depth statistics on childhood cancers in Ontario, read the **Pediatric Oncology Group of Ontario Surveillance Report** [\(https://www.pogo.ca/research-data/data-reports/?utm_source=outlook&utm_medium=email&utm_campaign=OCS_2022\)](https://www.pogo.ca/research-data/data-reports/?utm_source=outlook&utm_medium=email&utm_campaign=OCS_2022).

CHANGES IN THIS EDITION

Compared with previous editions, this edition of *Ontario Cancer Statistics* contains the following methodological changes:

- The Jump model in the Joinpoint software was used to analyze trends in age-standardized incidence for selected cancer sites where a coding change has resulted in an artificial increase (or “jump”) in rates. The use of this model accounts for the “jump” without impacting the underlying trend. See **Appendix 2: Analysis** [\(/node/72821\)](#) for more information.
- In addition to reporting on limited-duration prevalence counts, for the first time this report includes statistics on prevalence proportions. See **Appendix 2: Analysis** [\(/node/72821\)](#) for more information.
- For childhood cancer mortality statistics reported by the Pediatric Oncology Group of Ontario, this edition focuses on the mortality of children ages 0 to 14 with cancer to allow for comparisons with other reports, whereas the childhood cancer mortality statistics reported in the previous edition by the Pediatric Oncology Group of Ontario included all deaths at any age among people diagnosed with cancer as children.

CITATION AND REFERENCING

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DISCLAIMERS

Many of the tables and charts in this report contain information derived from the Ontario Cancer Registry and the Pediatric Oncology Group of Ontario Networked Information System. While Ontario Health (Cancer Care Ontario) and the Pediatric Oncology Group of Ontario made every effort to ensure the completeness, accuracy and currency of the information at the time of writing this report, information changes over time, as does the interpretation of it.

Please do not use this information, either alone or with other information, to identify an individual. This includes attempting to decrypt information that is encrypted, attempting to identify an individual based on encrypted information and attempting to identify an individual based on prior knowledge.

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- Children's Hospital, London Health Sciences Centre
- McMaster Children's Hospital, Hamilton Health Sciences
- The Hospital for Sick Children
- Kingston Health Sciences Centre, Kingston General Hospital Site

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Contact Us

The **Surveillance Program** (</node/33211>) welcomes comments and suggestions. To provide feedback, or to be notified about future editions of this report or related information products, send us an **email** (<mailto:cancersurveillance@ontariohealth.ca>). To submit suggestions or questions about childhood cancer, please contact the Pediatric Oncology Group of Ontario by **email** (<mailto:info@pogo.ca>).

For More Information

CANCER SURVEILLANCE PROGRAM

Learn about the Ontario Health program that analyzes and interprets cancer data to examine and report on Ontario's cancer burden and trends.

View Surveillance Program

[\(/node/33211\)](/node/33211)

ONTARIO CANCER REGISTRY

Learn about Ontario's comprehensive population-based cancer registry, which records data about nearly 80,000 new cases of cancer each year.

View Ontario Cancer Registry

[\(/node/33226\)](/node/33226)

PEDIATRIC ONCOLOGY GROUP OF ONTARIO (POGO) AND POGO NETWORKED INFORMATION SYSTEM

Learn more about POGO, childhood cancer and POGO's comprehensive registry and database on childhood cancer in Ontario, which has captured information about this unique population since 1985.

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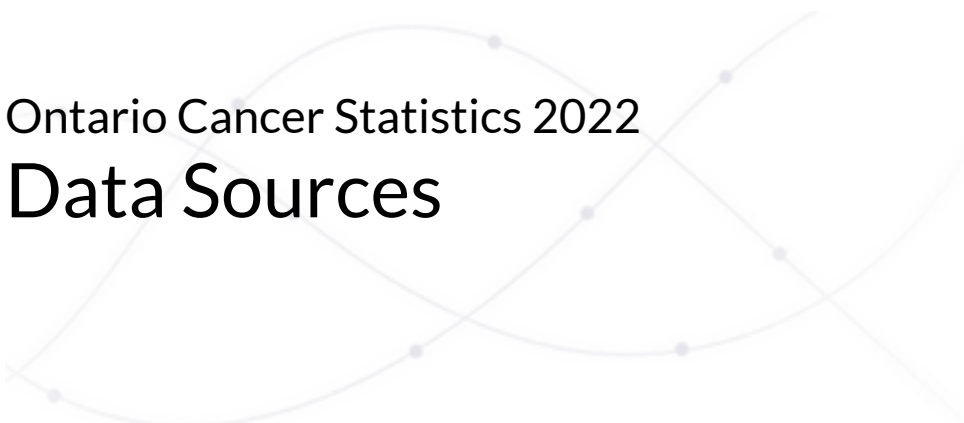
[utm_campaign=OCS_2022\)](https://www.pogo.ca/about-us/?utm_source=outlook&) POGO.

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[database/\)](https://www.pogo.ca/research-data/pogonis-childhood-cancer-database/)



Ontario Cancer Statistics 2022

Data Sources

The Ontario Cancer Registry, which is maintained by Ontario Health (Cancer Care Ontario), is the main data source for this report. The registry's goals are to collect, analyze and disseminate timely and high-quality information describing cases of cancer diagnosed among Ontario residents. The female and male sex terms used in this report refer to the sex that is recorded in the Ontario Cancer Registry.

The registry is a dynamic database; new case information and updates to past cases may be added throughout the year. Consequently, the results of analyses vary based on when the data are extracted from the registry. The data in this report were extracted in December 2020 (mortality) and March 2021 (incidence, survival and prevalence).

Ontario Cancer Registry records are created using data collected for purposes other than cancer registration. This information comes from various administrative databases, laboratory reports and clinical records. Four primary sources are used to generate case records in the registry:

- provincial pathology reports from Ontario's public hospital laboratories and private laboratories
- activity-level reporting database, containing data from Ontario's 14 regional cancer centres and their associated hospitals, for selected systemic therapy and all radiation treatment
- admission and discharge information from the Canadian Institute of Health Information's hospital abstracting databases (Discharge Abstract Database, National Ambulatory Care and Reporting System)
- cause-of-death data from the Office of the Registrar General for Ontario within the Ministry of Government and Consumer Services

Safeguarding confidential information is a guiding principle for Ontario Health (Cancer Care Ontario). All activities – from the initial registration of a new cancer case in the Ontario Cancer Registry, through to research and reporting – are governed by the Personal Health Information Protection Act, 2004.^[1] This Ontario law governs the collection and use of data, and the disclosure of personal health information. The act designates Ontario Health as a prescribed entity and authorizes the organization to collect, use and disclose personal health information for the purposes of managing and planning Ontario's health system. See our Statement of Information Practices for details.

DATA QUALITY

Death certificate only and microscopically confirmed cases

Table A.1 shows the percentage of cases in the Ontario Cancer Registry diagnosed based on a death certificate only and the percentage microscopically confirmed.

Overall, 1.3% of cases diagnosed in 2018 were death certificate only. The percentage ranged from a low of 0.1% for thyroid cancer and melanoma to a high of 3.4% for pancreatic cancer.

For all cancers combined, 90.9% of cases were microscopically confirmed. This falls slightly below the Surveillance, Epidemiology and End Results Program's recommendation of at least 93% of cases microscopically confirmed.^[2] The percentage microscopically confirmed varied from a low of 55.3% for liver to a high of 99.2% for thyroid cancer.

Table A.1 Percentage death certificate only and microscopically confirmed cases by cancer type, Ontario Cancer Registry, 2018

CANCER TYPE	DEATH CERTIFICATE ONLY		MICROSCOPICALLY CONFIRMED	
	NUMBER OF CASES	PERCENT (%) OF CASES	NUMBER OF CASES	PERCENT (%) OF CASES
All cancers	1,136	1.3%	77,085	90.9%
Bladder	32	0.8%	4,020	97.7%
Brain	27	2.3%	975	81.7%
Breast	61	0.5%	11,553	98.5%
Cervix	**	**	603	97.3%
Colorectal	180	2.1%	7,864	93.6%
Esophagus	18	1.9%	861	93.2%
Hodgkin lymphoma	**	**	395	94.0%
Kidney	39	1.5%	2,387	91.5%
Larynx	9	2.2%	386	93.7%
Leukemia	15	0.6%	1,952	80.8%
Liver	41	3.1%	731	55.3%
Lung	241	2.3%	8,845	85.6%
Melanoma	**	**	3,834	98.8%
Myeloma	12	0.8%	955	65.1%
Non-Hodgkin lymphoma	24	0.6%	3,490	81.5%
Oral cavity and pharynx	23	1.2%	1,778	95.1%
Ovary	19	1.5%	1,148	88.8%
Pancreas	70	3.4%	1,431	69.5%
Prostate	52	0.5%	9,411	96.7%
Stomach	19	1.1%	1,569	94.0%
Testis	**	**	514	95.9%

Thyroid	**	**	3,046	99.2%
Uterus	14	0.4%	3,102	98.4%

Symbol: ** Suppressed due to small case count (count less than 6).

Analysis by: Ontario Cancer Registry, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

Incidence-to-mortality ratio

The age-standardized incidence-to-mortality ratio identifies areas of under-coverage within a registry. The incidence-to-mortality ratio for the Ontario Cancer Registry for 2018 was 3.2:1 (Table A.2). This ratio meets the Canadian Partnership Against Cancer's recommended ratio of at least 2.3:1 ^[2], with variation by cancer type. An incidence-to-mortality ratio below the recommended level may indicate incomplete registration of cases.

Table A.2 Age-standardized incidence to mortality ratio by cancer type, Ontario, 2018

CANCER TYPE	I:M RATIO
All cancers	2.9
Bladder	4.9
Brain	1.5
Breast	6.2
Cervix	4.4
Colorectal	2.8
Esophagus	1.1
Hodgkin lymphoma	14.5
Kidney	4.7
Larynx	2.9
Leukemia	2.3
Liver	1.1
Lung	1.5
Melanoma	8.1
Myeloma	2.6
Non-Hodgkin lymphoma	3.9
Oral cavity and pharynx	3.4
Ovary	2.0

Pancreas	1.1
Prostate	5.3
Stomach	2.1
Testis	25.4
Thyroid	35.6
Uterus	6.9

Note: I:M ratio is the ratio of the age-standardized incidence rate to the age-standardized mortality rate.

Abbreviation: I means incidence and M means mortality.

Analysis by: Surveillance, Ontario Health (Cancer Care Ontario)

Data source: Ontario Cancer Registry (incidence (March 2021) and mortality (December 2020), Ontario Health (Cancer Care Ontario)

Data element completeness

All the data quality indicators met the minimal requirements from the Canadian Cancer Registry guideline, which is the Gold (i.e., highest) certification standard of the North American Association of Central Cancer Registries, and the Surveillance, Epidemiology and End Results Program guideline:

- Stage capture rates overall and for collaborative staging achieved the provincial target of 90% for breast, prostate, colorectal, lung and cervical cancers in 2018.
- There were no cases missing information about "age at diagnosis," "age at death" or "sex," thereby meeting the North American Association of Central Cancer Registries' Gold standard of a maximum of 2% or less. Furthermore, 0.01% of cases were listed as "alive with current age over 100" and 0.005% cases were listed as "dead" with missing death date.
- Postal codes were missing for 1.4% of the cases, which is under the 5% Canadian Cancer Registry's threshold for this indicator.
- The 1.9% percent of cases with unknown primary (C80.9) also met the less than 2.3% threshold of the Surveillance, Epidemiology and End Results Program standard.

In 2018, 87.4% of discrete synoptic cancer pathology reports had all mandatory elements complete in accordance with the College of American Pathologists electronic Cancer Checklists.

There are no standards for the average number of sources or notifications per case, or for the percentage of cases with unknown morphology. Cases with a greater number of supporting data sources or notifications are assumed to be considered more complete and credible. The high percentage of unknown morphology raises some concern about data quality and data collection. Table A.3 presents other data quality measures related to completeness of Ontario Cancer Registry case registration.

Table A.3 Data element completeness estimates, Ontario Cancer Registry, 2018

MEASURE	VALUE
Average number of sources/notifications per case	15.8
Cases with unknown primary site of cancer	1.9%
Cases with unknown morphology†	5.4%

Cases staged, all incident (stageable)‡	87.8% (93.7%)
Completeness of Ontario Cancer Registry data collection‡	90.0%
Synoptic pathology reports with mandatory elements	87.4%
Cases missing "age at diagnosis/death"	0.0%
Cases missing "sex"	0.0%
Cases missing "postal code" at diagnosis	1.4%
Patients listed as "alive" with current age >100	0.01%
Patients listed as "dead" missing death date	0.005%

Symbols:

†Histology range 8000 to 8005 (Not otherwise specified)

‡For lung, female breast, colorectal, cervical and prostate cancers only

Notes:

- For all malignant cases and in situ bladder.
- Total number of cases is 84,817 and represents 81,224 people.

Analysis by: Ontario Cancer Registry, Ontario Health (Cancer Care Ontario)**Data source:** Ontario Cancer Registry (March 2021), Ontario Health (Cancer Care Ontario)

POPULATION DATA

The population used in this report for age standardization is the 2011 Canadian Standard population (Table A.4), which is based on the 2011 Statistics Canada census.

Cancer Care Ontario surveillance reports published before 2016 used the 1991 Canadian Standard population. Therefore, comparing age-standardized rates in this report with the rates in earlier reports is not recommended.

The 1991 standard population is no longer appropriate because the population age structure has changed considerably since then. Using the 2011 standard population results in age-standardized rates that are closer to the crude rate (i.e., rate unadjusted for age distribution).

Except where otherwise noted, population data used in denominators for cancer projections are from the Ontario Ministry of Finance (spring 2021 release).^[3]

Table A.4 Population counts, by age group from the 2011 Canadian Standard Population used for age-standardized rates

AGE GROUP (YEARS)	POPULATION
0 - 4	1,899,064
5 - 9	1,810,433
10 - 14	1,918,164
15 - 19	2,238,952

20 - 24	2,354,354
25 - 29	2,369,841
30 - 34	2,327,955
35 - 39	2,273,087
40 - 44	2,385,918
45 - 49	2,719,909
50 - 54	2,691,260
55 - 59	2,353,090
60 - 64	2,050,443
65 - 69	1,532,940
70 - 74	1,153,822
75 - 79	919,338
80 - 84	701,140
85 and older	643,070

Note: Postcensal estimates are based on the 2011 census counts adjusted for census net undercoverage (including adjustment for incompletely enumerated Indian reserves) and the components of demographic growth that took place since that census. Intercensal estimates use counts from 2 consecutive censuses adjusted for census net undercoverage (including incompletely enumerated Indian reserves and postcensal estimates).

Data source: Statistics Canada. Table 17-10-0005-01 – Estimates of population, by age group and sex for July 1, Canada, provinces and territories, annual (persons unless otherwise noted)

CANCER SITE GROUPING

The Ontario Cancer Registry codes cancer cases using the third edition of the International Classification of Diseases for Oncology (ICD-O-3).^[4] Deaths in the cancer registry are based on the 10th edition of the International Classification of Diseases and Related Health Problems (ICD-10).^[5]

In this report, cancer sites are grouped according to the Surveillance, Epidemiology and End Results Program's recode systems, with some exceptions.^[6] In these exceptions, the cancer groupings were redefined to be more clinically relevant or to align with definitions used by other cancer surveillance systems.

The full list of cancer definitions and groupings used in this report are in Table A.5.

Table A.5A Definitions for cancer incidence

CANCER TYPE: SHORT FORM / LONG FORM	ICD-O-3 SITE AND HISTOLOGY CODE
Bladder / Urinary bladder	C67
Brain / Brain and other nervous system	C70-C72, C75.1-C75.3
Glioblastoma	C71 with histologies 9440, 9441, 9442

All other gliomas	C71 with histologies 9380-9385,9391-9439,9443-9444,9446-9460
Meningiomas	C70.0-C70.1, C70.9 with histologies 9530-9534,9537-9539
Pituitary, pineal and craniopharyngeal duct	C75.1-C75.3
Breast (female)	C50
Cervix / Cervix uteri	C53
Colorectal / Colon and rectum	C18.0, C18.2-C20, C26.0
Colon / Colon excluding rectum	C18.0, C18.2-C18.9
Left-sided colon	C18.5, C18.6, C18.7
Right-sided colon	C18.0, C18.2, 18.3, C18.4
Rectum and rectosigmoid junction	C19.9, C20.9
Rectosigmoid junction	C19.9
Rectum	C20.9
Esophagus	C15
Adenocarcinoma	C15 with histologies 8140-8573
Squamous cell carcinoma	C15 with histologies 8050-8082
Kidney	C64.9
Larynx	C32
Leukemia	C42.0, C42.1, C42.4 with histologies 9811-9818, 9837,9823 9827. Histologies 9826, 9835-9836, 9820, 9832-9834, 9940, 9840, 9861, 9865-9867, 9869, 9871-9874, 9895-9897, 9898, 9910-9911, 9920, 9891, 9863, 9875-9876, 9945-9946, 9860, 9930, 9801, 9805-9809, 9931, 9733, 9742, 9800, 9831, 9870, 9948, 9963-9964
Acute lymphocytic leukemia	Histologies 9826, 9835-9836 C42.0, C42.1, C42.4 with histologies 9811-9818, 9837
Acute monocytic leukemia	9891
Acute myeloid leukemia	Histologies 9840, 9861, 9865-9867, 9869, 9871-9874, 9895-9897, 9898, 9910-9911, 9920
Chronic lymphocytic leukemia	C42.0, C42.1, C42.4 with histology 9823
Chronic myeloid leukemia	Histologies 9863, 9875-9876, 9945-9946
Liver / Liver and intrahepatic bile duct	C22.0, C22.1
Lung / Lung and bronchus	C34
Adenocarcinoma / Adenocarcinoma (NSCLC)	C34 with histologies 8015, 8050, 8140-1, 8143-5, 8147, 8190, 8201, 8211, 8250-5, 8260, 8290, 8310, 8320, 8323, 8333, 8401, 8440, 8470-1, 8480-1, 8490, 8503, 8507, 8550, 8570-2, 8574, 8576
Large cell carcinoma / Large cell carcinoma (NSCLC)	C34 with histologies 8012-4, 8021, 8034, 8082

Small cell carcinoma	C34 with histologies 8022, 8041, 8045
Squamous cell carcinoma / Squamous cell carcinoma (NSCLC)	C34 with histologies 8051-2, 8070-6, 8078, 8083-4, 8090, 8094, 8120, 8123
Lymphoma	All sites with histologies 9650-9667; Histologies 9590-9597, 9670-9671, 9673, 9675, 9678-9680, 9684, 9687, 9689-9691, 9695, 9698-9702, 9705, 9708-9709, 9714-9719, 9727-9729; All sites other than C42.0, C42.1, C42.4 with histologies 9823, 9827
Hodgkin lymphoma	All sites with histologies 9650-9667
Non-Hodgkin lymphoma (NHL)	Histologies 9590-9597, 9670-9671, 9673, 9675, 9678-9680, 9684, 9687, 9689-9691, 9695, 9698-9702, 9705, 9708-9709, 9714-9719, 9727-9729; All sites other than C42.0, C42.1, C42.4 with histologies 9823, 9827
NHL - extranodal	All sites except C02.4, C09.8-C09.9, C11.1, C14.2, C37.9, C42.2, C77.0-C77.9 with histologies 9590-9597, 9670-9671, 9673, 9675, 9678-9680, 9684, 9687, 9688, 9689-9691, 9695, 9698-9702, 9705, 9708-9709, 9712, 9714-9719, 9724-9729, 9735, 9737, 9738 All sites except C02.4, C09.8-C09.9, C11.1, C14.2, C37.9, C42.0-C42.2, C42.4, C77.0-C77.9 with histologies 9811-9818, 9823, 9827, 9837
NHL - nodal	C02.4, C09.8, C09.9, C11.1, C14.2, C37.9, C42.2, C77 with histologies 9590-9597, 9670-9671, 9673, 9675, 9678-9680, 9684, 9687-9691, 9695, 9698-9702, 9705, 9708-9709, 9712, 9714-9719, 9724-9729, 9735, 9737-9738, 9811-9818, 9823, 9827, 9837
Melanoma (non-cutaneous)	C00-14, C20-C21, C30-31, C51-63, C69 with histologies 8720-8774
Mucosal	C00-14, C20-C21, C30-31, C51-63
Ocular	C69
Melanoma / Melanoma of the skin	C44 with histologies 8720-8790
Myeloma / Multiple myeloma	9731-9732, 9734
Oral cavity and pharynx	C00-C06, C09-C14
Hypopharynx	C12.9, C13
Lip and oral cavity	C00, C02, C03, C04, C05.0, C06
Nasopharynx	C11
Oropharynx	C01.9, C05.1, C05.2, C09, C10
Ovary	C56.9
Pancreas	C25
Prostate	C61.9
Stomach	C16
Testis	C62
Thyroid	C73.9
Anaplastic carcinoma	C73.9 with histologies 8012,8020-8021,8030-8032
Follicular carcinoma	C73.9 with histologies 8290, 8330-8332, 8335

Medullary thyroid carcinoma	C73.9 with histologies 8345, 8346, 8510
Papillary carcinoma	C73.9 with histologies 8050,8260,8340-8344
Uterus / Corpus and uterus NOS	C54, C55.9
Endometrial	C54, C55.9 with histologies 8050,8140,8143,8210-8211,8255,8260-8263,8310,8323,8340,8380-8384,8441,8460-8461,8560,8570,8950-8951,8980-8981
Uterine sarcoma	C54, C55.9 with histologies 8800-8802,8805,8890-8891,8896,8900,8910,8930-8931

Abbreviations: ICD-O-3 means International Classification of Disease for Oncology, Third Edition.

Notes:

- Histology types 9590 to 9989 (leukemias, lymphomas and hematopoietic diseases), 9050 to 9055 (mesothelioma) and 9140 (Kaposi sarcoma) are excluded from other specific organ sites.
- Histology types 8720 to 8774 (mucosal melanoma) are excluded from the following sites (and selected subsites): colorectal, ovary, uterine, cervix, prostate, testis, and oral cavity and pharynx.

Table A.5B Definitions for cancer mortality

CANCER TYPE: SHORT FORM / LONG FORM	ICD-10 CODE
Bladder / Urinary bladder	C67
Brain / Brain and other nervous system	C70-C72, C75.1-C75.3
Breast (female)	C50
Cervix / Cervix uteri	C53
Colorectal / Colon and rectum	C18.0,C18.2-C20, C26
Esophagus	C15
Hodgkin lymphoma	C81
Kidney	C64
Larynx	C32
Leukemia	C90.1, C91.0-C91.7, C91.9, C92.0-C92.4, C92.6-C92.9, C93.0-C93.3, C93.7, C93.9, C94.0-C94.5, C94.7, C95.0-C95.2, C95.7, C95.9
Liver / Liver and intrahepatic bile duct	C22.0-C22.4, C22.7, C22.9
Lung / Lung and bronchus	C34
Melanoma / Melanoma of the skin	C43
Myeloma / Multiple myeloma	C90.0, C90.2, C90.3
Non-hodgkin lymphoma (NHL)	C82-C86, C96.3
Oral cavity & pharynx	C00-C06, C09-C14
Ovary	C56
Pancreas	C25

Prostate	C61
Stomach	C16
Testis	C62
Thyroid	C73
Uterus / Corpus and uterus NOS	C54-C55

Abbreviations: ICD-10 means International Statistical Classification of Diseases and Related Health Problems, Tenth Revision.

NON-MELANOMA SKIN CANCER

Data in this report exclude cases of basal cell and squamous cell carcinoma of the skin, the most common types of non-melanoma skin cancer.

These tumours are generally not life-threatening and are treated in outpatient settings. Although these cases are captured in pathology reports, their large number poses a challenge for data capture and quality assurance by the Ontario Cancer Registry, which is a requirement for meaningful surveillance.

CANCER STAGE AT DIAGNOSIS

Cancer staging is essential for quality care. Stage data are vital for:

- evaluating the effectiveness of screening and treatment programs
- analyzing survival
- research into new treatments
- resource planning for healthcare management

The tumour–node–metastasis (TNM) system is the most widely used classification system for stage at diagnosis. It is recognized as the international standard for describing the anatomy extent of cancers. TNM definitions, now in their eighth edition, are maintained by the Union for International Cancer Control and the American Joint Committee on Cancer. The stage data for 2018 in this report are based on the eighth edition of TNM^[7], while prior years use collaborative stage, which is based on the seventh edition of TNM.^[8] See **Recent Changes in Cancer Staging, Coding and Case Creation Standards** ([#cancer-staging-coding-and-case-creation-standards](#)) for more information.

Collaborative staging (2010 to 2017 years of diagnosis) was a staging approach used by central cancer registries. Collaborative staging brought together the principles of the following:

- National Cancer Institute's Surveillance, Epidemiology and End Results Program Summary Stage
- TNM categories and stage groupings
- Surveillance, Epidemiology and End Results extent of disease coding structure

Most of the collaborative staging data items were traditionally collected by some cancer registries. These items included tumour size, extension, lymph node status and metastatic status. Other data, such as site-specific or histology-specific factors (e.g., Gleason score and receptor status), were specific to collaborative staging. The data were used to derive the "best stage" grouping consistent with the American Joint Committee on Cancer Staging Manual (in its eighth edition).^[7]

Ontario Cancer Registry staging values for invasive cancer range from stage 1, which means the disease is in the

early phase, to stage 4, which means the cancer has spread (or metastasized) to other organs or places in the body. An "unknown stage" is the result of limited stage workup, limited documentation in the person's health record or both. "Not staged" means no attempt at staging has taken place.

Starting with cases diagnosed on January 1, 2005, the Ontario Cancer Registry phased in various versions of collaborative staging by reporting selected cancer type and hospital (see the list of contributing hospitals and regional cancer centres below). Collaborative staging was fully implemented for breast, lung, colorectal and prostate cancers in 2010; for ovarian, uterine and cervical cancers, and melanoma in 2011; and for thyroid cancer in 2013.

Approximately 8% to 16% of breast, colorectal, lung and prostate cancer cases in the Ontario Cancer Registry are missing information on stage at diagnosis and are therefore excluded from this analysis. Stage at diagnosis may be missing due to inadequate supporting information in someone's medical record to support a definitive stage at the time of diagnosis. Stage distributions may not be the same for the cases with missing data.

RECENT CHANGES IN CANCER STAGING, CODING AND CASE CREATION STANDARDS

Changes in coding and case creation standards implemented in 2018 provide cancer registries with a standard set of rules to follow when coding and counting distinct cancers.

- The 2018 Surveillance, Epidemiology and End Results Solid Tumor Coding Rules replaced the 2007 Surveillance, Epidemiology and End Results Multiple Primary and Histology Coding Rules for cases diagnosed from January 1, 2018, onward in the Ontario Cancer Registry. While this update has not resulted in significant changes in incidence for overall cancer sites, there have been changes to some subtypes and histology codes.
- With the new coding rules, ambiguous terminology (e.g., "with features of") is no longer used to determine a subtype or histology code. As a result, the prevalence of histological subtypes that have been affected by the new rules may appear to have decreased in 2018. However, this is not a true decrease because the 2018 Surveillance, Epidemiology and End Results Solid Tumor Coding Rules have grouped some subtypes under 1 histology code. One of the sites where this 2018 rule has the greatest impact is breast.

Beginning with the 2018 diagnosis year, the Collaborative Stage Data Collection System was decommissioned by the Canadian Council of Cancer Registries and use of the eighth edition of the American Joint Committee on Cancer's tumour–node–metastases staging system (TNM 8th edition) was mandated.

- TNM 8th edition has stricter requirements than the Collaborative Stage Data Collection System for key data elements when mapping to an overall stage group. Due to these stricter requirements, in 2018 there is an increase in unknown stage group cancers and a shift in stage distribution for certain cancer types compared with previous years. As a result, it is recommended that comparisons be avoided between pre- and post-2018 stage data.
- The introduction of TNM 8th edition has resulted in an increase in unknown stage group cancers. This increase is primarily due to the lack of the computer algorithm that was part of the Collaborative Stage Data Collection System, which derived a "combined best stage" using whatever clinical and pathological data elements the cancer registrar was able to collect from the patient record.

CONTRIBUTING FACILITIES TO ACTIVITY-LEVEL REPORTING DATA USED FOR POPULATION-LEVEL STAGING, ONTARIO

Regional cancer centres

- Cancer Centre of Southeastern Ontario
- Carlo Fidani Peel Regional Cancer Centre

- Grand River Regional Cancer Centre
- Juravinski Cancer Centre
- London Regional Cancer Program
- Northeast Cancer Centre
- Odette Cancer Centre
- Princess Margaret Cancer Centre
- R.S. McLaughlin Durham Regional Cancer Centre
- Regional Cancer Care Northwest
- Simcoe Muskoka Regional Cancer Centre
- Stronach Regional Cancer Centre
- The Ottawa Hospital Cancer Program
- Windsor Regional Cancer Centre

Hospitals

- Alexandra and Marine General Hospital
- Alexandra Hospital
- Bluewater Health Sarnia General
- Brant Community Healthcare System, Brantford
- Brockville General Hospital
- Cambridge Memorial Hospital
- Chatham Kent Health Alliance, Chatham
- Collingwood General and Marine Hospital
- Cornwall Community Hospital
- Four Counties Health Services Corp
- Georgian Bay General Hospital, Midland
- Grand River Hospital Corp, Waterloo
- Grey Bruce Health Services, Owen Sound
- Guelph General Hospital
- Halton Healthcare Services Corp Oakville
- Hamilton Health Sciences Corporation Juravinski
- Hawkesbury and District General Hospital
- Headwaters Health Care Centre
- Health Sciences North, Laurentian Site
- Hôpital Montfort
- Humber River Hospital, Wilson Site
- Joseph Brant Hospital
- Kemptville District Hospital
- Kingston Health Sciences Centre (HDH)
- Kingston Health Sciences Centre, Kingston General
- Kirkland and District Hospital
- Lake of the Woods District Hospital
- Lakeridge Health Oshawa
- Lennox and Addington County General Hospital
- Listowel Memorial Hospital
- London Health Sciences Centre Victoria Hospital

- Mackenzie Health Richmond Hill Hospital
- Markham Stouffville Hospital
- Muskoka Algonquin Healthcare, Bracebridge
- Muskoka Algonquin Healthcare, Huntsville
- Niagara Health System, St Catharines General
- Norfolk General Hospital
- North Bay Regional Health Centre
- North York General Hospital
- Northumberland Hills Hospital
- Orillia Soldiers' Memorial Hospital
- Ottawa Hospital (The)
- Pembroke Regional Hospital Inc.
- Perth & Smiths Falls District Smiths Falls
- Peterborough Regional Health Centre
- Queensway Carleton Hospital
- Quinte Healthcare Corporation Belleville
- Renfrew Victoria Hospital
- Riverside Health Care Facility
- Ross Memorial Hospital
- Royal Victoria Regional Health Centre
- Sault Area Hospital, Sault Ste Marie
- Scarborough Health Network, Centenary
- Scarborough Health Network, Scarborough General Site
- Sinai Health System Mount Sinai Site
- South Bruce Grey Health Centre Kincardine
- Southlake Regional Health Centre
- St. Joseph's General Hospital
- St. Joseph's Health Care London
- St. Joseph's Health Care System Hamilton
- St. Mary's General Hospital
- St. Mary's Memorial Hospital
- St. Thomas Elgin General Hospital
- Stevenson Memorial Hospital Alliston
- Stratford General Hospital
- Strathroy Middlesex General Hospital
- Sunnybrook Health Sciences Centre
- Temiskaming Hospital
- Thunder Bay Regional Health Sciences Centre
- Tillsonburg District Memorial Hospital
- Timmins & District General Hospital
- Toronto East Health Network, Michael Garron Hospital
- Trillium Health Partners Credit Valley
- Trillium Health Partners Mississauga
- Trillium Health Partners Queensway Health
- Unity Health Toronto St. Joseph's

- Unity Health Toronto St. Michael's
- University Health Network Princess Margaret
- West Parry Sound Health Centre
- William Osler Health System
- Winchester District Memorial Hospital
- Windsor Regional Hospital, Metropolitan
- Windsor Regional Hospital, Ouellette Campus
- Women's College Hospital
- Woodstock General Hospital

CODING RULES FOR MULTIPLE PRIMARY CANCERS

Different rules exist to determine whether a cancer is a new primary cancer or an extension of a previous cancer. Following a recent rebuild and similar to other North American cancer registries, the Ontario Cancer Registry adopted the Surveillance, Epidemiology and End Results Program's rules for counting multiple primaries and assigning histology. ^[9]

To identify multiple primary cancers, the Surveillance, Epidemiology and End Results counting rules take into account histology, site, laterality and time since the initial diagnosis. The Surveillance, Epidemiology and End Results rules are more liberal than the rules previously used in the Ontario Cancer Registry for counting multiple primaries in their definition of a new primary case.

The Surveillance, Epidemiology and End Results rules for multiple primary cancers have been applied to cases in the Ontario Cancer Registry diagnosed on or after January 1, 2010.

Cases from the years before the Surveillance, Epidemiology and End Results rules adoption (i.e., 1964 to 2009) have been imported into the new Ontario Cancer Registry from the Ontario Cancer Registry Information System for continued analytic use. The Ontario Cancer Registry Information System applied a modified version of the International Agency for Research on Cancer/International Association of Cancer Registries (IARC/IACR) rules [10], which are more conservative than the Surveillance, Epidemiology and End Results rules. Under the IARC/IACR rules, only 1 tumour is registered for an organ, irrespective of time, unless there are histological differences. In this report, data were converted using the IARC/IACR rules when:

- trend analyses span both the Ontario Cancer Registry (2010 onward) and Ontario Cancer Registry Information System (1983 to 2009) eras
- comparisons are made between data from the 2 registry systems

When data are presented only from 2010 onward, the Surveillance, Epidemiology and End Results Program rules were applied.

Given that the Surveillance, Epidemiology and End Results rules are more liberal than the IARC/IACR rules, applying the Surveillance, Epidemiology and End Results Program rules results in an increase in the number of cases included in incidence counts. This is simply a result of using a different methodology and does not reflect an actual increase in the number of people diagnosed with cancer. In 2018, 4.2% of new cases were considered multiple primaries in Ontario.

CHILDHOOD CANCER DATA

The Pediatric Oncology Group of Ontario Networked Information System (POGONIS), maintained by the Pediatric Oncology Group of Ontario and funded by the Ontario Ministry of Health, is the data source for the 0 to 14 age

group. POGONIS is a reliable, validated data source used to estimate incidence, inform policy and planning, and provide essential data for research on childhood cancer cases in Ontario.

POGONIS, like the Ontario Cancer Registry, is a dynamic database, with data continuously being entered into it. The childhood cancer data used in this report were extracted from POGONIS in April 2021.

POGONIS is a population-based registry and database that captures detailed demographic, diagnostic, treatment and outcome information starting in 1985 on all children and adolescents diagnosed or treated with cancer in a specialized childhood cancer program in Ontario. Standardized POGONIS data are actively collected by dedicated data managers or clinical research associates at each of the 5 tertiary centres with specialized childhood cancer programs across Ontario. The information comes from comprehensive hospital chart review, internal hospital information systems and direct connections with patient healthcare teams. Death information in POGONIS is validated and supplemented via annual record linkage to the Ontario Cancer Registry and the Ontario Registrar General Death File under a data sharing agreement with Ontario Health (Cancer Care Ontario) to systematically capture deaths in the entire cohort.

The Pediatric Oncology Group of Ontario is also designated as a prescribed entity under the Personal Health Information Protection Act. The Pediatric Oncology Group of Ontario has created and operationalized detailed policies and procedures that govern all aspects of the collection, use and disclosure of personal health information.

Classification

The POGONIS database classifies childhood cancer according to the International Classification of Childhood Cancer, third edition (ICCC-3).^[11] This classification divides childhood cancer into 12 main diagnostic groups and 47 sub-groups for additional refinement.

The classification of each case applied in this analysis is true to the timing of the diagnosis and the associated International Classification of Diseases for Oncology (ICD-O) morphology code for that period. Because the ICCC-3 (published in 2005) does not incorporate coding changes made in the updated version of the ICD-O-3 system (ICD-O-3.1, published in 2013), the Pediatric Oncology Group of Ontario has incorporated changes to the ICD-O-3.1 codes into an updated ICCC classification based on Ontario clinical and epidemiological expertise. Details of the differences in coding between POGONIS and the ICCC-3 are available in the **Pediatric Oncology Group of Ontario Surveillance Report** [\[https://www.pogo.ca/research-data/data-reports/\]](https://www.pogo.ca/research-data/data-reports/).

Population data

Included in incidence, mortality and survival analyses:

- children diagnosed from ages 0 to 14 and residents of Ontario who were treated in a specialized childhood cancer program in Ontario with a diagnosis included in the in Pediatric Oncology Group of Ontario updated ICCC-3 classification system

Excluded from incidence, mortality and survival analyses:

- children who were not residents of Ontario, but who were diagnosed or treated in a specialized childhood cancer program in Ontario
- cases not diagnosed and fully treated in a specialized childhood cancer program in Ontario

The population used in this report for age standardization for childhood cancers is the 2011 Canadian Standard population (Table A.4).

Coding rules for multiple primary cancers

Childhood cancer incidence counts and rates are based on all cases of cancer diagnosed in children, ages 0 to 14 at time of diagnosis for the 1986 to 2020 period, who were diagnosed in a specialized childhood cancer program in Ontario and registered in POGONIS. Every occurrence of childhood cancer is considered an incident (or new) case. Following the International Agency for Research on Cancer rules for primary cancers, the Pediatric Oncology Group of Ontario registers or counts neoplasms of different morphology as multiple cancers (even if they are diagnosed simultaneously in the same site).^[10]

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Ontario Cancer Statistics 2022 Analysis

SIGNIFICANCE TESTING

Throughout this report, the word “significant” refers to statistical significance at an alpha level of 0.05 for changes in trend or when comparing differences in rates or ratios. When referring to changes in trends, statistically non-significant changes are described in this report as “stable.” Any other noted trend changes (increasing or decreasing) are statistically significant. In some instances (such as for survival statistics), statistical significance is assessed using a confidence interval, which accounts for variations and chance errors and represents the frequency with which the interval would contain the average measure 19 times out of 20 (or 95% of the time).

PROBABILITY OF DEVELOPING OR DYING FROM CANCER

The probability of developing or dying from cancer refers to the probability of a newborn child developing or dying from cancer at some point during their lifetime. Lifetime risk calculations are based on current incidence and mortality rates. Therefore, these risk calculations assume that the current rates within each age group will remain constant during the life of the newborn child.

The probability of developing or dying from cancer was calculated using DevCan software.⁽¹⁾ The DevCan software program uses life-table methods based on cross-sectional incidence, mortality and population data for 18 age groups to compute the lifetime and age-conditional probabilities of developing or dying from cancer.

PROJECTIONS

Incidence and mortality

Projections of incidence and mortality for 2019 to 2022 were estimated using the Canproj projection package⁽²⁾ in R software.⁽³⁾ The Canproj package is a modified version of Nordpred Power 5 package,⁽⁴⁾ which is based on an age-period-cohort Poisson regression model. The Canproj package has enhancements that overcome difficulties in the standard Poisson model and improve projection accuracy.

The Ontario populations used for the cancer projections were from population projections up to 2046 derived by the Ontario Ministry of Finance. The methodology and assumptions for the projected populations can be found elsewhere.⁽⁵⁾

Canproj consists of 3 sub-packages:

- Nordpred model (adpcproj: age-drift-period-cohort model)
- age-cohort model (acproj: age-cohort model)
- hybrid model (hybdproj: age-only model)

Each sub-package can work independently for projections. Canproj has a built-in decision tree to help determine which of the 3 models is most appropriate. The package can also replace the Poisson distribution to a negative-binomial distribution when overdispersion is present in the data. Finally, Canproj tests the goodness-of-fit of the chosen model.

Projections for "all cancers" and each individual cancer site were estimated using the Canproj package.

Age-drift-period-cohort model (Nordpred)

The Norpred Power 5 model is represented as:

$$Case_{ap} \sim Poisson(\mu_{ap}),$$

$$R_{ap} = \frac{\mu_{ap}}{n_{ap}} = (A_a + P_p + C_c + Dp)^5$$

where the symbols represent the following:

- R_{ap} is the incidence rate in age group a in calendar period p .
- μ_{ap} is the mean count of cases in age group a in calendar period p .
- n_{ap} case is the size of the corresponding population.
- A_a is the age component for age group a .
- D is the common linear drift parameter.
- P_p is the non-linear period component of period p .
- C_c is the non-linear cohort component of cohort c .
- p is the calendar period,

Cohorts were calculated as $c = A + p - a$ with A equaling the total number of age groups.⁽²⁾

Age-cohort model (acproj model)

The age-cohort model is a reduced form of the Nordpred model selected by Canproj when sparse data exist in the youngest and oldest birth cohorts. Due to sparseness of the data at both extreme cohorts, the remaining cohorts with complete observations are set as reference when age and cohort affects are being estimated.⁽²⁾

The expression for the age-cohort model is

$$Case_{ap} \sim \text{Poisson}(\mu_{ap}),$$

$$R_{ap} = \frac{\mu_{ap}}{n_{ap}} = (A_a + C_c)^5, \quad c = A + p - a,$$

$$p = 1, 2, \dots, P, \quad c = 1, 2, \dots, C \text{ where } C = A + P - 1$$

Hybrid models: age-only, common trend and age-specific trend models

There are 3 types of hybrid models: age-only, common trend and age-specific. The models use a combination of 3 methods: average, joinpoint type and whenever the cohort effects are not significant, Poisson regression methods.^(2,6) The hybrid functions first compare the common trend model with the age-specific model using a chi-square test in the age groups where data exist for the entire periods. When there is no significant difference between the models, the common trend is preferred; otherwise, age-specific is preferred.

The incidence, death and population data were classified by year of diagnosis, year of death and sex, and grouped by 5-year age groups (0 to 4, 5 to 9 ... 85 and older). For incidence projections, cases meeting the International Association for Research on Cancer/International Association of Cancer Registries multiple primary rules from 1984 to 2018 were projected. These were later converted for the 2010 to 2016 period for Surveillance, Epidemiology and End Results multiple primary rules by applying an inflation factor based on the age-specific increase in multiple primary cancers. Projections for all cancers combined were estimated based on the sum of all data from the 23 cancer sites in this report.

Mortality projections were also made with a Canproj package using cancer deaths from 1984 to 2018 divided into 5-year age groups and calendar year. To get incidence and mortality projections for all cancers combined, projections were calculated by sex and then summed. This method was used because the projections based only on the data for all cancers combined are not equal to the sum of the projections for males and for females. The lists of models used for all cancers combined and for each individual cancer site by sex are in Table A.6 for incidence projections and Table A.7 for mortality projections.

Table A.6 Canproj models for cancer incidence projections, by cancer type and sex, Ontario

CANCER TYPE	SEX	
	MALES	FEMALES
All cancers	adpcproj (NB)	adpcproj (NB)
Bladder	adpcproj (NB)	adpcproj (P)
Brain	acproj (P)	adpcproj (P)
Breast (female)	n/a	adpcproj (NB)
Cervix	n/a	adpcproj (P)
Colorectal	adpcproj (NB)	adpcproj (NB)
Esophagus	hybdproj (Avg)	hybdproj (ComT)
Hodgkin lymphoma	hybdproj (NBags)	acproj (P)
Kidney	adpcproj (NB)	hybdproj (NBags)
Larynx	adpcproj (P)	adpcproj (P)

Leukemia	hybdproj (NBags)	hybdproj (NBags)
Liver	adpcproj (NB)	adpcproj (NB)
Lung	adpcproj (NB)	adpcproj (NB)
Melanoma	adpcproj (NB)	adpcproj (NB)
Myeloma	adpcproj (P)	hybdproj (ComT)
Non-Hodgkin lymphoma	adpcproj (P)	adpcproj (P)
Oral cavity and pharynx	adpcproj (P)	adpcproj (P)
Ovary	n/a	adpcproj (NB)
Pancreas	hybdproj (NBags)	hybdproj (ComT)
Prostate	adpcproj (NB)†	n/a
Stomach	adpcproj (P)	adpcproj (NB)
Testis	hybdproj (ComT)	n/a
Thyroid	adpcproj (P)	adpcproj (NB)
Uterus	n/a	adpcproj (P)

Abbreviations:

- acproj (P) means age-cohort model with Poisson distribution
- acproj (NB) means age-cohort model with negative-binomial distribution
- adpcproj (NB) means Norpred model with negative-binomial distribution
- adpcproj (P) means Norpred model with Poisson distribution
- hybdproj (NBags) means hybrid model with age-specific and negative-binomial distribution
- hybdproj (Ags) means hybrid model with age-specific and Poisson distribution
- hybdproj (ComT) means hybrid model with common-trend
- hybdproj (Avg) means hybrid model with average method
- n/a means “not applicable”

Symbol: † Five periods were used to estimate projected incidence. Projected estimates used data starting from the 35- to 39-year age group.

Table A.7 Canproj models for cancer mortality projections, by cancer type and sex, Ontario

CANCER TYPE	SEX	
	MALES	FEMALES
All cancers	adpcproj (P)	adpcproj (NB)
Bladder	adpcproj (P)	hybdproj (ComT)
Brain	adpcproj (P)	adpcproj (NB)
Breast (female)	n/a	adpcproj (NB)

Cervix	n/a	adpcproj (P)
Colorectal	adpcproj (P)	adpcproj (P)
Esophagus	hybdproj (NBags)	hybdproj (ComT)
Hodgkin lymphoma	hybdproj (Ags)	hybdproj (ComT)
Kidney	acproj (P)	adpcproj (P)
Larynx	hybdproj (Ags)	adpcproj (P)
Leukemia	adpcproj (P)	hybdproj (Ags)
Liver	adpcproj (P)	adpcproj (P)
Lung	adpcproj (NB)	adpcproj (P)
Melanoma	acproj (P)	acproj (P)
Myeloma	hybdproj (NBags)	acproj (NB)
Non-Hodgkin lymphoma	adpcproj (P)	adpcproj (P)
Oral cavity and pharynx	hybdproj (NBags)	hybdproj (NBags)
Ovary	n/a	adpcproj (P)
Pancreas	hybdproj (Avg)	acproj (NB)
Prostate	adpcproj (NB)†	n/a
Stomach	adpcproj (P)	adpcproj (NB)
Testis	hybdproj (ComT)	n/a
Thyroid	hybdproj (ComT)	hybdproj (Avg)
Uterus	n/a	adpcproj (P)

Abbreviations:

- acproj(P) means age-cohort model with Poisson distribution
- acproj(NB) means age-cohort model with negative-binomial distribution
- adpcproj (NB) means Norpred model with negative-binomial distribution
- adpcproj (P) means Norpred model with Poisson distribution
- hybdproj(NBags) means hybrid model with age-specific and negative-binomial distribution
- hybdproj(Ags) means hybrid model with age-specific and Poisson distribution
- hybdproj(ComT) means hybrid model with common-trend
- hybdproj(Avg) means hybrid model with average method
- n/a means “not applicable”

Symbol: † Six periods were used to estimate projected incidence. Projected estimates used data starting from the 45- to 49-year age group.

Prevalence

Prevalence projections can be interpreted as the effect of the growth and aging of the Ontario population and current cancer control strategies. Projections for 2019 to 2034 were estimated using the Prevalence and Incidence Analysis Model (PIAMOD), which is a unified statistical package for estimating and projecting complete prevalence of cancer.⁽⁷⁾

Prevalence projection in PIAMOD requires several types of input data, such as cancer incidence, population and all-cause mortality. To this end, annual observed incidence data by cancer type (from 1984 to 2018) were extracted from the Ontario Cancer Registry and were restricted to first primaries. Ontario population and all-cause mortality were obtained from Statistics Canada databases for single years of age (0, 1, 2 ... 90+ years old).

Age-cohort models with different parameters were fitted to the historical cancer- and sex-specific incidence data in the PIAMOD software. The best age-cohort models were selected based on the lowest likelihood ratio test statistic and fewest parameters. The selected cancer- and sex-specific age-cohort models are shown in Table A.8. The estimated parameters from the selected age-cohort models and tabulated relative survival rates estimated from SEER*Stat software⁽⁸⁾ were used for annual age-specific prevalence projections by sex and cancer type (including all cancers combined) in PIAMOD. The projected counts are used to calculate prevalence proportion and standardized to 2011 Canadian Standard population. A validation of the PIAMOD projected prevalence estimates was conducted by comparing the actual prevalence obtained through the direct counting method or limited-duration prevalence estimation with the PIAMOD projected estimates for the year 2018. The relative percentage differences between the limited-duration and PIAMOD prevalence estimates were generally between 0.34% and 13%, in both males and females.

Table A.8 Age-cohort models for cancer incidence, by cancer type and sex, Ontario

CANCER SITE	MALES	LRS	FEMALES	LRS
All cancers	AC701	8285.9	AC603	4705.1
Breast (female)	n/a	n/a	AC603	3942.4
Colorectal	AC205	3147.3	AC505	2708
Kidney	AC404	2519.7	AC401	2406.7
Leukemia	AC602	3234	AC303	2967.6
Lung	AC404	2707.2	AC404	2667.2
Melanoma	AC205	2977.6	AC402	3000.6
Non-Hodgkin lymphoma	AC404	3014.9	AC403	2807.6
Prostate	AC503	20689.4	n/a	n/a
Thyroid	AC203	2237.4	AC404	3893.8
Uterus	n/a	n/a	AC402	2627.7

Abbreviations: AC means age-cohort model; LRS means likelihood ratio statistic; n/a means not applicable.

INCIDENCE AND MORTALITY

Counts

Incidence counts are the number of new cancer cases diagnosed in a population during a specific period. In this report, incidence counts refer to the number of new cancer diagnoses in a calendar year in Ontario. At the time of

writing, complete death-cleared incidence data were available up to 2018.

Mortality counts describe the number of deaths attributed to cancer during a specific period in a specific population. In this report, mortality refers to the number of deaths due to cancer in a calendar year in Ontario. For consistency, this report uses data for the same range of years for incidence and mortality (i.e., 1984 to 2018).

The childhood cancer incidence statistics included this report are based on the cohort of children diagnosed with cancer from 1986 to 2020 and are presented for 1986 to 2020. Childhood cancer mortality statistics are based on the cohort of children diagnosed with cancer from 1986 to 2019 and are presented for 1991 to 2019.

Rates

Incidence and mortality rates are the number of new cancer cases or deaths per 100,000 people in a population during a specific period. Rates presented by sex are per 100,000 males or per 100,000 females in the population during the specified period. The rates are sometimes called crude rates because they do not adjust for the age distribution of the population. Rates were calculated using SEER*Stat v.8.3.8.⁽⁸⁾

For children with cancer (ages 0 to 14), incidence and mortality rates are the number of new cancer cases or deaths per 1,000,000 people in the population during a specific period. Childhood cancer rates were calculated using Statistical Analysis System v.9.4.⁽⁹⁾

Age-standardized rates

Age-standardized rates are weighted averages of age-specific rates using a standard population. Age-standardized incidence rates and age-standardized mortality rates are adjusted for differences in the age structure of different populations. This adjustment permits comparisons of cancer incidence or mortality between different populations, which may be different segments of a population (e.g., different geography) or the same population at different times. An age-standardized rate gives the rate that would have occurred if the population had the same age distribution as the standard population.

This report uses direct standardization, which produces artificial rates for the purpose of comparison only. The standard population used is based on the 2011 Canadian Standard population (with 5-year age groups).

Trends in age-standardized rates

Incidence and mortality trends were determined using annual percent change and average annual percent change, and calculated using age-standardized rates. Annual percent change was used when examining short-term changes in trend. Average annual percent change is a summary measure that describes the change in trend over a longer period with a single statistic.

Annual percent change and average annual percent change statistics were produced using the Joinpoint Regression Program (version 4.8.0.1).^(10,11) The Joinpoint software uses piecewise regression to model the change in rates on the log scale.

The Joinpoint software uses a statistical algorithm to interpret data and determine statistically significant changes in trend. The software chooses the best points for a trend to change (called joinpoints) and how many changes there should be. Joinpoint uses the Monte Carlo Permutation test to determine whether the change in trend is statistically significant.⁽⁴⁾ In general, the model that the Joinpoint software found to be the best fit was used. A maximum of 3 joinpoints and a minimum of 5 data points between joinpoints were allowed.

Jump model for incidence trend analysis

For most cancer sites, the standard joinpoint model (see above) was used to analyze incidence trends. Furthermore, these analyses only included cancer cases meeting the International Association for Research on

Cancer/International Association of Cancer Registries criteria for multiple primary cancers.

However, for selected cancer sites, the jump model was used instead of the standard joinpoint model to analyze trends in age-standardized incidence. The jump model is an option available in the Joinpoint software to estimate trends in situations where a coding change has resulted in a sudden shift (or “jump”) in cancer rates. Since a shift in rates caused by a coding change is assumed to be artificial, the jump model accounts for this type of shift to produce estimates of the underlying trend.⁽¹²⁾

In this report, the jump model was used for the following cancer sites for cases meeting the National Cancer Institute’s Surveillance, Epidemiology and End Results Program’s criteria for multiple primaries (see **Coding Rules for Multiple Primary Cancers** [./statistical-reports/ontario-cancer-statistics-2022/data-sources-appendices-1-2022#ocs-anchor-coding-rules-for-multiple-primary-cancers](/statistical-reports/ontario-cancer-statistics-2022/data-sources-appendices-1-2022#ocs-anchor-coding-rules-for-multiple-primary-cancers)):

- all cancers
- bladder
- breast (female)
- melanoma

For all cancers, melanoma and breast (female), an abrupt increase in incidence rates was observed due to the impact of applying the Surveillance, Epidemiology and End Results rules for cases diagnosed from 2010 onwards. For bladder cancer, an abrupt increase in incidence rates occurred primarily due to the inclusion of in situ bladder cases, also from 2010 onwards. The jump model accounted for these artificial increases to produce estimates of the underlying trend.

SURVIVAL

In this report, survival analyses measure net cancer survival. Net survival is the probability of surviving cancer in the absence of other causes of death. It is a measure that is not influenced by changes in mortality from other causes and is therefore a useful way to track cancer survival across time, as well as between population groups and between registries. The measure of net survival used in this report is the relative survival ratio. Relative survival ratios are estimated by comparing the survival of people with cancer (observed survival) with the survival of similar people in the general population of Ontario during the same time period (expected survival):

- Observed survival is the percentage of people with cancer who are alive at the end of a selected time period out of the total number of people with cancer at the start of the time period. It can also be described as the probability of surviving all causes of death among people with a cancer diagnosis.
- Expected survival is the percentage of similar people in the general population (matched by age and sex to the cancer population) expected to be alive at the end of the same time period.

A relative survival ratio is the ratio of observed survival to expected survival and shows how much a cancer diagnosis can shorten a life span. The relative survival ratio is a ratio of percentages and is usually expressed as a percentage. The closer the value is to 100%, the closer the survival of the cancer population is to the general population.

Survival analyses were based on first primary cancers. This means that only the first occurrence of cancer per person in a specific time period was included in survival analyses. Furthermore, relative survival ratios are provided for cases diagnosed in people ages 15 to 99. Cases were excluded from the survival analyses in the following conditions:

- the age of the person was unknown
- they were diagnosed on the basis of an autopsy only
- their date of diagnosis and date of death were the same (i.e., death certificate only cases where the diagnosis happened at or following death)

See Table A.1 in Data Sources for details on death certificate only cases.

For survival analyses that included cases diagnosed before 2010, the International Association for Research on Cancer/International Association of Cancer Registries multiple primary rules for counting cancer cases were used. For survival analyses that only included cases diagnosed in 2010 onward, the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) Program's rules for counting multiple primary cancers were used.

Survival analyses were performed using SEER*Stat software (version 8.3.8).⁽⁶⁾ Expected survival was derived using the Ederer II approach⁽¹³⁾ from provincial life tables produced by Statistics Canada. Life tables currently available for calculating expected survival may not completely reflect all factors contributing to variation in all-cause mortality, such as smoking. This possible gap should be taken into account when interpreting the estimates.

Relative survival ratios were estimated by different methods according to the availability of follow-up data. When complete follow-up data after diagnosis were available, the cohort method was used to estimate relative survival ratios (e.g., at least 5 years of follow-up to estimate a 5-year relative survival ratio). For recently diagnosed cases that did not have complete follow-up data available, the estimates were computed using the period method. Period analysis uses the survival experience of people in a recent interval to estimate survival.⁽¹⁴⁾ The period method allows for more up-to-date estimates because it means the analysis does not have to wait for data on the full follow-up period (e.g., 5 years for a 5-year ratio). Comparisons between cohort and period relative survival ratios should be interpreted with caution because of the 2 different methods used to derive the respective relative survival ratios.

Relative survival ratios were age-standardized by weighting with the International Cancer Survival Standard weights.⁽¹⁵⁾ See Table A.9 for details on weightings.

Table A.9 International Cancer Survival Standards used for standardizing relative survival ratios, by cancer type and age group

AGE GROUPS (YEARS)	WEIGHTINGS	CANCER TYPES
15 to 44, 45 to 54, 55 to 64, 65 to 74, 75 to 99	60, 10, 10, 10, 10	Testis, Hodgkin lymphoma, acute lymphatic leukemia
15 to 44, 45 to 54, 55 to 64, 65 to 74, 75 to 99	28, 17, 21, 20, 14	Nasopharynx, soft tissues, melanoma, cervix uteri, brain, thyroid gland, bone
15 to 44, 45 to 54, 55 to 64, 65 to 74, 75 to 99	7, 12, 23, 29, 29	All other cancer types except prostate
15 to 54, 55 to 64, 65 to 74, 75 to 84, 85 to 99	19, 23, 29, 23, 6	Prostate

For children ages 0 to 14, 5-year overall survival proportions were estimated based on first primary cancers diagnosed from 1990 to 2019. This means that only the first occurrence of cancer per child in a specific time period was included in the childhood cancer survival analyses. Overall survival is an estimate of the probability of surviving all causes of death for a specified interval following a diagnosis of cancer. Unlike relative survival ratios, overall survival proportions do not adjust for the expected survival of the general population in Ontario of the same age and sex during the same period. Overall survival proportions were calculated using the cohort method when complete follow-up data were available (for cases diagnosed historically from 1990 to 2014) and the period method when complete follow-up data were not available (for cases more recently diagnosed from 2015 to 2019). People with cancer were followed until date of death or December 31, 2019 (whichever occurred first).

PREVALENCE

Prevalence analyses were performed using SEER*Stat software (version 8.3.8).⁽⁶⁾ This report provides person-

based limited-duration prevalence, which is the number of people diagnosed with cancer over a specific period (e.g., 2 years, 5 years or 10 years) who were still alive on the index date. This report also provides the crude prevalence proportion per 100,000, which is the number of people alive with a past cancer diagnosis for every 100,000 people in the general population as of the index date. The chosen index date was January 1, 2019, and therefore representing people with cancer who were still alive at the end of 2018.

Only the first primary cancer was included in the prevalence count for all cancers combined, but for individual cancer types, all cases of a given cancer type per person were counted. For example, someone with a first primary of prostate cancer and a second primary of colorectal cancer would be included once in the prevalence count for all cancers, but twice in the individual cancer type counts (i.e., once in the prostate prevalence count and once in the colorectal prevalence count).

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Ontario Cancer Statistics 2022

Glossary

Age-standardized incidence rate (ASIR): A weighted average (based on a standard population) of the number of new cases of cancer per 100,000 people in a 5-year age group (0 to 4, 5 to 9 ... 85 and older) diagnosed during a year divided by the total number of people in that age group in that year. An age-standardized rate gives the rate that would occur if the population of interest had the same age distribution as a given standard population. In this report, the standard population is the 2011 Canadian Standard population.

Age-standardized mortality rate (ASMR): A weighted average (based on a standard population) of the number of deaths from cancer per 100,000 people in a 5-year age group (0 to 4, 5 to 9 ... 85 and older) that occurred during a year divided by the number of people in that age group in that year. An age-standardized rate gives the rate that would occur if the population of interest had the same age distribution as a given standard population. In this report, the standard population is the 2011 Canadian Standard population.

Annual percent change (APC): A measure to assess the rate of change over time of a rate (e.g., incidence or mortality rate). It represents the percentage increase or decrease per year in a specified time interval.

Average annual percent change (AAPC): Represents the weighted average of the annual percent changes, where the weight is the length (i.e., number of years) of the APC interval.

Cancer incidence: The number of new cancer cases diagnosed during a specific period in a population.

Cancer mortality: The number of deaths from cancer during a specific period in a population.

Cancer prevalence: The number of people newly diagnosed with cancer, as well as people previously diagnosed with cancer and who are still alive.

Canproj: A statistical cancer projection method based on age, period and/or cohort statistical modelling.

Complete prevalence: The number of people alive on a certain date (called an index date) who were diagnosed with cancer, regardless of when their diagnoses were made.

Conditional survival: The probability of surviving a certain number of years, given that someone has already survived "x" years after their diagnosis. In this report, 5-year conditional survival looks at the chance of surviving at least 5 years, given that someone has already survived 1, 2, 3 or 4 years after their initial diagnosis.

Death certificate only (DCO): Cases that only have a death certificate as their data source. These cases are excluded from survival analyses.

International Cancer Survival Standards (ICSS): An internationally accepted population weighting method for age standardizing survival ratios.

International Classification of Childhood Cancer (ICCC): A diagnostic classification scheme for childhood cancer based on tumour morphology and primary site that has a greater emphasis on morphology than the

classification of cancers for adults.

International Classification of Diseases for Oncology (ICD-0): An international standard for classifying a cancer using a topographical code, which describes the anatomical site of origin (or organ system) of the tumour, and a morphological code, which describes the cell type (or histology) of the tumour and the behaviour (malignant or benign).

Lead-time bias: The length of time between the early detection of cancer and the time of its usual clinical presentation and diagnosis.

Lifetime probability (of developing or dying from cancer): The chance someone has over the course of their lifetime (from birth to death) of being diagnosed with or dying from cancer.

Limited-duration prevalence: Describes the number of people alive on a certain date (called the index date) who were diagnosed with cancer within a specified number of years (e.g., 2 years, 5 years, 10 years, 30 years).

Look-back period: Describes how far back in time the prevalence is estimated for in limited-duration prevalence. For example, a 15-year limited-duration prevalence in 2018 has a 15-year look-back period, and considers people diagnosed from 2003 to 2018 and still alive in 2018.

Median age (at diagnosis): Age at which half of the cancer cases reported are older and half are younger.

Microscopically confirmed: Percentage of cases that were diagnosed on the basis of microscopic verification of a tissue specimen, including histologically confirmed cases, cases diagnosed on the basis of cytology specimens and cases of leukemia diagnosed on the basis of hematological examination.

Most common cancers: In this report, the 4 most commonly diagnosed cancers in Ontario are breast, prostate, lung and colorectal.

Multiple primary and histology coding rules: A set of rules that guide and standardize the process of determining the number of primary cancers. The histology rules contain detailed histology coding instructions for cancer registrars.

Overall survival proportion: An estimate of the probability of surviving all causes of death for a specified time interval (e.g., 5 years) following diagnosis of cancer. May also be referred to as observed survival.

Population aging: An increasing proportion of people age 65 and older in the population.

Prevalence and Incidence Analysis Model (PIAMOD): A statistical method that can be used for estimating and projecting prevalence statistics from cancer registry incidence and survival data ().

Prevalence proportion: The number of people alive who have had a cancer diagnosis for every 100,000 people in the general population as of the index date.

Primary cancer: The original, or first, tumour in the body. Cancer cells from a primary cancer may spread to other parts of the body and form new, or secondary, tumours.

Prognosis: The probable outcome or course of cancer.

Projection: An estimate or forecast of future cancer incidence, mortality or prevalence based on current and historical data.

Recurrence: The reappearance of cancer at the same site or in another location after remission.

Relative change (in projected rates): The difference in projected rates of 2 periods compared to the rate in the earlier period expressed as a percentage (i.e., [rate in period 2 minus rate in period 1] divided by rate in period 1).

Relative survival ratio (RSR): The proportion of people surviving for a certain amount of time (e.g., 5 years) compared with the expected survival of similar people (based on age, sex and time) in the general population.

Solid tumour coding rules: The new multiple primary and histology (MPH) rules that replaced the 2007 Surveillance, Epidemiology and End Results multiple primary and histology coding rules. They are used for cases diagnosed from 2018 onward in the Ontario Cancer Registry. Stage at diagnosis: Refers to how much a cancer has spread at the time of diagnosis.

Stage at diagnosis: Refers to how much a cancer has spread at the time of diagnosis.

Standard population: The age distribution used as weights to create age-standardized (i.e., age-adjusted)

statistics.

Subsite: An anatomical part of a body site, such as an organ.

Subtype: The histological type of a cancer.

TNM classification of malignant tumours: The recognized standard for classifying how much a cancer has spread.