Canadian Cancer Statistics

2019

Government of Canada / Gouvernement du Canada

Canadian Cancer Society / Société canadienne du cancer

Produced by the Canadian Cancer Society, Statistics Canada, the Public Health Agency of Canada, in collaboration with the provincial and territorial cancer registries

cancer.ca/statistics

Citation
Material appearing in this publication may be reproduced or copied without permission. The following citation is recommended: Canadian Cancer Statistics Advisory Committee. *Canadian Cancer Statistics 2019.* Toronto, ON: Canadian Cancer Society; 2019. Available at: cancer.ca/Canadian-Cancer-Statistics-2019-EN (accessed [date]).

September 2019

ISSN 0835-2976

This publication is available in English and French on the Canadian Cancer Society's website at cancer.ca/statistics. Visit the website for the most up-to-date version of this publication and additional resources, such as figures from the chapters and an archive of previous editions.

The development of this publication over the years has benefited considerably from the comments and suggestions of readers. The Canadian Cancer Statistics Advisory Committee appreciates and welcomes such comments. To offer ideas on how the publication can be improved or to be notified about future publications, complete the evaluation form or email stats@cancer.ca.

Members of the Canadian Cancer Statistics Advisory Committee

Leah Smith, PhD (Co-chair)
Canadian Cancer Society, St. John's, Newfoundland and Labrador

Ryan Woods, PhD (Co-chair)
Population Oncology, BC Cancer, Vancouver, British Columbia

Darren Brenner, PhD
Departments of Oncology and Community Health Sciences, University of Calgary, Calgary, Alberta

Shirley Bryan, PhD
Centre for Population Health Data, Statistics Canada, Ottawa, Ontario

Cheryl Louzado, MSc, MHSc
Data Integration and Linkage, Canadian Partnership Against Cancer, Toronto, Ontario

Amanda Shaw, MSc
Centre for Surveillance and Applied Research, Public Health Agency of Canada, Ottawa, Ontario

Donna Turner, PhD
CancerCare Manitoba, Winnipeg, Manitoba

Hannah K. Weir, PhD
Division of Cancer Prevention and Control, Centers for Disease Control and Prevention, Atlanta, Georgia

Analytic leads

Alain Demers, PhD
Centre for Surveillance and Applied Research, Public Health Agency of Canada, Ottawa, Ontario

Larry Ellison, MSc
Centre for Population Health Data, Statistics Canada, Ottawa, Ontario

Project management

Monika Dixon
Canadian Cancer Society, Toronto, Ontario

Acknowledgments

The following individuals are acknowledged for their assistance in the development of this publication:

Jean-Michel Billette, Statistics Canada

Jennifer Chadder, Canadian Partnership Against Cancer

Rami Rahal, Canadian Partnership Against Cancer

Megan Striha, Statistics Canada

Tracy Torchetti, Canadian Cancer Society

Dianne Zakaria, Public Health Agency of Canada

Table of Contents

Chapter 4
Cancer in Context: The cancer burden in Canada

APPENDIX I
Related resources

APPENDIX II
Data sources and methods

Executive summary

Canadian Cancer Statistics is a publication that provides comprehensive, up-to-date estimates of the cancer burden in Canada.

It is estimated that about 1 in 2 Canadians will develop cancer in their lifetime, and about 1 in 4 Canadians will die of cancer. In 2019 alone, it is estimated that 220,400 Canadians will be diagnosed with cancer and 82,100 will die from the disease.

Lung and bronchus (lung), breast, colorectal and prostate cancers account for almost half of all new cancer cases diagnosed. Lung cancer is the leading cause of cancer death, responsible for more cancer deaths among Canadians than the other three major cancer types combined. Despite this large impact, there has been a substantial drop in the lung cancer death rate in males over the past 30 years, which has contributed to a decline in the death rate in males for all cancers combined. This publication shows that lung cancer death rates in females have also recently started to decrease. As a result of the progress made with lung and other cancers, cancer death rates have decreased more than 35% in males and 20% in females since their peak in 1988.

Cancer survival has also increased. In the early 1990s, five-year net survival was only 55%, but current estimates show that it has reached 63%. Survival varies widely by the type of cancer. Some cancers have very high five-year net survival, including thyroid cancer (98%) and testicular cancer (97%). Other cancers have

consistently low five-year net survival, such as esophageal cancer (15%) and pancreatic cancer (8%).

Cancer strikes males and females, young and old, and those in different regions across Canada on a decidedly uneven basis. For example:

- Males are more likely to be diagnosed with cancer than females, and females are more likely to survive cancer than males.
- About 90% of cancer diagnoses occur among Canadians who are at least 50 years of age, but its impact at a younger age can be particularly devastating. In 2016, cancer was the leading cause of disease-related death in children under the age of 15 years.[1]
- Across Canada, cancer incidence and death rates are generally higher in the east than in the west.

Measures of the cancer burden in Canada are vital for developing and evaluating health policy, helping decision-makers assess the type and amount of health resources needed and informing health research priorities. This information is also essential for informing and evaluating primary and secondary cancer prevention activities and assessing the impact of early detection and cancer treatment on cancer outcomes. Moreover, these statistics can be used to prioritize services to help Canadians and their families who have been affected by cancer and who may need support after their treatment has ended.

We hope that our readers think critically about what these numbers mean and how they can be used to reduce cancer incidence, improve survival and develop better overall care for those dealing with cancer in Canada.

Notable new statistics

Compared with the last full Canadian Cancer Statistics publication in 2017, several new patterns have emerged. Notably:

- Lung cancer incidence and death rates in females are now decreasing.
- Female breast cancer death rates have decreased an estimated 48% since they peaked in 1986.
- Pancreatic cancer is expected to be the third leading cause of cancer death in Canada in 2019, surpassing breast cancer.
- Some of the biggest increases in survival since the early 1990s were for blood-related cancers.

Reference

1. Statistics Canada [Internet]. Table 13-10-0394-01. Leading causes of death, total population by age group. Available at: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310039401 (accessed March 2019).

About this publication

Canadian Cancer Statistics 2019 is the most recent in a series of publications that began in 1987 to describe the burden of cancer in Canada. It was developed through a partnership between the Canadian Cancer Society, the Public Health Agency of Canada and Statistics Canada, who brought together expertise from across the cancer surveillance and epidemiology community in the form of the Canadian Cancer Statistics Advisory Committee.

Purpose and intended audience

This publication provides the most current summary of key surveillance indicators in Canada. It includes detailed information on incidence, mortality, survival and other measures of cancer burden for the most common types of cancer in Canada. This information is presented by sex, age group, geographic region and time period.

These statistics are produced using the Canadian Cancer Registry (CCR),[1] one of the highest quality national population-based cancer registry systems in the world,[2] as well as the national Vital Statistics—Death Database (CVSD),[3] a census of all deaths occurring in Canada each year. Such comprehensive and reliable surveillance information allows us to monitor cancer patterns and identify where progress has been made and where there is more to do. It is also important for cancer control planning, healthcare resource allocation and research. Box 1 describes some of the ways in which the specific types of statistics in this publication can be used.

Box 1 How these statistics can be used

Cancer cases (incidence): Useful for determining the amount of diagnosis, treatment and support services needed.

Age-standardized incidence rates (ASIR): Facilitate comparisons across populations and over time; can reflect changes in risk factors and show where progress is being made (or not) in cancer prevention and screening.

Cancer deaths (mortality): Useful for determining the amount of healthcare and support services needed, particularly for those who are at the end of life.

Age-standardized mortality rates (ASMR): Facilitate comparisons across populations and over time; can reflect changes in incidence rates, show where progress is being made in early detection, diagnosis and treatment and indicate where more progress is needed.

Annual percent change (APC): Useful for examining trends in age-standardized incidence and mortality rates over time.

Net survival: Facilitate comparisons across populations and over time; useful for monitoring the effects of early detection, diagnosis and treatment on cancer outcomes.

Notably, this publication is the only source of national estimates of cancer incidence and mortality projected to the current year (2019). While projected estimates must be interpreted with caution (Box 2), they provide a more up-to-date picture of the cancer burden in Canada than would otherwise be available, which is important for planning health services and allocating resources.

This publication is designed to help health professionals, policy-makers and researchers make decisions and identify priorities for action in their respective areas. However, the information contained in this publication is relevant to a much broader audience. As such, the media, educators and members of the public with an interest in cancer may also find this publication valuable.

What is new or noteworthy?

Continuous efforts are made to ensure this publication best serves the needs of the cancer community and is based on the most up-to-date data and most appropriate methodology available. To that end, many updates were made this year. Two are particularly noteworthy.

1. New publication strategy

In 2018, more than 650 stakeholders were engaged to inform the future of *Canadian Cancer Statistics*. Based on the consultations, a new publication strategy was developed that puts the work on an alternating cycle, whereby a full publication is produced on a biennial basis and complementary products are produced every other year. More specifically:

- Starting with this 2019 publication and every second year thereafter, a full *Canadian Cancer Statistics* publication will be released. It will include detailed statistics on incidence, mortality and survival by sex, age group, geographic region and time period for the most commonly diagnosed cancers in Canada.
- Every other year (2020, 2022, etc.), a *Canadian Cancer Statistics* snapshot publication will be released. It will include current-year projected estimates of incidence and mortality by sex and geographic region for the most commonly diagnosed cancers in Canada. Separately, a special report on a topic of particular interest to the cancer community will also be released (analogous to the "special topics" previously produced).

All types of *Canadian Cancer Statistics* publications are being formatted to better suit the needs of our audience, so readers may notice changes from previous publications. For example, the amount of text in this edition is considerably shorter than the text in the 2017 edition.

Box 2 Projecting the cancer burden to 2019

This publication strives to provide the most up-to-date statistics. However, because time is required for reporting, collating, verifying, analyzing and publishing surveillance data, the most recent data available are several years behind the publication year. For this publication, actual cancer and death data up to 2015 were used (except Quebec, where cancer data were available to 2010). These historical data were used to project cancer incidence and cancer deaths to 2019.

It is important to note that projected estimates are not expected to be exact predictions. They are used to give an indication of what might be expected if the analytic assumptions were to hold true over the projected time frame based on the best available data.

2. Updated survival statistics

Since the 2013 edition, estimates of cancer survival have been based on data to 2008. The recent linkage of incidence and death data to 2014 by Statistics Canada has provided the opportunity to examine more recent trends in cancer survival in Canada. These updated survival statistics are presented in detail in *Chapter 3*.

References

1. Statistics Canada [Internet]. Canadian Cancer Registry (CCR). Ottawa, ON: Statistics Canada; 2019. Available at: http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3207 (accessed March 2019).
2. International Agency for Research on Cancer [Internet]. Cancer Registries: Why, what and how? Geneva, Switzerland: Union for International Cancer Control. Available at: https://www.uicc.org/sites/main/files/atoms/files/UICC%20Cancer%20Registries-%20why%20what%20how.pdf (accessed March 2019).
3. Statistics Canada [Internet]. Vital Statistics—Death Database (CVS: D). Ottawa: ON; 2018. Available at: http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3233 (accessed March 2019).

Chapter 1

How many people get cancer in Canada?

Incidence by sex, age, geography and year

The number and rate of new cases of cancer diagnosed each year (incidence) and over time are important measures of the cancer burden on the Canadian population and healthcare system. This information is essential for ensuring that adequate screening, diagnosis, treatment and support services are available, as well as for directing future cancer prevention, control and research programs.

This chapter examines incidence by sex, age and geographic region, as well as over time, to better understand who is affected by cancer in Canada and what can be done about it.

Key findings

- It is estimated that nearly 1 in 2 Canadians will be diagnosed with cancer in their lifetime.
- An estimated 220,400 new cases of cancer are expected to be diagnosed in Canada in 2019. The number of cases expected in males (113,000) is slightly higher than in females (107,400).
- In 2019, breast cancer is expected to surpass colorectal cancer and become the second most commonly diagnosed cancer.
- Lung and bronchus (lung), breast, colorectal and prostate cancers are expected to remain the most commonly diagnosed cancers, accounting for 48% of all cancers diagnosed in 2019.
- The number of cancer cases diagnosed each year has been increasing because of the growing and aging population. When the effect of age and population size are removed, the risk of cancer has been decreasing.
- The risk of cancer increases substantially with age. It is expected that 90% of new cancer cases will be diagnosed in Canadians 50 years of age and older.
- In general, cancer incidence rates are lower in the western provinces and the territories, and higher in the central and eastern provinces. Newfoundland and Labrador is expected to have the highest rate in Canada.

Probability of developing cancer

The probability of developing a specific type of cancer depends on many factors, including age, sex, risk factors and life expectancy. This probability reflects the average experience of people in Canada and does not take into account individual behaviours and risk factors; therefore, it should not be interpreted as an individual's risk. The numbers presented in this section reflect the likelihood at birth that Canadians will develop cancer at some point during their lifetime.

- Nearly 1 in 2 Canadians is expected to be diagnosed with cancer in their lifetime (Figure 1.1).
- The probability of developing cancer remains slightly higher in males (45%) than females (43%).

As shown in Table 1.1, the probability of developing cancer varies by cancer type.

- Canadians are more likely to be diagnosed with lung cancer than any other cancer. An estimated 1 in 15 Canadians are expected to be diagnosed with lung cancer in their lifetime.
- 1 in 9 males is expected to be diagnosed with prostate cancer in their lifetime.
- 1 in 8 females is expected to be diagnosed with breast cancer in their lifetime.

FIGURE 1.1 Lifetime probability of developing cancer, Canada (excluding Quebec), 2015

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada
Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

Probability

The chance of developing cancer measured over a defined period of time. The probability of developing cancer is expressed as a percentage or as a chance (e.g., 20% or 1 in 5 people over a lifetime).

Estimated new cancer cases in 2019

The cancer incidence data used for this publication were from 1984 to 2015 (1984 to 2010 for Quebec). These were the most recent data available when the analyses began. The data were used to project rates and counts to 2019.

An estimated 220,400 new cases of cancer are expected to be diagnosed in Canada in 2019 (Table 1.2).

- Lung cancer is the most commonly diagnosed cancer in Canada with an estimated 29,300 cases expected in 2019. It is followed by breast cancer (27,200), colorectal cancer (26,300) and prostate cancer (22,900).
- The four most commonly diagnosed cancers are expected to account for about half (48%) of all cancers diagnosed in in 2019.

Every hour in 2019, 25 Canadians are expected to be diagnosed with cancer.

Incidence by sex

Cancer affects males and females differently. This may be the result of biological differences, or differences in risk factors or health behaviours. In general, cancer is more commonly diagnosed in males than females (Table 1.2).

- Slightly more males (113,000) than females (107,400) are expected to be diagnosed with cancer in 2019.
- The age-standardized incidence rate (ASIR) in males (559 per 100,000) is about 14% higher than in females (490 per 100,000).
- Cancer is more commonly diagnosed in males than females for all cancer types except breast and thyroid cancers.

Figure 1.2 shows the expected distribution of cancer cases in males and females in 2019.

- In males, prostate cancer is expected to be the most commonly diagnosed cancer, accounting for about 1 in 5 (20%) of new cases. It is followed by lung cancer (13%), colorectal cancer (13%), bladder cancer (8%) and non-Hodgkin lymphoma (5%).
- In females, breast cancer is expected to be the most commonly diagnosed cancer, accounting for 1 in 4 (25%) of new cases. It is followed by lung cancer (14%), colorectal cancer (11%), uterine cancer (7%) and thyroid cancer (6%).

FIGURE 1.2 Percent distribution of projected new cancer cases, by sex, Canada, 2019

Prostate	20.3%
Lung and bronchus	13.2%
Colorectal	12.9%
Bladder	8.1%
Non-Hodgkin lymphoma	5.0%
Kidney and renal pelvis	4.2%
Melanoma	3.8%
Leukemia	3.5%
Oral	3.3%
Pancreas	2.7%
Stomach	2.3%
Liver	1.9%
Thyroid	1.9%
Multiple myeloma	1.7%
Esophagus	1.6%
Brain/CNS	1.5%
Testis	1.0%
Larynx	0.9%
Hodgkin lymphoma	0.5%
Breast	0.2%
All other cancers	9.7%

Breast	25.0%
Lung and bronchus	13.5%
Colorectal	10.9%
Uterus (body, NOS)	6.7%
Thyroid	5.7%
Non-Hodgkin lymphoma	4.1%
Melanoma	3.3%
Ovary	2.8%
Pancreas	2.6%
Leukemia	2.5%
Bladder	2.5%
Kidney and renal pelvis	2.3%
Oral	1.5%
Stomach	1.4%
Multiple myeloma	1.3%
Cervix	1.3%
Brain/CNS	1.2%
Liver	0.7%
Esophagus	0.5%
Hodgkin lymphoma	0.4%
Larynx	0.2%
All other cancers	9.6%

CNS=central nervous system, NOS=not otherwise specified

Note: The complete definition of the specific cancers included here can be found in Table A1.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

Incidence

The number of new cancer cases diagnosed in a given population during a specific period of time, often a year.

Age-standardized incidence rate (ASIR)

The number of new cases of cancer per 100,000 people, standardized to the age structure of the 2011 Canadian population. In this publication, ASIR is also referred to as "incidence rate."

Projected incidence

Actual cancer incidence data were available to 2015 for all provinces and territories except Quebec, for which data were available to 2010. These historical data were used to project cancer incidence to 2019.

The most commonly diagnosed cancer in males is prostate cancer and in females is breast cancer.

Incidence by age

Age is the most important risk factor for cancer. Figure 1.3 shows the dramatic increase in cancer rates by age.

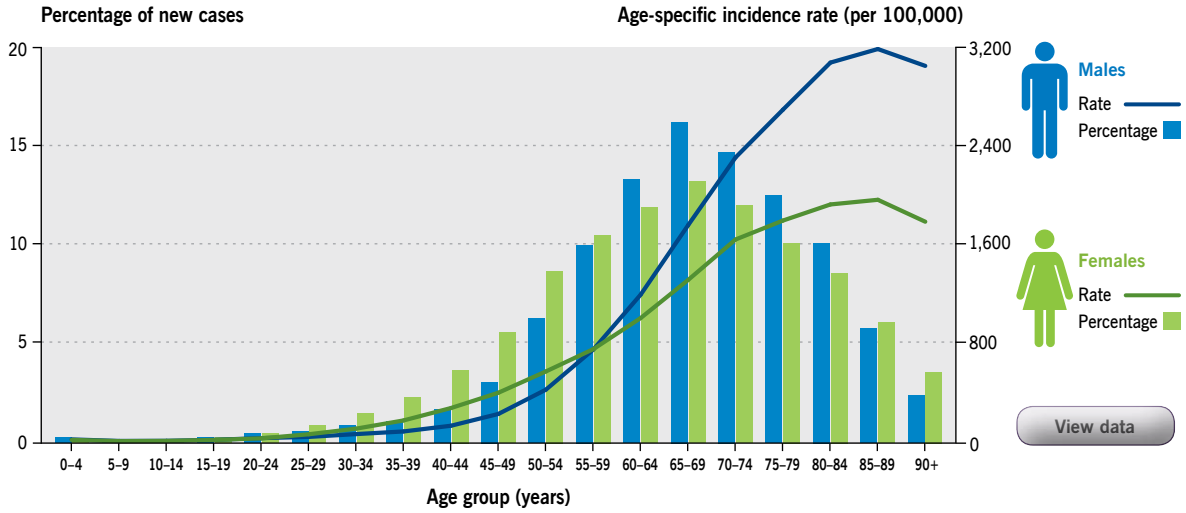
- Cancer rates peak in males aged 85 years and older and females aged 80 to 84 years.
- For both males and females, the highest number of new cancers are diagnosed between the ages of 65 and 69 years.
- Between the ages of 25 and 59 years, rates of cancer are higher in females than males. In all other age groups, rates are higher in males.

Table 1.3 shows the projected number of cases by age group in 2019.

- 9 in 10 of all cancers are expected to be diagnosed in Canadians aged 50 years and older.
- An estimated 1,000 children (aged 0 to 14 years) and 134,900 seniors (aged 65 and older) will be diagnosed with cancer.
- Almost all lung and prostate cancers (98% and 99%, respectively) are expected to occur in people 50 years of age or older.
- Over half (56%) of colorectal cancer cases are expected to occur in Canadians who fall within the age covered by the screening guidelines (50 to 74 years).[1] About 7% of colorectal cancer cases are expected to be diagnosed in people younger than 50 years of age.
- Nearly 40% of breast cancer cases are expected to be diagnosed in females aged 30 to 59, which helps to explain why overall cancer rates are higher in females than males in that age group.

The distribution of cancer type varies by age. In general, embryonal and hematopoietic cancers are more common in children, while epithelial tumours are more common in adults. Cancers found in adolescents and young adults are a mix of childhood and adult tumours.

FIGURE 1.3 Percentage of new cases and age-specific incidence rates for all cancers, by age group and sex, Canada (excluding Quebec), 2013–2015



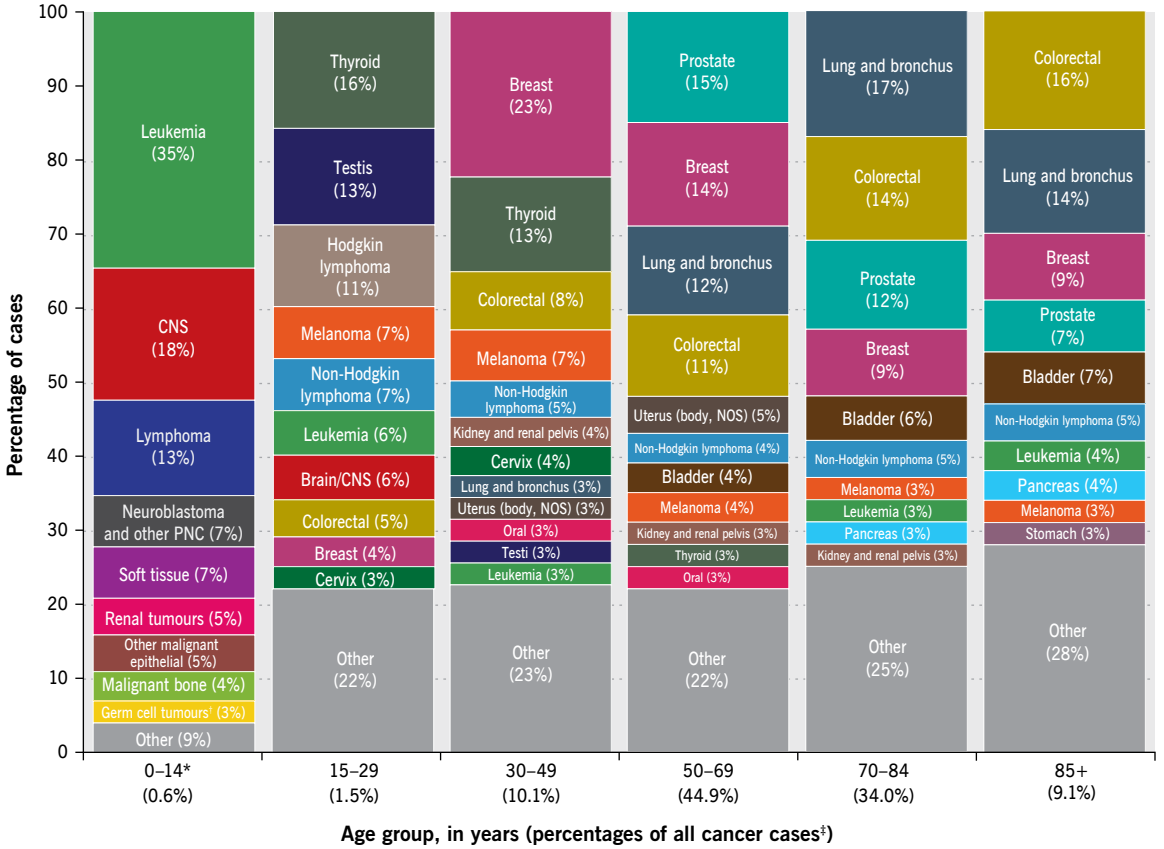
Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada
Data source: Canadian Cancer Registry database at Statistics Canada

The most commonly diagnosed cancers in each age group are shown in Figure 1.4:

- In children aged 0 to 14 years, the most commonly diagnosed cancers were leukemia (35%), followed by central nervous system cancers (18%), lymphoma (13%), neuroblastoma and other peripheral nervous cell tumours (7%) and soft tissue sarcoma (7%).
- Among youth and young adults (aged 15 to 29 years), the most commonly diagnosed cancers were thyroid (16%), testicular (13%), Hodgkin lymphoma (11%), melanoma (7%) and non-Hodgkin lymphoma (7%).
- In Canadians aged 30 to 49, the most commonly diagnosed cancers were breast (23%), thyroid (13%), colorectal (8%) and melanoma (7%).
- After age 50, lung, breast, colorectal and prostate cancers are the most commonly diagnosed cancers.

The most commonly diagnosed types of cancers vary between age groups.

FIGURE 1.4 Distribution of new cancer cases for selected cancers, by age group, Canada (excluding Quebec), 2011–2015



CNS=central nervous system; PNC=peripheral nervous cell tumours; NOS=not otherwise specified

* Adrenal gland cancers (C74) in the 0–14 year age group most likely represent neuroblastomas.

† Also includes trophoblastic tumours and neoplasms of gonads.

‡ The relative percentage is calculated based on the total number of cases over five years (2011–2015) for each age group.

Note: Cancers diagnosed in children (aged 0–14 years) were classified according to the Surveillance, Epidemiology and End Results Program (SEER) update to the International Classification of Childhood Cancer, Third Edition (ICCC-3).

Cancers diagnosed in older individuals were classified according to the International Classification of Diseases for Oncology, Third Edition (ICD-O-3). See *Appendix II: Data sources and methods* for further details.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Incidence by geographic region

Figure 1.5 shows the expected distribution of cancer across Canada in 2019. Estimates for Quebec were not included because a different projection approach was used for Quebec, meaning those rates are not comparable to the others.

- The number of expected cancer cases in each province and territory is largely a function of the expected population size. While the number of cases is important for healthcare planning within a region, age-standardized rates should be used when comparing across jurisdictions and populations.
- In general, it is estimated that cancer incidence rates for 2019 will be highest in eastern and central Canada and lowest in western Canada and the territories.
- Newfoundland and Labrador is expected to have the highest ASIR in 2019, followed by Ontario and Nova Scotia.

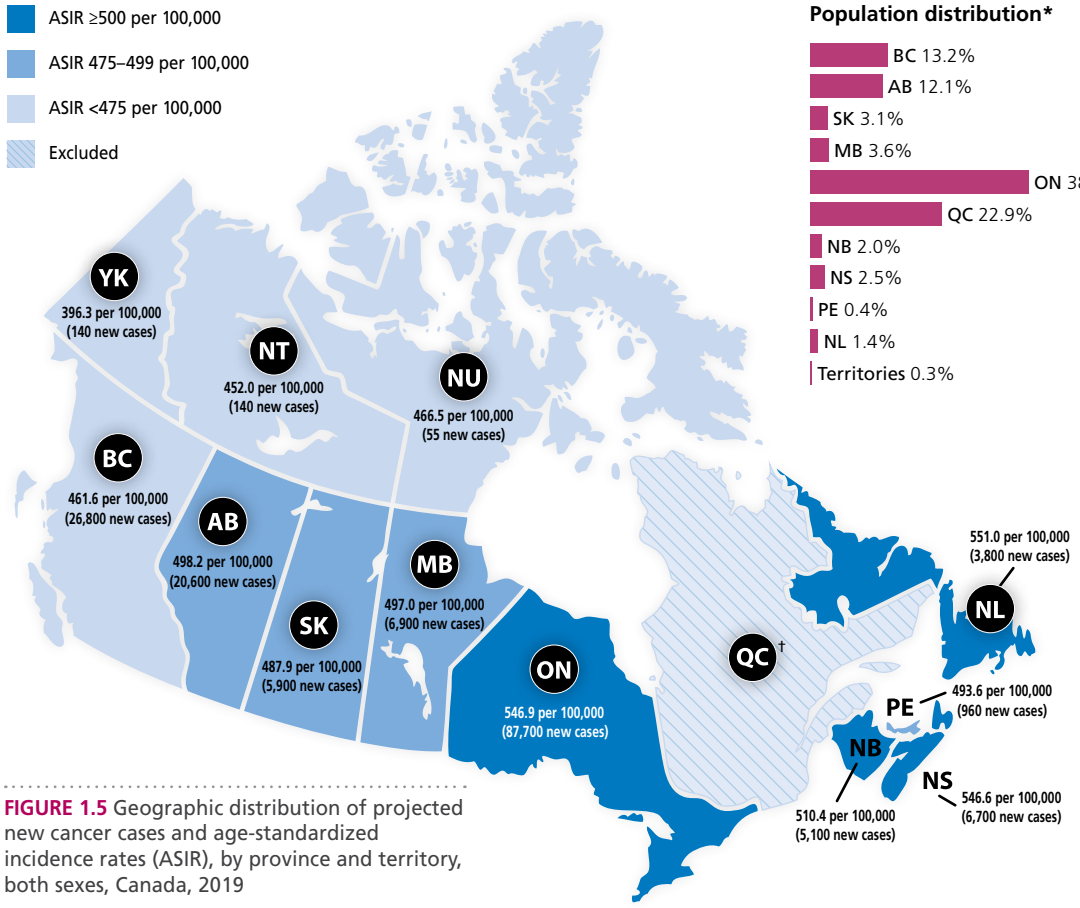


FIGURE 1.5 Geographic distribution of projected new cancer cases and age-standardized incidence rates (ASIR), by province and territory, both sexes, Canada, 2019

Tables 1.4 and 1.5 show the estimated number of new cases and estimated ASIR by cancer type for each province and territory.

- Among males and females, the highest rate of colorectal cancer was in Newfoundland and Labrador, while the highest rates of lung cancer were in the other Atlantic provinces (Nova Scotia, New Brunswick and Prince Edward Island).
- There was considerable variation in prostate cancer rates across the country, ranging from a low of 92 per 100,000 in Prince Edward Island to a high of 138 per 100,000 in Alberta.
- Rates of breast cancer in females were similar across jurisdictions, ranging from 117 per 100,000 in New Brunswick to 132 per 100,000 in Ontario.

Differences in cancer rates between provinces and territories could be the result of different risk factors (such as smoking and obesity), as well as differences in diagnostic practices and data collection. For example, the dramatic variation in prostate cancer incidence across the country is likely largely due to differences in the use of prostate-specific antigen (PSA) testing rather than differences in risk.

Importantly, these estimates do not include a measure of precision, such as confidence intervals or p-values, so we cannot determine whether the differences reported are statistically significant.

* Based on projected estimates of population size in 2019.

† Quebec was not included because a different projection method was used for Quebec than the other regions, meaning the estimates are not comparable. See *Appendix II: Data source and methods* for additional details.

Note: Rates are age-standardized to the 2011 Canadian population.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

Incidence over time

Monitoring trends in incidence over time can help identify emerging trends, where progress has been made and where more needs to be done.

Figure 1.6 shows the counts and rates for all cancers combined, by sex.

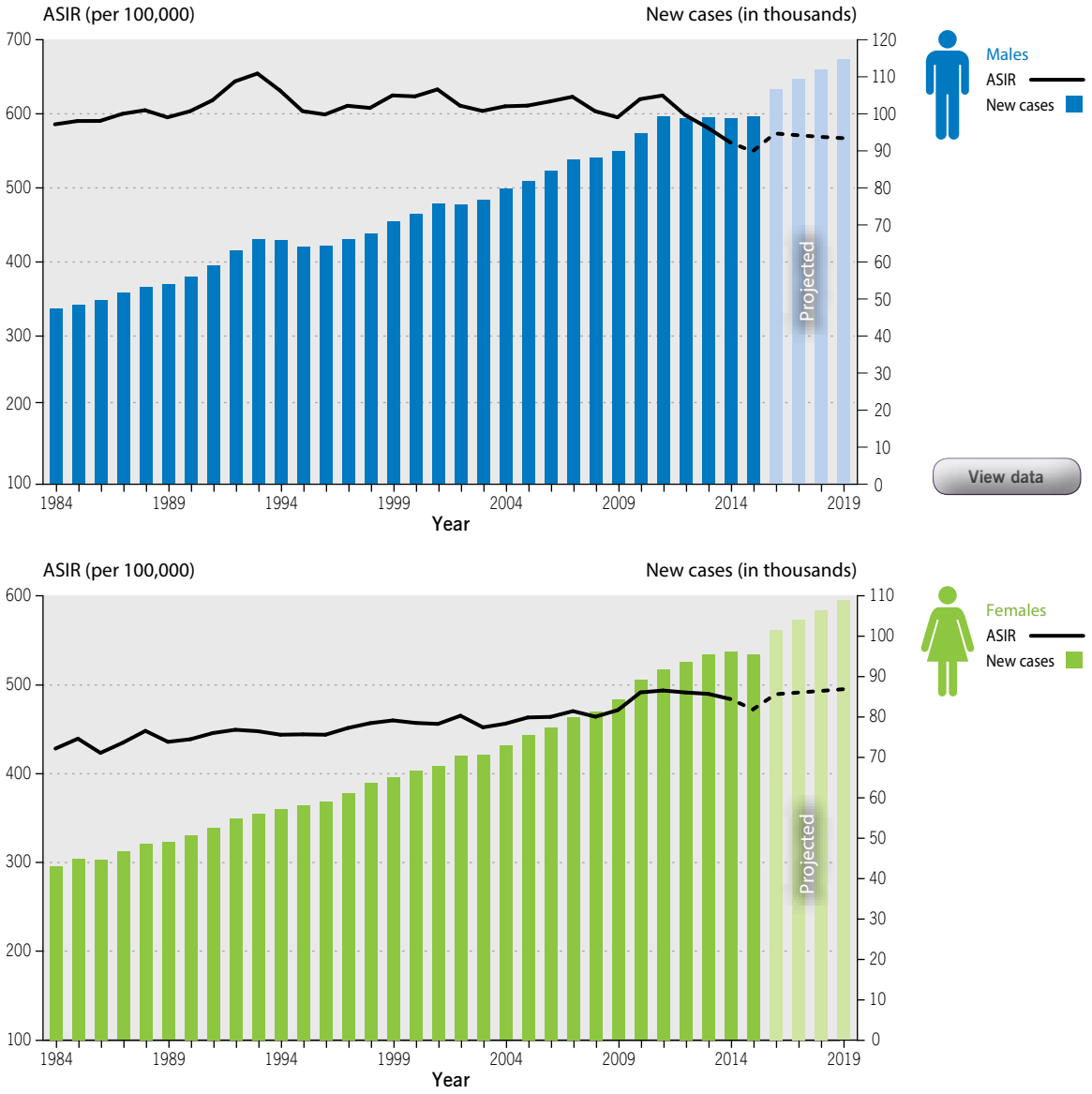
- From 1984 to 2019, the age-standardized incidence rate (ASIR) for all cancers combined decreased from 577 to an estimated 559 per 100,000 in males and increased in from 424 to an estimated 490 per 100,000 in females.
- During the same period, the number of new cases diagnosed each year rose steadily, from 46,700 to an estimated 113,000 in males, and from 42,500 to an estimated 107,400 in females. The steady increase in the number of new cases diagnosed each year is primarily due to the growing and aging Canadian population.[2,3]

Recent trends

Table 1.6 provides details on trends between 1984 and 2015 for each cancer, by sex, as measured by annual percent change (APC). Table 1.7 draws out the most recent trends for each cancer. These recent trends are depicted in Figure 1.7.

- In males, the biggest decreases were for prostate (-9.1%), lung (-3.3%), laryngeal (-2.6%), esophageal (-2.4%) and colorectal (-2.2%) cancers.

FIGURE 1.6 New cases and age-standardized incidence rates (ASIR) for all cancers, Canada, 1984–2019



Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada
Data source: Canadian Cancer Registry database at Statistics Canada

Note: Rates are age-standardized to the 2011 Canadian population. Quebec is included in the cases, but not in the rates. Actual data were available to 2015 for all provinces and territories except Quebec, for which actual data were available to 2010 and projected thereafter.

- In females, the biggest decreases were for cervical (-3.3%), laryngeal (-3.0%), colorectal (-1.9%) and lung (-1.3%) cancers (the decrease for brain/CNS was not statistically significant).
- The biggest increases in males were for thyroid (6.4%), multiple myeloma (2.6%) and melanoma (2.2%). In females, liver (2.7%) and melanoma (2.0%) increased the most.

Annual percent change (APC)

The estimated change in the age-standardized incidence rate per year over a defined period of time in which there is no significant change in trend (i.e., no changepoint). It is reported as a percentage.

Reference year

The year corresponding to the start year of the APC.

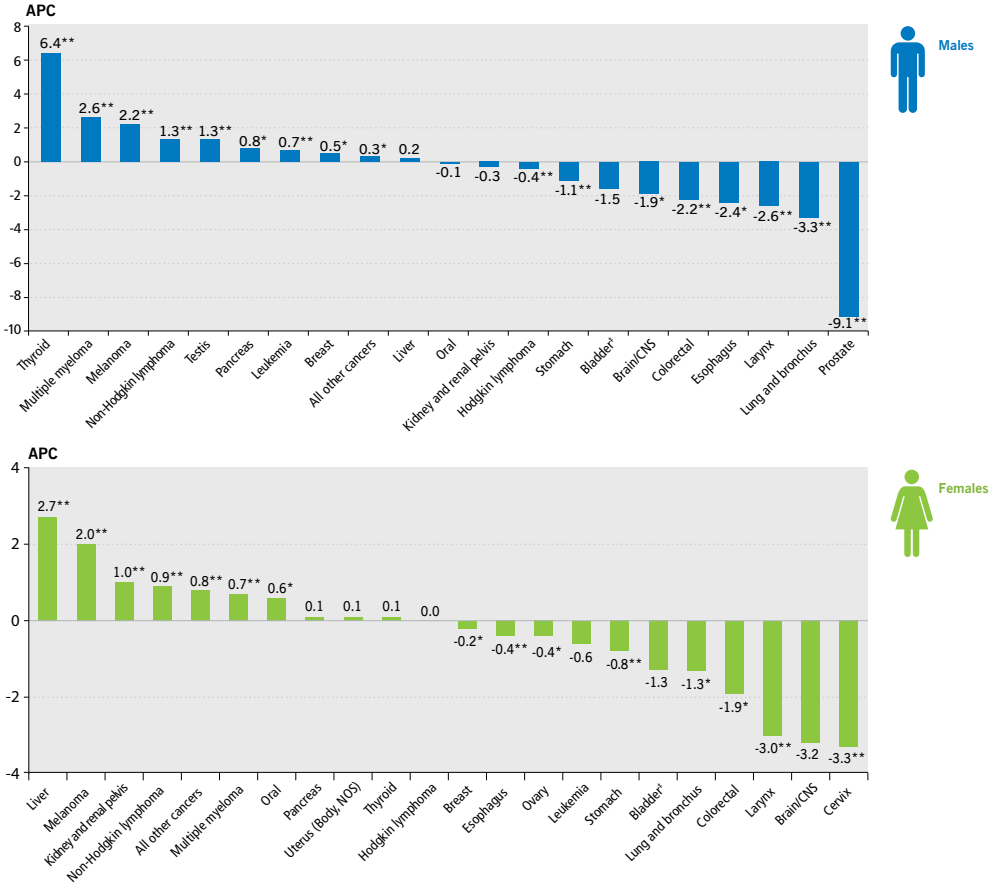
Statistical significance

Refers to a result that is unlikely due to chance given a predetermined threshold (e.g., fewer than 1 out of 20 times, which is expressed as $p<0.05$).

Confidence limits (CL)

Upper and lower values of a range that provide an indication of the precision of an estimate. Confidence limits are usually 95%, which means that, assuming no other sources of bias, one can be 95% confident the limits contain the true value for the estimate of interest.

FIGURE 1.7 Most recent annual percent change (APC)† in age-standardized incidence rates (ASIR), by sex, Canada (excluding Quebec), 1984–2015



CNS=central nervous system; NOS=not otherwise specified

* APC differs significantly from 0, $p<0.05$

** APC differs significantly from 0, $p<0.001$

† The APC was calculated using the Joinpoint Regression Program using rates from 1984–2015. If one or more significant change in the trend of rates was detected, the APC reflects the trend from the most recent significant change (reference year) to 2015. If no significant change in trend was detected, the APC reflects the trend in rates over the entire period (1984–2015). The reference year for each cancer is in Table 1.6. For further details, see *Appendix II: Data sources and methods*.

‡ The reference year of 2010 was imposed for bladder cancer to account for the artificial change in cancer counts introduced in 2010 when Ontario started to include *in situ* carcinomas of the bladder in their data collection. See *Appendix II: Data sources and methods* for further details.

Note: The range of scales differs widely between the figures.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

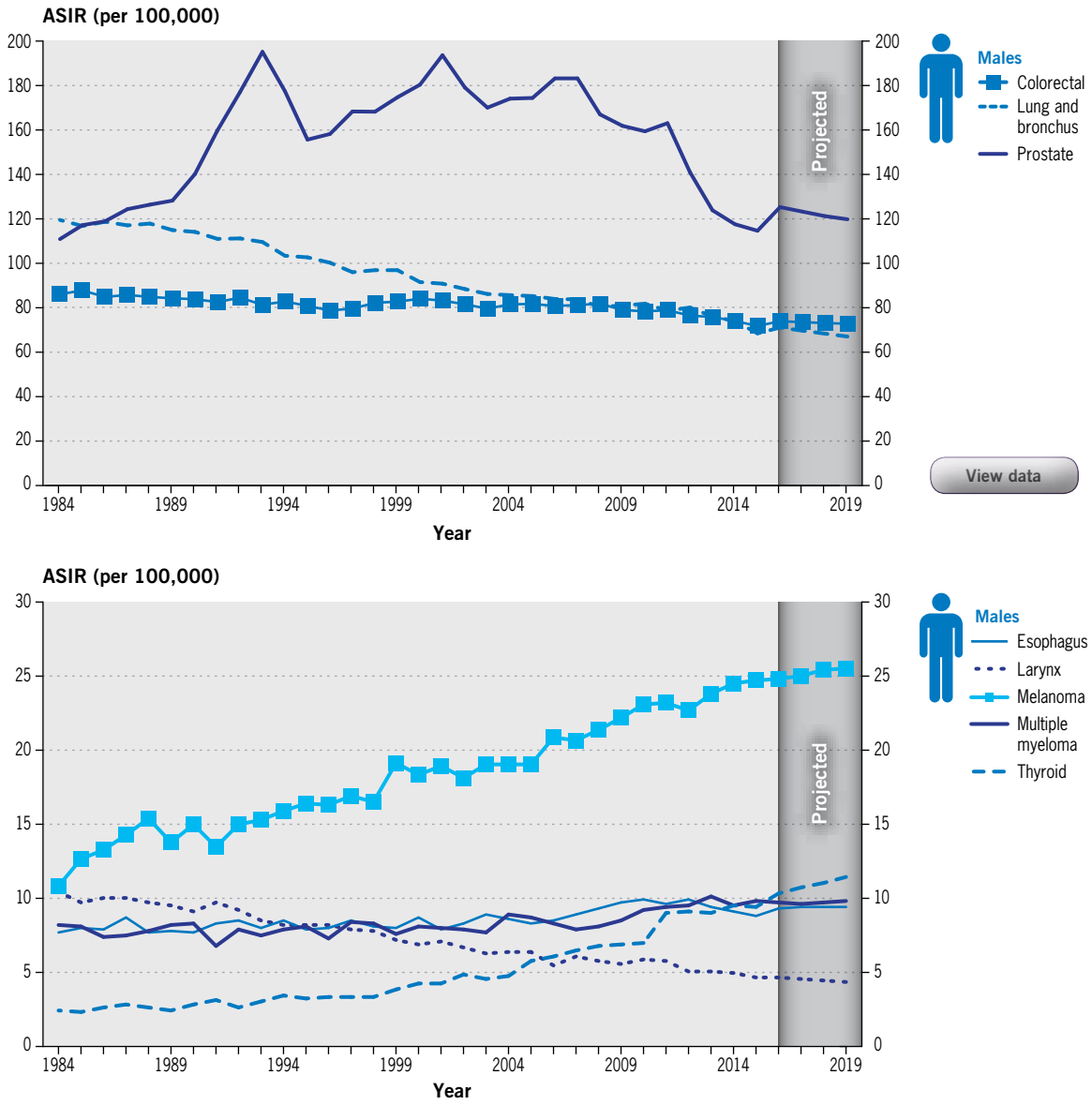
Long-term trends

Longer-term trends provide additional context for understanding the achievements and challenges in reducing cancer incidence. Table 1.6 shows trends in incidence rates between 1984 and 2015 by cancer type.

- The trend for all cancers combined in males increased slowly from 1984 to 1992 (0.9%), stabilized between 1992 and 2011 (-0.1%) and decreased after 2011 (-2.6%).
- The trend for all cancers combined in females increased slowly between 1984 and 2007 (0.3%), and then more steeply between 2007 and 2011 (1.6%). Since 2011, the rate has been decreasing in females (-0.9%).

Figures 1.8 and 1.9 show the ASIR over time (projected to 2019) for the four most common cancers in Canada (lung, female breast, colorectal and prostate) and cancers that had a statistically significant change in APC of at least 2% in the most recent trend: laryngeal and melanoma cancers in both sexes, esophageal, multiple myeloma and thyroid cancers in males, and cervical and liver cancers in females. A short discussion of trends (based on Table 1.6) for each of these notable cancers is presented below. The list does not include brain/CNS cancer in females (APC=-3.2%) because the trend was not statistically significant.

FIGURE 1.8 Age-standardized incidence rates (ASIR) for selected* cancers, males, Canada (excluding Quebec), 1984–2019



Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada
Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

* Four most frequently diagnosed cancers (both sexes combined) and cancers with a statistically significant change in incidence rate of at least 2% per year, as measured by the most recent annual percent change (see Table 1.7).

Note: Rates are age-standardized to the 2011 Canadian population. Actual incidence data were available to 2015 and projected thereafter. Quebec was excluded because actual incidence data were only available to 2010. The range of scales differs widely between the figures.

Lung and bronchus (lung) cancer

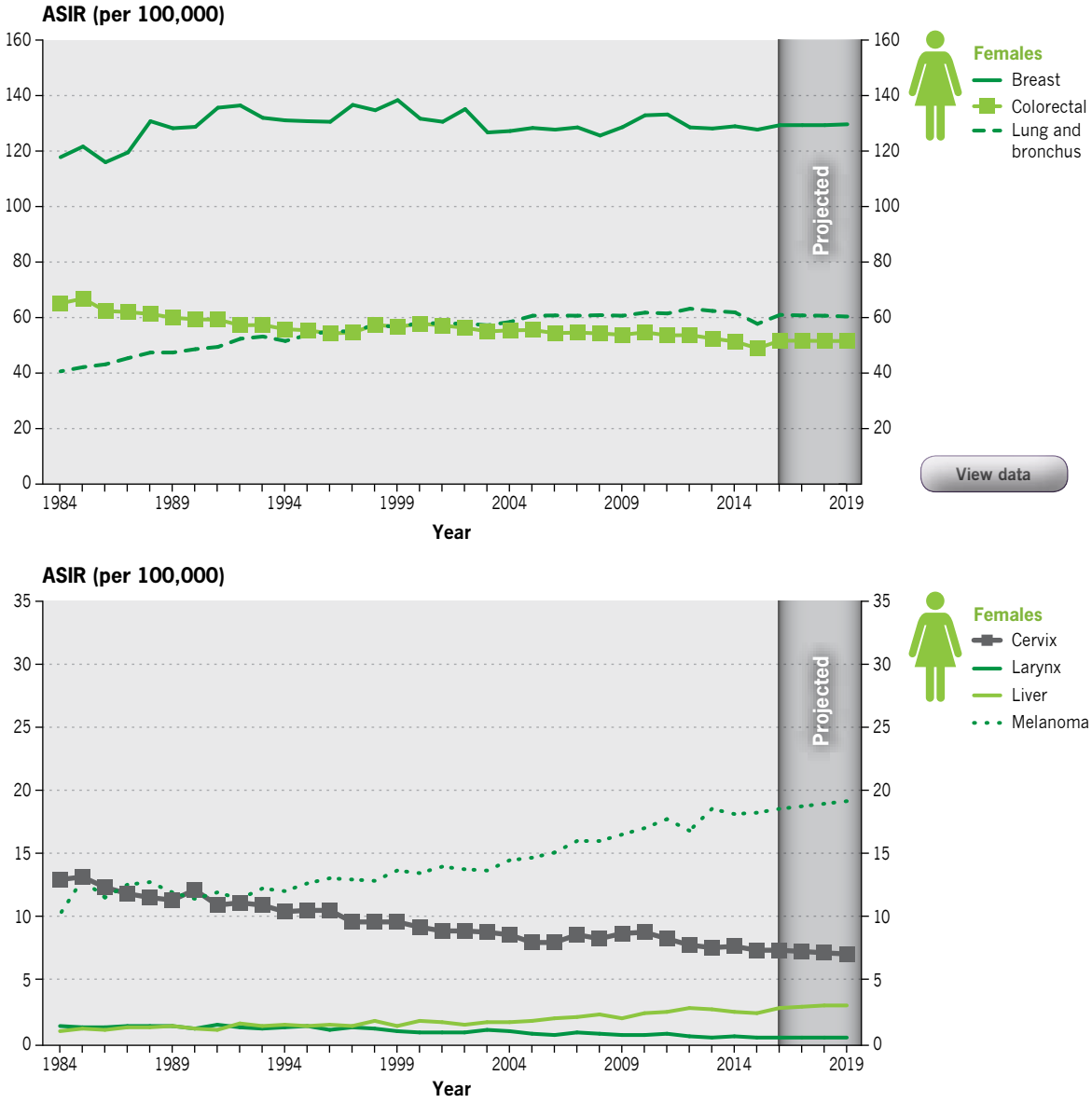
In males, the incidence rate for lung cancer was stable in the late 1980s and has been decreasing since 1990, though at different rates: steeply from 1990 to 2003 (-2.2%), then less steeply from 2003 to 2011 (-0.9%), and then more steeply after 2011 (-3.3%). In females, the lung cancer incidence rate increased significantly between 1984 and 1993 (2.9%). The increase continued, but more slowly, from 1993 to 2011 (0.9%). Starting in 2011 the lung cancer incidence rate in females started to decrease (-1.3%).

The differences in trends in lung cancer rates in males and females reflect past differences in cigarette smoking, which is the main risk factor for this cancer. In males, a decrease in the prevalence of daily smokers began in the mid-1960s in Canada, preceding the decrease in lung cancer incidence by about 20 years.[4] In females, the drop in smoking was not until the mid-1980s, and lung cancer rates have only recently started to decrease. These results are similar to those found in the United States (US).[5]

Breast cancer (female)

In Canada, the breast cancer incidence rate in females rose between 1984 and 1991 by 2.1% per year. This is attributable in part to increased opportunistic mammography screening that was done before even the first organized screening programs were implemented. After 1991, incidence rates fluctuated with peaks around

FIGURE 1.9 Age-standardized incidence rates (ASIR) for selected* cancers, females, Canada (excluding Quebec), 1984–2019



Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada
Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

* Four most frequently diagnosed cancers (both sexes combined) and cancers with a statistically significant change in incidence rate of at least 2% per year, as measured by the most recent annual percent change (see Table 1.7).

Note: Rates are age-standardized to the 2011 Canadian population. Actual incidence data were available to 2015 and projected thereafter. Quebec was excluded because actual incidence data were only available to 2010. The range of scales differs widely between the figures.

1999 and 2010. However, overall, rates have shown a small but statistically significant decline between 1991 and 2015 of -0.2% per year.

The reasons for these fluctuations are unclear. They are likely due to continued participation in mammography screening and to long-term changes in hormonal factors, such as early age at menarche, breastfeeding, late age at menopause, oral contraceptive use and late age at full-term pregnancy.[6] The slight decrease in incidence that occurred around 2002 may reflect the reduced use of hormone replacement therapy (HRT) among post-menopausal females at that time.[7,8] Recent data from the US show a moderate increase in female breast cancer rates over the last 10 years.[9]

Colorectal cancer

The incidence rates for colorectal cancer decreased between 1984 and 1996 (-0.7% in males and -1.5% in females). Incidence rates were stable for males and females from 1996 to 2000, and then declined moderately from 2000 to 2011 (-0.5% in males and females). Since 2011, colorectal cancer incidence rates have declined more steeply in males (-2.2%) and females (-1.9%).

The recent decline in colorectal cancer rates is likely due in part to increased screening for the disease, which can identify treatable precancerous polyps and reduce cancer incidence. Between 2007 and 2016, Yukon and every province in Canada (except Quebec) implemented organized colorectal cancer screening programs.[10,11] The decline in colorectal cancer incidence rates may be confined to older adults as rates are reportedly increasing among adults younger than 50 years of age in Canada and the US.[12,13]

Prostate cancer

The prostate cancer incidence rate for males increased dramatically from 1984 to 1993 (6.3%), then levelled off, started to decline after 2001 (-1.6%), and then declined more steeply after 2011 (-9.1%). The incidence rate peaked in 1993 and 2001, which mirrored intensified use of prostate-specific antigen (PSA) testing in Canada.[14] The US Preventive Services Task Force advised against PSA screening in men over 75 years of age in 2008, and then in asymptomatic men of all ages in 2011. Canada released similar guidelines in 2014.[15,16] The dramatic decline in prostate cancer following changes in PSA testing guidelines has also been reported in the US.[5,17]

Thyroid cancer

The incidence rates for thyroid cancer have increased since 1984. In males, the incidence rate increased 2.8% per year from 1984 to 1997, and then more rapidly from 1997 to 2015 (6.4%). In females, the incidence rate for thyroid cancer increased 3.8% per year from 1984 to 1998, then 11.9% per year from 1998 to 2002, and then 6.5% per year from 2002 to 2011. After 2011, the incidence rate for thyroid cancer stabilized in females. In contrast, results from the US show that the rate of thyroid cancer cases is increasing in females but is stable in males.[18,19]

It is suspected that a substantial portion of the increase in thyroid cancer incidence is due to the over-diagnosis as a result of increased use of improved diagnostic technologies such as ultrasound and fine needle aspiration.[20] Many reports have found increases primarily in small, indolent papillary cases with no concurrent increase in mortality.[21] However, recent studies also show an increase in late-stage papillary tumours, suggesting that the overall increase may not be entirely due to over-diagnosis.[22]

Melanoma

In males, the incidence rate for melanoma has increased steadily at about 2.2% per year since 1984. In females, the incidence rate for melanoma was stable from the mid-1980s to the mid-1990s, but it began increasing after 1994 (2.0%).

Exposure to ultraviolet (UV) radiation through sunlight, tanning beds and sun lamps is a well-established risk factor for melanoma.[23] Past increases in sun exposure without corresponding increases in sun safety behaviours likely accounts for the continued rise in melanoma rates.[24]

Multiple myeloma

In males, the incidence rate for multiple myeloma was stable until 2007, after which it began to increase at about 2.6% per year. In females, the rate has been increasing slowly since 1984 at about 0.6% per year. In the US, the incidence rate for multiple myeloma increased slowly (0.8%) until 2006 and has been increasing more steeply since (2.2%).[25]

The increased prevalence of obesity may be related to the increasing rate for multiple myeloma.[26,27] In addition, improved detection and case ascertainment may be influencing some of the increase in multiple myeloma cases (the rate of myeloma is relatively stable in countries with high ascertainment).[28,29]

Liver cancer

In males, the incidence rate for liver cancer increased by about 3.8% per year from 1984 to 2011, and then started to stabilize. In females, liver cancer incidence has risen consistently since 1984 (2.7%). The most common type of liver cancer, hepatocellular carcinoma (HCC), is highly prevalent in low-income countries. The increase in liver cancer in Canada may be partially

explained by rising immigration from regions of the world where HCC is common, such as parts of Asia and Africa.[27,28] The general increases in HCC are likely driven by chronic hepatitis B and C infection and increasing rates of excessive alcohol consumption, diabetes and obesity. These trends are similar to those reported in the US.[5]

Esophageal Cancer

The incidence rate for esophageal cancer increased slowly in males from 1984 to 2006 (0.3%). There was no statistically significant change until 2010 when it started to decrease rapidly (-2.4%). In females, the incidence rate has been decreasing slowly since 1984 (-0.4%). Similar trends have been found in the US: the incidence rate for males increased until 2004, and then started to decline; and the rate for females has been declining since 1997.[30,31]

Esophageal cancer is associated with risk factors like obesity, alcohol consumption and tobacco consumption.[31–35] Whereas obesity[27] and sales of alcoholic drinks[36] have been increasing in Canada, past decreases in tobacco consumption[4] may be driving the decreases observed in esophageal cancer.

Cervical cancer

The incidence rate for cervical cancer decreased in Canada from 1984 to 2006 at about -2.1% per year. It then stabilized for several years before decreasing again from 2010 to 2015 at about -3.3% per year. The decrease in the incidence rate for cervical cancer is largely a result of routine screening with Pap tests, which can find precancerous lesions that can be treated before they turn into invasive cervical cancer. Every province in Canada (except Quebec) has an organized cervical cancer screening program. Current guidelines recommend screening every two to three years starting at 21 or 25 years of age until 65 or 70 years of age.[37] In the coming years, further reductions in cervical cancer incidence are expected as the effects of human papillomavirus (HPV) vaccination are realized.[38] Similar trends in cervical cancer rates have been reported in the US and other high-income countries.[39,40]

Laryngeal cancer

The incidence rate for laryngeal cancer has been declining in males since 1984 at about -2.6% per years. In females, it has been declining since 1991 at about -3.0% per year. As cancer of the larynx is strongly associated with smoking,[41] the decreasing trend in laryngeal cancer, as well as the delayed decrease among females, likely reflects the decreasing trend in smoking rates in Canada.[42,43] These trends are similar to those found in the US.[17]

Average annual percent change (AAPC)

Table 1.6 also shows the average annual percent change (AAPC) in cancers between 1984 and 2015. By summarizing changes in trends, the AAPC enables the comparison of changes in incidence across cancers for the same defined time period. In both males and females, the greatest increases were observed for thyroid (4.9% and 5.1%, respectively) and liver (3.3% and 2.7%, respectively). The greatest decrease was in laryngeal cancer (-2.6% and -2.2%, respectively). Despite the current decrease in prostate cancer incidence, the dramatic increases and decreases since 1984 have averaged to indicate virtually no change over the three time periods (AAPC=0.1%).

Average annual percent change (AAPC)

The weighted average of the APCs in effect during a period of time, where the weights equal the proportion of time accounted for by each APC in the interval. AAPC summarizes the change in age-standardized rates over a specified interval. It is reported as a percentage.

What do these statistics mean?

Cancer strikes males and females, young and old, and those in different regions across Canada on a decidedly uneven basis. The statistics in this chapter can support informed decision-making to ensure that healthcare services meet the needs of specific populations. They can also help identify opportunities for further prevention and cancer control initiatives.

We estimate that approximately 1 in 2 Canadians will be diagnosed with cancer in their lifetime. This high number is attributable to a number of factors, including that the Canadian population is living longer. It emphasizes the need for support services for those diagnosed with cancer and their caregivers.

In 2019 alone, a projected 220,400 people in Canada will be diagnosed with cancer. An increased focus on primary prevention efforts, including vaccination and tobacco control, should be employed to minimize the risk of developing cancer. In addition, a focus on screening and early detection should be maintained to diagnose and treat these cancers at an earlier stage when treatments are more effective and more likely to be successful.

The biggest risk factor for cancer is age, and the Canadian population is aging.[44] Like many other developed countries, Canada now has a greater proportion of seniors (people who are 65 years of age or older) than at any time in the past, and seniors represent the fastest-growing age group in Canada.[45] As a result, the number of people diagnosed with cancer is increasing in Canada each year, a trend that is expected to continue until at least the early 2030s.[46] With the rising number of new cancer cases, there will be a corresponding increase in the need for screening, diagnosis, treatment and support services, including palliative care.

It is also important to recognize that the priorities of people with cancer and their needs for services can vary at different points in the age continuum. For example, females are more likely than males to be diagnosed with cancer in the prime of their lives (between the ages of 20 and 59 years), which reflects patterns for specific cancers, such as breast and thyroid. Also, less than 1% of cancers are diagnosed in children, but these cancers have a significant and lasting impact on both the individuals and their caregivers.

Cancer incidence rates vary across the country, with generally higher rates in the east and lower rates in the west. These data can help inform screening and support efforts. To better target prevention activities, these differences in rates can be correlated with the prevalence of risk factors, such as tobacco and alcohol consumption, physical inactivity and obesity rates.

The overall incidence rate for both sexes combined has not changed dramatically over the past 30 years, but trends in individual cancers tell a different story about the progress that has been made. For example, the decreases in laryngeal cancer in both sexes and lung cancer in males likely reflect the success of tobacco control. Also, the decline in cervical cancer likely reflects the success of widespread screening programs; similar signs of progress are also emerging for colorectal cancer. In contrast, there are significant increases in some cancers, such as liver, thyroid and melanoma. Strategies to mitigate these increases must be developed promptly.

Supplementary resources

Cancer.ca/statistics houses supplementary resources for this chapter. This includes:

- Excel spreadsheets with the statistics used to create the figures
- Excel spreadsheets with supplementary statistics
- PowerPoint images of the figures throughout this chapter

References

1. Canadian Task Force on Preventive Healthcare. Recommendations on screening for colorectal cancer in primary care. CMAJ. 2016;188 340–8.
2. Statistics Canada [Internet]. Age and sex, and type of dwelling data: Key results from the 2016 Census. Ottawa, ON: The Daily: Statistics Canada; 2017. Available at: https://www150.statcan.gc.ca/n1/en/daily-quotidien/170503/dq170503a-eng.pdf?st=li6F_zjZ (accessed March 2019).
3. Statistics Canada [Internet]. Population size and growth in Canada: Key results from the 2016 Census. Ottawa, ON: The Daily: Statistics Canada; 2016. Available at: https://www150.statcan.gc.ca/n1/daily-quotidien/170208/dq170208a-eng.htm (accessed March 2019).
4. Organisation for Economic Co-operation Development (OECD) [Internet]. Daily smokers (indicator); 2015. Available at: https://data.oecd.org/healthrisk/daily-smokers.htm (accessed March 2019).
5. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2018. CA Cancer J Clin. 2018;68(1): 7–30.
6. Holford TR, Cronin KA, Marriotto AB, Feuer EJ. Changing patterns in breast cancer incidence trends. J Natl Cancer Inst Monogr. 2006;36:19–25
7. De P, Neutel CI, Olivotto I, Morrison H. Breast cancer incidence and hormone replacement therapy in Canada. J Natl Cancer Inst. 2010;102(19):1489–95.
8. Neutel Ci, Morrison H. Could recent decreases in breast cancer incidence really be due to lower HRT use? Trends in attributable risk for modifiable breast cancer risk factors in Canadian women. Can J Public Health. 2010;101(5):405–9.
9. Edwards BK, Noone AM, Mariotto AB, Simard EP, Boscoe FP, Henley SJ, et al. Annual Report to the Nation on the status of cancer, 1975–2010, featuring prevalence of comorbidity and impact on survival among persons with lung, colorectal, breast, or prostate cancer. Cancer. 2014;120(9):1290–314.
10. Cancer Care Ontario [Internet]. Colorectal cancer incidence increasing among adolescents and young adults. Toronto, ON: Cancer Care Ontario; 2009. Available at: http://www.cancercare.on.ca/cancerfacts (accessed March 2019).
11. BC Cancer Agency [Internet]. Vancouver, BC: Cancer Agency; 2015. Available at: http://www.bccancer.bc.ca/statistics-and-reports-site/Documents/2018_Colorectal_inc_trend_1970_2015_20180424.pdf (accessed March 2019).
12. Austin H, Henley SJ, King J, Richardson LC, Eheman C. Changes in colorectal cancer incidence rates in young and older adults in the United States: What does it tell us about screening. Cancer Causes Control. 2014 Feb;25(2):191–201.
13. Brenner DR, Ruan Y, Shaw E, De P, Heitman SJ, Hilsden RJ. Increasing colorectal cancer incidence trends among younger adults in Canada. Prev Med. 2017 Dec;105:345–9.
14. LeBlanc AG, Demers A, Shaw A. Recent trends in prostate cancer in Canada. Health Rep. 2019 Apr; 17(30):12–17.
15. Bell N, Connor Gorber S, Shane A, Joffres M, Singh H, Dickinson J, et al. Recommendations on screening for prostate cancer with the prostate-specific antigen test. CMAJ. 2014 Nov 4;186(16):1225–34.
16. Lin K, Croswell JM, Koenig H, Lam C, Maltz A. Prostate-specific antigen-based screening for prostate cancer: An evidence update for the US Preventive Services Task Force. Rockville, MD: U.S. Preventive Services Task Force Evidence Syntheses, formerly Systematic Evidence Reviews. 2011.
17. Eheman C, Henley SJ, Ballard-Barbash R, Jacobs EJ, Schymura MJ, Noone AM, et al. Annual Report to the Nation on the status of cancer, 1975–2008, featuring cancers associated with excess weight and lack of sufficient physical activity. Cancer. 2012 May 1;118(9):2338–66.
18. Noone AM, Howlader N, Krapcho M, et al. (eds). SEER Cancer Statistics Review, 1975–2015, National Cancer Institute. Bethesda, MD. Available at: https://seer.cancer.gov/csr/1975_2016/browse_csr.php?sectionSEL=26&pageSEL=sect_26_table.02 (accessed March 2019).
19. Noone AM, Howlader N, Krapcho M, et al. (eds). SEER Cancer Statistics Review, 1975-2015, National Cancer Institute. Bethesda, MD. Available at: https://seer.cancer.gov/csr/1975_2016/browse_csr.php?sectionSEL=26&pageSEL=sect_26_table.03#a (accessed March 2019).
20. Vaccarella S, Dal Maso L, Laversanne M, Bray F, Plummer M, Franceschi S. The impact of diagnostic changes on the rise in thyroid cancer incidence: A population-based study in selected high-resource countries. Thyroid. 2015 Oct;25(10):1127–36.
21. Topstad D, Dickinson JA. Thyroid cancer incidence in Canada: A national cancer registry analysis. CMAJ Open. 2017 Aug 11;5(3):E612–6.
22. Lim H, Devesa SS, Sosa JA, Check D, Kitahara CM. Trends in thyroid cancer incidence and mortality in the United States, 1974–2013. JAMA. 2017 Apr 4;317(13):1338–48.
23. International Agency for Research on Cancer and Exposure to Artificial Ultraviolet Light. Exposure to Artificial UV Radiation and Skin Cancer. Lyon, France. Available at: http://publications.iarc.fr/Book-And-Report-Series/Iarc-Working-Group-Reports/Exposure-To-Artificial-UV-Radiation-And-Skin-Cancer-2006 (accessed March 2019).
24. National Skin Cancer Prevention Committee. Exposure to and Protection from the Sun in Canada. A Report Based on the 2006 Second National Sun Survey. Toronto, ON: Canadian Partnership Against Cancer; 2010.
25. SEER Cancer Statistics Review 1975–2018 [Internet]. Bethesda, MD: National Cancer Institute. Available at: https://seer.cancer.gov/csr/1975_2015/browse_csr.php?sectionSEL=18&pageSEL=sect_18_table.01#* (accessed March 2019).
26. Becker N. Epidemiology of multiple myeloma. Recent Results Cancer Res. 2011;183:25–35.
27. Twells LK, Gregory DM, Reddigan J, Midodzi WK. Current and predicted prevalence of obesity in Canada: a trend analysis. CMAJ Open. 2014 Mar 3;2(1):E18–26.
28. Velez R, Turesson I, Landgren O, Kristinsson SY, Cuzick J. Incidence of multiple myeloma in Great Britain, Sweden, and Malmo, Sweden: The impact of differences in case ascertainment on observed incidence trends. BMJ Open. 2016 Jan 21;6(1): e009584.
29. Andres M, Feller A, Arndt V, Group NW. Trends of incidence, mortality, and survival of multiple myeloma in Switzerland between 1994 and 2013. Cancer Epidemiol. 2018 Apr;53:105–10.
30. Noone AM, Howlader N, Krapcho M, Miller D, Brest A, Yu M, et al (eds.). SEER Cancer Statistics Review, 1975–2015. Bethesda, MD: National Cancer Institute; 2018.
31. Arnold M, Laversanne M, Brown LM, Devesa SS, Bray F. Predicting the future burden of esophageal cancer by histological subtype: International trends in incidence up to 2030. Am J Gastroenterol. 2017 Aug;112(8):1247–55.
32. Chen Z, Ren Y, Du XL, Yang J, Shen Y, Li S, et al. Incidence and survival differences in esophageal cancer among ethnic groups in the United States. Oncotarget. 2017 Jul 18;8(29):47037–51.
33. Arnold M, Soerjomataram I, Ferlay J, Forman D. Global incidence of oesophageal cancer by histological subtype in 2012. Gut. 2015 Mar;64(3):381–7.
34. Runge TM, Abrams JA, Shaheen NJ. Epidemiology of Barrett's esophagus and esophageal adenocarcinoma. Gastroenterol Clin North Am. 2015 Jun;44(2):203–31.
35. Otterstatter MC, Brierley JD, De P, Ellison LF, Macintyre M, Marrett LD, et al. Esophageal cancer in Canada: Trends according to morphology and anatomical location. Can J Gastroenterol. 2012 Oct;26(10):723–7.
36. Agriculture and Agri-Food Canada [Internet]. Consumer Trends: Wine, Beer and Spirits in Canada 2013. Available at: http://www.agr.gc.ca/resources/prod/Internet-Internet/MISB-DGSIM/ATS-SEA/PDF/6476-eng.pdf (accessed March 2019).
37. The Canadian Partnership Against Cancer [Internet]. Cervical Cancer Screening in Canada — environmental scan. Toronto, ON; 2017. Available at: https://www.canerview.ca/preventionandscreening/cervicalcancercontrolincanada/ (accessed March 2019).
38. Canadian Cancer Society's Advisory Committee on Cancer Statistics [Internet]. Canadian Cancer Statistics 2016. Toronto, ON: Canadian Cancer Society; 2016 Available at: http://www.cancer.ca/Canadian-Cancer-Statistics-2016-ENw (accessed March 2019).
39. Vaccarella S, Lortet-Tieulent J, Plummer M, Franceschi S, Bray F. Worldwide trends in cervical cancer incidence: Impact of screening against changes in disease risk factors. Eur J Cancer. 2013 Oct;49(15):3262–73.
40. Cronin KA, Lake AJ, Scott S, Sherman RL, Noone AM, Howlader N, et al. Annual Report to the Nation on the Status of Cancer, part I: National cancer statistics. Cancer. 2018 Jul;124(13):2785–800.
41. International Agency for Research on Cancer. Tobacco smoke and involuntary smoking. IARC Monogr Eval Carcinog Risks Hum. 2004;83:1–1438.
42. Statistics Canada. [Internet]. Canadian Tobacco, Alcohol and Drugs Survey (CTADS): 2013 summary. Ottawa, ON: Health Canada; 2015. Available at: http://healthycanadians.gc.ca/science-research-sciences-recherches/data-donnees/ctads-ectad/summary-sommaire-2013-eng.php (accessed March 2019).
43. Health Canada. Canadian Alcohol and Drug Use Monitoring Survey (CADUMS). Ottawa, ON: Health Canada; 2012. Available at: https://www.canada.ca/en/health-canada/services/health-concerns/drug-prevention-treatment/canadian-alcohol-drug-use-monitoring-survey.html (accessed March 2019).
44. Statistics Canada. Annual Demographic Estimates: Canada, Provinces and Territories. (Catalogue no. 91-215-X). Ottawa, ON: Statistics Canada; 2015.
45. Statistics Canada [Internet]. Seniors. Ottawa, ON; 2018. Available at: https://www150.statcan.gc.ca/n1/pub/11-402-x/2011000/chap/seniors-aines/seniors-aines-eng.htm (accessed March 2019).
46. Canadian Cancer Society's Advisory Committee on Cancer Statistics [Internet]. Canadian Cancer Statistics 2015. Toronto, ON: Canadian Cancer Society; 2015. Available at: www.cancer.ca/Canadian-Cancer-Statistics-2015-EN (accessed March 2019).

TABLE 1.1 Lifetime probability of developing cancer, Canada (excluding Quebec), 2015

	Lifetime probability of developing cancer					
	%			One in:		
	Both sexes	Males	Females	Both sexes	Males	Females
All cancers*	**43.8**	**44.9**	**43.0**	**2.3**	**2.2**	**2.3**
Lung and bronchus	6.8	7.1	6.6	15	14	15
Colorectal	6.3	7.0	5.6	16	14	18
Breast	6.2	0.1	12.1	16	880	8
Prostate	—	11.3	—	—	9	—
Bladder	2.9	4.5	1.3	35	22	75
Non-Hodgkin lymphoma	2.4	2.7	2.2	41	37	46
Melanoma	2.1	2.4	1.8	48	42	56
Leukemia	1.7	2.0	1.3	60	49	75
Kidney and renal pelvis	1.5	1.9	1.1	67	52	94
Uterus (body, NOS)	—	—	3.1	—	—	32
Thyroid	1.3	0.7	1.9	77	142	53
Pancreas	1.3	1.3	1.3	76	75	79
Oral	1.1	1.5	0.7	89	66	137
Stomach	1.0	1.4	0.7	98	74	142
Multiple myeloma	0.9	1.0	0.7	117	101	137
Brain/CNS	0.6	0.7	0.6	157	140	178
Ovary	—	—	1.3	—	—	75
Esophagus	0.6	0.9	0.3	171	116	314
Liver	0.6	0.9	0.3	168	114	322
Cervix	—	—	0.6	—	—	168
Larynx	0.3	0.4	0.1	389	228	1247
Testis	—	0.4	—	—	236	—
Hodgkin lymphoma	0.2	0.2	0.2	444	411	481

— Not applicable; CNS=central nervous system; NOS=not otherwise specified

* "All cancers" includes *in situ* bladder cancer and excludes non-melanoma skin cancer (neoplasms, NOS; epithelial neoplasms, NOS; and basal and squamous).

Note: The probability of developing cancer is calculated based on age- and sex-specific cancer incidence and mortality rates for Canada in 2015. For further details, see *Appendix II: Data sources and methods*. The complete definition of the specific cancers included here can be found in Table A1.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

TABLE 1.2 Projected new cases and age-standardized incidence rates (ASIR)* for cancers, by sex, Canada, 2019

	New cases (2019 estimates)			Cases per 100,000		
	Total†	Males	Females	Both sexes	Males	Females
All cancers‡	**220,400**	**113,000**	**107,400**	**518.8**	**559.0**	**489.5**
Lung and bronchus	29,300	14,900	14,500	62.1	66.0	59.6
Breast	27,200	230	26,900	66.8	1.2	128.0
Colorectal	26,300	14,600	11,700	60.6	71.7	50.9
Prostate	22,900	22,900	—	—	118.1	—
Bladder	11,800	9,100	2,700	25.0	42.1	10.6
Non-Hodgkin lymphoma	10,000	5,600	4,400	24.2	29.0	20.0
Thyroid	8,200	2,100	6,100	21.8	11.2	32.1
Melanoma	7,800	4,300	3,500	21.7	25.1	19.1
Kidney and renal pelvis	7,200	4,700	2,500	17.0	23.2	11.3
Uterus (body,NOS)	7,200	—	7,200	—	—	34.5
Leukemia	6,700	4,000	2,700	16.4	20.8	12.5
Pancreas	5,800	3,000	2,800	12.9	14.2	11.7
Oral	5,300	3,700	1,600	12.7	18.4	7.4
Stomach	4,100	2,600	1,450	9.3	13.1	6.1
Multiple myeloma	3,300	1,950	1,400	7.7	9.6	6.0
Brain/CNS	3,000	1,650	1,300	7.1	8.3	6.0
Ovary	3,000	—	3,000	—	—	14.2
Liver	3,000	2,200	780	6.7	10.5	3.2
Esophagus	2,300	1,800	540	5.6	9.2	2.4
Cervix	1,350	—	1,350	—	—	7.2
Larynx	1,150	980	190	2.4	4.2	0.7
Testis	1,150	1,150	—	—	6.4	—
Hodgkin lymphoma	1,000	560	440	2.6	2.9	2.3
All other cancers	21,300	11,000	10,300	47.7	53.4	43.3

— Not applicable; CNS=central nervous system; NOS=not otherwise specified

* Rates are age-standardized to the 2011 Canadian population and exclude Quebec.

† Column totals may not sum to row totals due to rounding.

‡ "All cancers" includes *in situ* bladder cancer and excludes non-melanoma skin cancer (neoplasms, NOS; epithelial neoplasms, NOS; and basal and squamous). The complete definition of the specific cancers listed here can be found in Table A1.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

TABLE 1.3 Projected new cases for the most common cancers, by age group and sex, Canada, 2019

Age	All cancers*			Lung and bronchus			Breast	Colorectal			Prostate
	Both sexes†	Males	Females	Both sexes†	Males	Females	Females	Both sexes†	Males	Females	Males
All ages	**220,500**	**113,000**	**107,400**	**29,300**	**14,900**	**14,500**	**26,900**	**26,300**	**14,600**	**11,700**	**22,900**
0–14	1,000	540	450	—	—	—	—	5	—	5	—
15–29	2,800	1,350	1,450	25	15	10	140	180	75	100	—
30–39	5,800	2,000	3,800	90	30	55	1,100	430	210	210	—
40–49	13,200	4,500	8,700	570	210	350	3,300	1,150	620	550	280
50–59	34,100	15,700	18,500	3,300	1,450	1,800	6,000	3,600	2,000	1,550	3,600
60–69	61,500	34,200	27,300	8,300	4,200	4,100	7,400	6,900	4,200	2,700	9,900
70–79	60,200	33,600	26,600	10,400	5,400	5,000	5,700	7,800	4,500	3,300	6,700
80+	41,900	21,200	20,700	6,700	3,500	3,200	3,300	6,200	2,900	3,300	2,500
50–74	129,000	68,700	60,300	17,200	8,600	8,600	16,600	14,700	8,700	6,000	17,800
65+	134,900	73,400	61,500	21,700	11,300	10,400	12,700	17,800	9,800	8,000	14,500

— Fewer than 3 cases.

* "All cancers" includes *in situ* bladder cancer and excludes non-melanoma skin cancer (neoplasms, NOS; epithelial neoplasms, NOS; and basal and squamous).

† Counts for both sexes may not sum to row totals due to rounding.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

TABLE 1.4 Projected age-standardized incidence rates (ASIR) for selected cancers, by sex and province, Canada (excluding Quebec*), 2019

	Cases per 100,000										
	CA†	BC	AB	SK	MB	ON	QC*	NB	NS	PE	NL
Males											
All cancers‡	**559.0**	**493.1**	**544.4**	**533.1**	**531.6**	**587.9**		**557.3**	**591.7**	**554.3**	**591.4**
Prostate	118.1	104.3	137.8	117.8	108.1	121.8		100.4	99.3	92.0	113.4
Colorectal	71.7	72.3	70.9	90.1	77.5	65.6		78.0	91.4	87.4	114.5
Lung and bronchus	66.0	54.4	60.1	67.4	70.0	67.5		87.3	86.7	90.9	79.8
Bladder	42.1	39.5	41.1	39.6	33.2	44.2		45.1	44.0	36.0	40.1
Non-Hodgkin lymphoma	29.0	22.4	25.5	23.9	25.4	33.1		27.2	31.5	24.0	28.7
Melanoma	25.1	22.3	19.4	15.3	20.8	28.5		21.7	33.1	36.1	21.4
Kidney and renal pelvis	23.2	19.6	21.7	24.6	24.6	23.2		29.1	30.9	21.1	33.7
Leukemia	20.8	18.6	21.6	21.4	19.4	22.4		24.8	17.7	10.5	14.6
Oral	18.4	17.1	16.6	14.6	18.4	19.7		14.7	18.9	27.8	18.1
Pancreas	14.2	14.0	14.4	16.0	15.1	14.0		16.6	15.1	14.4	10.2
Stomach	13.1	10.0	9.9	13.2	14.3	15.1		12.4	10.2	9.9	17.6
Thyroid	11.2	5.8	8.4	6.4	8.4	14.9		9.2	10.9	3.3	11.9
Liver	10.5	12.3	8.9	8.6	9.0	11.1		6.0	8.6	9.7	7.5
Multiple myeloma	9.6	7.4	9.3	9.2	8.4	11.0		8.0	8.2	9.6	5.7
Esophagus	9.2	9.0	11.4	7.1	7.7	8.7		8.8	14.0	9.2	8.4
Brain/CNS	8.3	8.4	8.0	8.1	8.0	8.4		8.0	8.8	6.5	9.4
Testis	6.4	6.7	6.5	5.7	6.2	6.5		6.0	5.2	4.6	2.8
Larynx	4.2	3.3	3.7	4.2	3.5	4.6		5.3	5.0	3.9	6.3
Hodgkin lymphoma	2.9	2.7	2.9	3.0	2.7	3.0		3.2	2.7	—	1.6
Breast	1.2	1.0	0.9	1.2	0.9	1.3		1.4	1.5	—	0.9
Females											
All cancers	**489.5**	**436.5**	**461.2**	**452.7**	**474.6**	**518.6**		**473.9**	**513.1**	**444.5**	**518.8**
Breast	128.0	121.6	127.5	122.9	122.0	131.7		116.8	129.4	121.3	128.7
Lung and bronchus	59.6	53.4	58.0	63.3	63.0	59.6		71.4	76.0	66.0	62.5
Colorectal	50.9	51.3	50.8	57.2	47.2	48.4		50.2	62.8	60.6	75.2
Uterus (body, NOS)	34.5	31.3	34.3	31.3	43.6	35.9		30.5	32.0	29.0	32.8
Thyroid	32.1	14.2	22.3	14.7	21.5	44.7		23.2	23.5	8.1	33.8
Non-Hodgkin lymphoma	20.0	17.3	17.8	17.7	18.0	22.2		20.0	18.2	14.9	20.5
Melanoma	19.1	18.7	16.2	14.4	15.2	20.2		20.5	28.5	27.4	16.8
Ovary	14.2	14.9	11.0	14.5	12.6	15.4		10.4	12.0	11.1	13.8
Leukemia	12.5	11.7	13.2	13.0	10.7	13.1		16.7	10.5	9.4	6.5
Pancreas	11.7	11.2	12.4	11.5	13.4	11.5		12.6	12.0	8.1	11.5
Kidney and renal pelvis	11.3	7.6	10.6	13.9	12.2	11.7		14.7	18.1	9.1	17.6
Bladder	10.6	9.3	9.9	10.9	10.1	11.1		11.1	12.2	9.7	12.8
Oral	7.4	6.6	6.5	6.0	8.1	8.2		6.6	6.6	4.8	5.4
Cervix	7.2	7.4	7.5	7.6	6.8	7.2		4.8	5.9	8.0	11.4
Multiple myeloma	6.0	5.1	5.1	5.2	5.3	6.8		5.8	4.8	5.4	5.4
Stomach	6.1	4.5	4.9	4.5	5.1	7.4		5.1	3.9	3.6	8.6
Brain/CNS	6.0	5.5	5.9	6.3	6.4	6.1		6.8	6.1	2.7	6.7
Liver	3.2	3.4	3.3	2.1	2.9	3.6		1.2	1.5	—	2.1
Esophagus	2.4	2.9	2.3	2.1	2.2	2.4		2.1	2.6	—	1.9
Hodgkin lymphoma	2.3	2.1	1.9	2.7	2.3	2.5		1.8	2.4	—	2.0
Larynx	0.7	0.5	0.6	0.7	0.7	0.7		0.5	1.4	—	0.9

— ASIR based on fewer than 3 cases; CNS=central nervous system; NOS=not otherwise specified

* Quebec was not included because a different projection method was used for Quebec than the other regions, meaning the estimates are not comparable. See *Appendix II: Data source and methods* for additional details.

† Canada totals include provincial and territorial estimates, exept Quebec. Territories are not listed due to small numbers.

‡ "All cancers" includes *in situ* bladder and excludes non-melanoma skin cancer (neoplasms, NOS; epithelial neoplasms, NOS; and basal and squamous). Rates are age-standardized to the 2011 Canadian population. The complete definition of the specific cancers listed here can be found in Table A1.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

TABLE 1.5 Projected new cases for selected cancers, by sex and province, Canada,* 2019

	CA†	BC	AB	SK	MB	ON	QC‡	NB	NS	PE	NL
Males											
All cancers§	**113,000**	**13,900**	**10,800**	**3,100**	**3,500**	**44,400**	**28,500**	**2,700**	**3,400**	**510**	**1,950**
Prostate	22,900	3,100	2,800	710	730	9,600	4,300	510	610	90	410
Lung and bronchus	14,900	1,550	1,150	390	470	5,100	4,800	430	520	85	270
Colorectal	14,600	2,000	1,400	520	510	4,900	3,800	370	530	80	380
Bladder	9,100	1,100	770	230	220	3,300	2,800	220	260	35	130
Non-Hodgkin lymphoma	5,600	620	500	140	170	2,500	1,300	130	170	20	90
Kidney and renal pelvis	4,700	540	450	140	160	1,700	1,250	140	180	20	110
Melanoma	4,300	610	380	85	130	2,100	590	100	190	30	65
Leukemia	4,000	510	430	120	130	1,650	890	120	100	10	45
Oral	3,700	470	350	85	120	1,450	900	70	110	25	60
Pancreas	3,000	390	270	90	100	1,050	840	80	90	15	35
Stomach	2,600	280	190	75	95	1,150	680	60	60	10	60
Liver	2,200	350	180	50	60	860	590	30	55	10	25
Thyroid	2,100	150	180	35	55	1,100	490	40	55	5	40
Multiple myeloma	1,950	210	180	55	55	830	500	40	50	10	20
Esophagus	1,800	250	220	40	50	660	390	40	80	10	30
Brain/CNS	1,650	220	170	45	55	620	440	35	50	5	30
Testis	1,150	160	160	30	40	450	240	20	20	5	5
Larynx	980	95	75	25	25	350	330	25	30	5	20
Hodgkin lymphoma	560	70	65	15	20	210	150	10	15	—	5
Breast	230	30	15	5	5	95	60	5	10	—	5
Females											
All cancers§	**107,400**	**13,000**	**9,800**	**2,800**	**3,400**	**43,300**	**27,100**	**2,400**	**3,300**	**460**	**1,800**
Breast	26,900	3,500	2,700	730	850	10,600	6,600	580	800	120	440
Lung and bronchus	14,500	1,700	1,250	420	480	5,300	4,100	390	530	70	240
Colorectal	11,700	1,600	1,100	370	350	4,200	3,000	280	430	65	270
Uterus (body, NOS)	7,200	900	720	190	300	3,000	1,600	160	210	30	110
Thyroid	6,100	370	480	80	140	3,300	1,400	100	130	5	110
Non-Hodgkin lymphoma	4,400	520	380	110	130	1,900	1,000	100	120	15	75
Melanoma	3,500	530	340	85	110	1,650	480	95	160	25	55
Ovary	3,000	430	230	90	90	1,250	740	55	80	10	45
Pancreas	2,800	360	270	75	100	1,050	770	70	85	10	45
Bladder	2,700	300	210	70	75	1,000	890	60	85	10	50
Leukemia	2,700	350	280	85	80	1,100	610	85	65	10	20
Kidney and renal pelvis	2,500	230	230	85	90	980	640	75	110	10	65
Oral	1,600	200	140	40	60	690	380	35	45	5	20
Stomach	1,450	140	100	30	35	640	390	30	25	5	30
Multiple myeloma	1,400	160	110	35	40	610	340	35	35	5	20
Cervix	1,350	190	170	40	45	530	280	20	30	5	30
Brain/CNS	1,300	160	130	40	45	490	360	30	35	5	25
Liver	780	110	70	15	20	310	220	5	10	—	10
Esophagus	540	90	50	15	15	210	110	10	20	—	5
Hodgkin lymphoma	440	55	40	15	15	190	100	5	10	—	5
Larynx	190	15	10	5	5	60	70	5	10	—	5

— Fewer than 3 cases; CNS=central nervous system; NOS=not otherwise specified

* Canada totals include provincial and territorial estimates. Territories are not listed due to small numbers.

† Canadian counts may not sum to row totals due to rounding.

‡ Quebec projections were calculated differently from the other provinces and territories because actual data were only available to 2010 for Quebec, whereas they were available to 2015 for the other regions. See *Appendix II: Data source and methods* for additional details.

§ "All cancers" includes *in situ* bladder cancer and excludes non-melanoma skin cancer (neoplasms, NOS; epithelial neoplasms, NOS; and basal and squamous). The complete definition of the specific cancers listed here can be found in Table A1.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

TABLE 1.6 Annual percent changes (APC) and average annual percent change (AAPC) in age-standardized incidence rates (ASIR) for selected cancers, by sex, Canada (excluding Quebec), 1984–2015

	Both sexes			Males			Females		
	Period	APC (95% CL)	AAPC (95% CL), 1984–2015	Period	APC (95% CL)	AAPC (95% CL), 1984–2015	Period	APC (95% CL)	AAPC (95% CL), 1984–2015
All Cancers	**1984–2011**	**0.3 (0.2, 0.4)**		**1984–1992**	**0.9 (0.1, 1.6)**		**1984–2007**	**0.3 (0.2, 0.4)**	
	2011–2015	**-1.5 (-2.7, -0.4)**	**0.1 (-0.1, 0.2)**	**1992–2011**	**-0.1 (-0.3, 0.1)**	**-0.2 (-0.5, 0.1)**	**2007–2011**	**1.6 (0.2, 3.0)**	**0.3 (0.1, 0.5)**
				2011–2015	**-2.6 (-4.0, -1.2)**		**2011–2015**	**-0.9 (-1.8, -0.1)**	
Lung and bronchus	1984–1988	0.9 (-0.7, 2.5)		1984–1990	-0.6 (-1.4, 0.1)		1984–1993	2.9 (2.3, 3.5)	
	1988–2011	-0.5 (-0.6, -0.4)	-0.5 (-0.7, -0.2)	1990–2003	-2.2 (-2.4, -1.9)	-1.7 (-1.9, -1.4)	1993–2011	0.9 (0.8, 1.1)	1.2 (1.0, 1.5)
	2011–2015	-1.7 (-2.8, -0.5)		2003–2011	-0.9 (-1.4, -0.4)		2011–2015	-1.3 (-2.6, -0.0)	
				2011–2015	-3.3 (-4.5, -2.1)				
Breast	1984–1991	2.0 (0.8, 3.1)	0.2 (-0.1, 0.5)	1984–2015	0.5 (0.1, 1.0)	0.5 (0.1, 1.0)	1984–1991	2.1 (0.9, 3.2)	0.3 (0.0, 0.6)
	1991–2015	-0.3 (-0.4, -0.2)					1991–2015	-0.2 (-0.3, -0.1)	
Colorectal	1984–1996	-1.1 (-1.3, -0.9)		1984–1996	-0.7 (-1.0, -0.5)		1984–1996	-1.5 (-1.8, -1.3)	
	1996–2000	1.1 (-0.4, 2.7)	-0.7 (-0.9, -0.5)	1996–2000	0.9 (-1.0, 2.9)	-0.6 (-0.9, -0.3)	1996–2000	1.2 (-0.8, 3.2)	-0.9 (-1.2, -0.6)
	2000–2011	-0.5 (-0.7, -0.3)		2000–2011	-0.5 (-0.8, -0.2)		2000–2011	-0.5 (-0.8, -0.3)	
	2011–2015	-2.0 (-2.8, -1.2)		2011–2015	-2.2 (-3.2, -1.2)		2011–2015	-1.9 (-2.9, -0.8)	
Prostate				1984–1993	6.3 (4.6, 8.1)				
				1993–1997	-3.0 (-9.7, 4.2)				
				1997–2001	4.1 (-2.7, 11.3)	0.1 (-1.2, 1.5)			
				2001–2011	-1.6 (-2.7, -0.5)				
				2011–2015	-9.1 (-12.6, -5.5)				
Bladder*	1984–1992	-1.9 (-2.9, -0.9)		1984–2009	-1.0 (-1.2, -0.8)		1984–2009	-0.9 (-1.1, -0.6)	
	1992–2009	-0.6 (-0.9, -0.3)		2010–2015	-1.5 (-3.1,0.02)		2010–2015	-1.3 (-3.5, 1.0)	
	2010–2015	-1.2 (-2.6, 0.3)							
Non-Hodgkin lymphoma	1984–1990	2.6 (1.0, 4.3)	1.4 (1.0, 1.7)	1984–2015	1.3 (1.1, 1.4)	1.3 (1.1, 1.4)	1984–1993	2.2 (1.3, 3.1)	1.2 (1.0, 1.5)
	1990–2015	1.1 (0.9, 1.2)					1993–2015	0.9 (0.7, 1.0)	
Thyroid	1984–1997	3.9 (2.7, 5.1)		1984–1997	2.8 (1.1, 4.5)		1984–1998	3.8 (3.1, 4.5)	
	1997–2011	7.5 (6.7, 8.2)	5.0 (4.3, 5.7)	1997–2015	6.4 (5.8, 7.0)	4.9 (4.1, 5.6)	1998–2002	11.9 (6.2, 18.0)	5.1 (4.3, 5.9)
	2011–2015	0.3 (-2.6, 3.2)					2002–2011	6.5 (5.6, 7.4)	
							2011–2015	0.1 (-1.9, 2.1)	
Melanoma	1984–2015	1.9 (1.8, 2.1)	1.9 (1.8, 2.1)	1984–2015	2.2 (2.1, 2.4)	2.2 (2.1, 2.4)	1984–1994	0.1 (-1.0, 1.3)	1.4 (1.0, 1.8)
							1994–2015	2.0 (1.8, 2.3)	

Continued on next page

TABLE 1.6 Annual percent changes (APC) and average annual percent change (AAPC) in age-standardized incidence rates (ASIR) for selected cancers, by sex, Canada (excluding Quebec), 1984–2015

	Both sexes			Males			Females		
	Period	APC (95% CL)	AAPC (95% CL), 1984–2015	Period	APC (95% CL)	AAPC (95% CL), 1984–2015	Period	APC (95% CL)	AAPC (95% CL), 1984–2015
Kidney and renal pelvis	1984–1988	4.6 (1.4, 7.9)	1.4 (0.8, 2.0)	1984–1989	4.0 (1.3, 6.8)	1.4 (0.8, 2.0)	1984–2015	1.0 (0.8, 1.3)	1.0 (0.8, 1.3)
	1988–2003	0.3 (-0.1, 0.7)		1989–2003	0.1 (-0.4, 0.6)				
	2003–2007	3.9 (0.3, 7.6)		2003–2011	2.8 (1.7, 3.9)				
	2007–2015	0.6 (-0.0, 1.3)		2011–2015	-0.3 (-2.4, 1.9)				
Uterus (body, NOS)							1984–1990	-1.5 (-3.1, 0.1)	0.6 (0.0, 1.1)
							1990–2006	0.5 (0.1, 0.8)	
							2006–2011	3.7 (1.5, 6.1)	
							2011–2015	0.1 (-1.9, 2.1)	
Leukemia	1984–1997	-0.6 (-1.1, -0.2)	0.1 (-0.2, 0.4)	1984–1994	-0.9 (-1.8, 0.1)	0.2 (-0.2, 0.5)	1984–2003	-0.2 (-0.5, 0.1)	0.2 (-0.3, 0.8)
	1997–2010	1.3 (0.9, 1.7)		1994–2015	0.7 (0.4, 0.9)		2003–2007	3.7 (-0.3, 8.0)	
	2010–2015	-0.9 (-2.2, 0.4)					2007–2015	-0.6 (-1.4, 0.2)	
Pancreas	1984–2000	-0.9 (-1.5, -0.4)	-0.2 (-0.5, 0.2)	1984–2000	-1.5 (-2.1, -0.9)	-0.4 (-0.8, -0.0)	1984–2015	0.1 (-0.2, 0.3)	0.1 (-0.2, 0.3)
	2000–2015	0.6 (0.1, 1.1)		2000–2015	0.8 (0.2, 1.3)				
Oral	1984–2003	-2.0 (-2.2, -1.7)	-0.8 (-1.0, -0.5)	1984–2004	-2.5 (-2.7, -2.2)	-1.1 (-1.5, -0.7)	1984–2003	-1.0 (-1.3, -0.7)	-0.4 (-0.7, -0.1)
	2003–2015	1.2 (0.7, 1.7)		2004–2011	2.1 (0.8, 3.5)		2003–2015	0.7 (0.1, 1.3)	
				2011–2015	-0.1 (-2.3, 2.1)				
Stomach	1984–2002	-2.6 (-2.8, -2.3)	-1.8 (-2.0, -1.6)	1984–2002	-2.5 (-2.8, -2.3)	-1.9 (-2.1, -1.7)	1984–1999	-3.0 (-3.4, -2.5)	-1.9 (-2.2, -1.6)
	2002–2015	-0.8 (-1.1, -0.4)		2002–2015	-1.1 (-1.5, -0.7)		1999–2015	-0.8 (-1.2, -0.4)	
Multiple myeloma	1984–2007	0.4 (0.1, 0.7)	0.9 (0.5, 1.2)	1984–2007	0.3 (-0.0, 0.7)	0.9 (0.5, 1.3)	1984–2015	0.6 (0.4, 0.8)	0.6 (0.4, 0.8)
	2007–2015	2.3 (1.1, 3.6)		2007–2015	2.6 (1.2, 4.0)				
Brain/CNS	1984–2011	-0.3 (-0.4, -0.1)	-0.6 (-1.0, -0.3)	1984–2009	-0.2 (-0.4, 0.0)	-0.5 (-0.8, -0.2)	1984–2011	-0.3 (-0.5, -0.1)	-0.7 (-1.2, -0.3)
	2011–2015	-2.9 (-5.5, -0.4)		2009–2015	-1.9 (-3.3, -0.5)		2011–2015	-3.2 (-6.4, 0.1)	
Ovary							1984–1994	-1.7 (-2.4, -0.9)	-0.8 (-1.1, -0.5)
							1994–2015	-0.4 (-0.6, -0.2)	
Liver	1984–2004	3.1 (2.6, 3.5)	3.0 (2.5, 3.5)	1984–2011	3.8 (3.4, 4.1)	3.3 (2.8, 3.8)	1984–2015	2.7 (2.4, 3.1)	2.7 (2.4, 3.1)
	2004–2011	5.1 (3.4, 6.8)		2011–2015	0.2 (-3.0, 3.6)				
	2011–2015	-0.7 (-3.2, 1.8)							

Continued on next page

TABLE 1.6 Annual percent changes (APC) and average annual percent change (AAPC) in age-standardized incidence rates (ASIR) for selected cancers, by sex, Canada (excluding Quebec), 1984–2015

Cancer	Both sexes			Males			Females		
	Period	APC (95% CL)	AAPC (95% CL), 1984–2015	Period	APC (95% CL)	AAPC (95% CL), 1984–2015	Period	APC (95% CL)	AAPC (95% CL), 1984–2015
Esophagus	1984–2006	0.1 (-0.1, 0.4)	0.2 (-0.4, 0.8)	1984–2006	0.3 (0.1, 0.6)	0.4 (-0.3, 1.1)	1984–2015	-0.4 (-0.7, -0.2)	-0.4 (-0.7, -0.2)
	2006–2010	3.5 (-1.0, 8.1)		2006–2010	4.3 (-0.3, 9.1)				
	2010–2015	-1.9 (-3.7, -0.1)		2010–2015	-2.4 (-4.2, -0.5)				
Cervix							1984–2006	-2.1 (-2.2, -1.9)	-1.8 (-2.3, -1.3)
							2006–2010	1.5 (-2.2, 5.3)	
							2010–2015	-3.3 (-4.9, -1.7)	
Larynx	1984–2015	-2.5 (-2.7, -2.3)	-2.5 (-2.7, -2.3)	1984–2015	-2.6 (-2.7, -2.4)	-2.6 (-2.7, -2.4)	1984–1991	0.7 (-2.3, 3.9)	-2.2 (-2.9, -1.5)
							1991–2015	-3.0 (-3.5, -2.6)	
Testis				1984–2015	1.3 (1.1, 1.5)	1.3 (1.1, 1.5)			
Hodgkin lymphoma	1984–2015	-0.2 (-0.4, -0.1)	-0.2 (-0.4, -0.1)	1984–2015	-0.4 (-0.6, -0.3)	-0.4 (-0.6, -0.3)	1984–2015	0.0 (-0.2, 0.3)	0.0 (-0.2, 0.3)
All other cancers	1984–2003	1.0 (0.7, 1.2)	0.6 (0.1, 1.2)	1984–1992	1.9 (0.4, 3.4)	0.7 (0.3, 1.1)	1984–2015	0.8 (0.7, 0.9)	0.8 (0.7, 0.9)
	2003–2007	-1.5 (-4.3, 1.5)		1992–2015	0.3 (0.1, 0.5)				
	2007–2011	2.9 (0.1, 5.8)							
	2011–2015	-1.1 (-2.7, 0.5)							

CL=confidence limits; CNS=central nervous system; NOS=not otherwise specified

* The trend analysis for bladder cancer was performed over two time periods (1984 to 2009 and 2010 to 2015) to account for the artificial change in cancer counts introduced in 2010 when Ontario started to include *in situ* carcinomas of the bladder in their data collection because of this, no AAPCs are provided for incident bladder cancer. See *Appendix II: Data sources and methods* for further details.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

TABLE 1.7 Most recent annual percent change (APC)* in age-standardized incidence rates (ASIR), by sex, Canada (excluding Quebec), 1984–2015

	Both sexes		Males		Females	
	Reference year	APC (95% CL)	Reference year	APC (95% CL)	Reference year	APC (95% CL)
All cancers†	**2011**	**-1.5 (-2.7, -0.4)**	**2011**	**-2.6 (-4.0, -1.2)**	**2011**	**-0.9 (-1.8, -0.1)**
Lung and bronchus	2011	-1.7 (-2.8, -0.5)	2011	-3.3 (-4.5, -2.1)	2011	-1.3 (-2.6, -0.0)
Breast	1991	-0.3 (-0.4, -0.2)	1984	0.5 (0.1, 1.0)	1991	-0.2 (-0.3, -0.1)
Colorectal	2011	-2.0 (-2.8, -1.2)	2011	-2.2 (-3.2, -1.2)	2011	-1.9 (-2.9, -0.8)
Prostate	—	—	2011	-9.1 (-12.6, -5.5)	—	—
Bladder‡	2010	-1.2 (-2.6, 0.3)	2010	-1.5 (-3.1,0.02)	2010	-1.3 (-3.5, 1.0)
Non-Hodgkin lymphoma	1990	1.1 (0.9, 1.2)	1984	1.3 (1.1, 1.4)	1993	0.9 (0.7, 1.0)
Thyroid	2011	0.3 (-2.6, 3.2)	1997	6.4 (5.8, 7.0)	2011	0.1 (-1.9, 2.1)
Melanoma	1984	1.9 (1.8, 2.1)	1984	2.2 (2.1, 2.4)	1994	2.0 (1.8, 2.3)
Kidney and renal pelvis	2007	0.6 (-0.0, 1.3)	2011	-0.3 (-2.4, 1.9)	1984	1.0 (0.8, 1.3)
Uterus (body, NOS)	—	—	—	—	2011	0.1 (-1.9, 2.1)
Leukemia	2010	-0.9 (-2.2, 0.4)	1994	0.7 (0.4, 0.9)	2007	-0.6 (-1.4, 0.2)
Pancreas	2000	0.6 (0.1, 1.1)	2000	0.8 (0.2, 1.3)	1984	0.1 (-0.2, 0.3)
Oral	2003	1.2 (0.7, 1.7)	2011	-0.1 (-2.3, 2.1)	2003	0.7 (0.1, 1.3)
Stomach	2002	-0.8 (-1.1, -0.4)	2002	-1.1 (-1.5, -0.7)	1999	-0.8 (-1.2, -0.4)
Multiple myeloma	2007	2.3 (1.1, 3.6)	2007	2.6 (1.2, 4.0)	1984	0.6 (0.4, 0.8)
Brain/CNS	2011	-2.9 (-5.5, -0.4)	2009	-1.9 (-3.3, -0.5)	2011	-3.2 (-6.4, 0.1)
Ovary	—	—	—	—	1994	-0.4 (-0.6, -0.2)
Liver	2011	-0.7 (-3.2, 1.8)	2011	0.2 (-3.0, 3.6)	1984	2.7 (2.4, 3.1)
Esophagus	2010	-1.9 (-3.7, -0.1)	2010	-2.4 (-4.2, -0.5)	1984	-0.4 (-0.7, -0.2)
Cervix	—	—	—	—	2010	-3.3 (-4.9, -1.7)
Larynx	1984	-2.5 (-2.7, -2.3)	1984	-2.6 (-2.7, -2.4)	1991	-3.0 (-3.5, -2.6)
Testis	—	—	1984	1.3 (1.1, 1.5)	—	—
Hodgkin lymphoma	1984	-0.2 (-0.4, -0.1)	1984	-0.4 (-0.6, -0.3)	1984	0.0 (-0.2, 0.3)
All other cancers	2011	-1.1 (-2.7, 0.5)	1992	0.3 (0.1, 0.5)	1984	0.8 (0.7, 0.9)

CL=confidence limits; CNS=central nervous system; NOS=not otherwise specified

* The APC was calculated using the Joinpoint Regression Program using rates from 1984–2015. If one or more significant change in the trend of rates was detected, the APC reflects the trend from the most recent significant change (reference year) to 2015. If no significant change in trend was detected, the APC reflects the trend in rates over the entire period (1984–2015). Actual incidence data were available to 2015 for all provinces andterritories except QC, for which data were not included. For further details, see *Appendix II: Data sources and methods*.

† "All cancers" includes *in situ* bladder cancer and excludes non-melanoma skin cancer (neoplasms, NOS; epithelial neoplasms, NOS; and basal and squamous). Rates are age-standardized to the 2011 Canadian population. The complete definition of the specific cancers listed here can be found in Table A1.

‡ The reference year of 2010 was imposed for bladder cancer to account for the artificial change in cancer counts introduced in 2010 when Ontario started to include *in situ* carcinomas of the bladder in their data collection. See *Appendix II: Data sources and methods* for further details.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and National Cancer Incidence Reporting System databases at Statistics Canada

Chapter 2

How many people die from cancer in Canada?

Mortality by sex, age, geography and year

The number and rate of cancer deaths that occur each year (mortality) and over time provide the ultimate measure of progress in cancer control: reduction in cancer-related deaths. Mortality is affected by the things that drive cancer incidence, such as risk factors and aging. It also reflects improvements in finding cancers early and treating them successfully.

This chapter examines mortality by sex, age, geography and over time to better understand who is dying from cancer so cancer control services to address the needs of specific populations can be better directed.

Key findings

- It is estimated that 1 in 4 Canadians will die from cancer. The lifetime probability of dying from cancer is slightly higher for males than females.
- An estimated 82,100 Canadians are expected to die from cancer in 2019. 1 in 4 of these deaths is expected to be caused by lung cancer.
- 2019 is the first year that pancreatic cancer is expected to be the third leading cause of cancer death in Canada, surpassing breast cancer deaths.
- Almost all (96%) of cancer deaths in Canada are expected to occur in people 50 years of age and older.
- In general, cancer mortality rates are lower in the western provinces and the territories and higher in the central and eastern provinces. Newfoundland and Labrador is expected to have the highest rate in Canada.
- The mortality rates for all cancers combined peaked in 1988 and have been decreasing ever since. However, the number of cancer deaths continues to increase each year due to the growing and aging population.

Probability of dying from cancer

The probability of dying from a specific type of cancer depends on many factors, including the probability of developing that cancer and the treatments available. The estimated probabilities are for the general Canadian population and should not be interpreted as an individual's risk.

- Approximately 1 in 4 Canadians is expected to die from cancer (Figure 2.1).
- The probability of dying from cancer is slightly higher for males (26%) than females (23%).

As shown in Table 2.1, the probability of dying from cancer varies by type of cancer.

- Canadians are more likely to die from lung and bronchus (lung) cancer than any other type of cancer. An estimated 1 in 17 Canadians will die from lung cancer.
- 1 in 29 (4%) males is expected to die from prostate cancer.
- 1 in 33 (3%) females is expected to die from breast cancer.

Estimated cancer deaths in 2019

The cancer mortality data used for this publication were from 1984 to 2015. These were the most recent data available when the analyses began. The data were used to project rates and deaths to 2019.

An estimated 82,100 Canadians are expected to die from cancer in 2019 (Table 2.2).

- Lung cancer is the leading cause of cancer death for both sexes, accounting for approximately 26% of all cancer deaths in Canada, followed by colorectal cancer (12%) and pancreatic cancer (6%).
- The five leading causes of cancer death (lung, colorectal, pancreas, breast and prostate cancers) account for over 50% of all cancer deaths in Canada.

Lung cancer is responsible for 1 in 4 cancer deaths in Canada.

FIGURE 2.1 Lifetime probability of dying from cancer, Canada (excluding Quebec), 2015

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada
Data source: Canadian Vital Statistics Death Database at Statistics Canada

Mortality by sex

Table 2.2 shows the number and rate of cancer deaths projected for males and females in 2019.

- For each cancer type except breast and thyroid, a higher number of deaths is expected among males than females.
- 53% of all cancer deaths are expected to occur among males.

Figure 2.2 shows the expected distribution of cancer deaths in males and females in 2019.

- For males, lung cancer is expected to be most common cause of cancer death, accounting for 25% of all cancer deaths, followed by colorectal cancer (12%) and prostate cancer (10%).
- For females, lung cancer is expected to be the leading cause of cancer death, accounting for 26% of all cancer deaths, followed by breast cancer (13%) and colorectal cancer (11%).

FIGURE 2.2 Percent distribution of projected cancer deaths, by sex, Canada, 2019

Males
43,300
Deaths

Lung and bronchus	25.2%
Colorectal	12.0%
Prostate	9.5%
Pancreas	6.2%
Bladder	4.2%
Leukemia	4.0%
Esophagus	3.9%
Non-Hodgkin lymphoma	3.7%
Brain/CNS	3.2%
Kidney and renal pelvis	2.9%
Stomach	2.8%
Liver*	2.5%
Oral	2.4%
Multiple myeloma	2.0%
Melanoma	1.9%
Larynx	0.8%
Thyroid	0.2%
Hodgkin lymphoma	0.1%
Breast	0.1%
Testis	0.1%
All other cancers	12.2%

Females
38,700
Deaths

Lung and bronchus	26.1%
Breast	12.9%
Colorectal	11.4%
Pancreas	6.5%
Ovary	4.9%
Leukemia	3.2%
Non-Hodgkin lymphoma	3.2%
Uterus (body, NOS)	3.2%
Brain/CNS	2.7%
Stomach	2.0%
Bladder	1.8%
Multiple myeloma	1.8%
Kidney and renal pelvis	1.7%
Esophagus	1.3%
Melanoma	1.2%
Oral	1.1%
Cervix	1.1%
Liver*	0.7%
Thyroid	0.3%
Larynx	0.2%
Hodgkin lymphoma	0.1%
All other cancers	12.7%

CNS=central nervous system; NOS=not otherwise specified

* Liver cancer mortality was underestimated because deaths from liver cancer, unspecified (ICD-10 code C22.9), were excluded. For further details, see *Appendix II: Data sources and methods*.

Note: The complete definition of the specific cancers included here can be found in Table A1.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death Database at Statistics Canada

Probability

The chance of dying from cancer measured over a defined period of time. The probability of dying from cancer is expressed as a percentage or as a chance (e.g., 20% or 1 in 5 people over a lifetime).

Deaths

The number of cancer deaths in a given population during a specific period of time, often a year.

Age-standardized mortality rate (ASMR)

The number of cancer deaths per 100,000 people, standardized to the age structure of the 2011 Canadian population. In this publication, ASMR is also referred to as "mortality rate" or "death rate."

Projected mortality

Actual death data were available to 2015 for all provinces and territories, except Quebec. For Quebec, estimates were obtained by subtracting from the national total. Data to 2015 were used to project cancer mortality to 2019.

Mortality by age

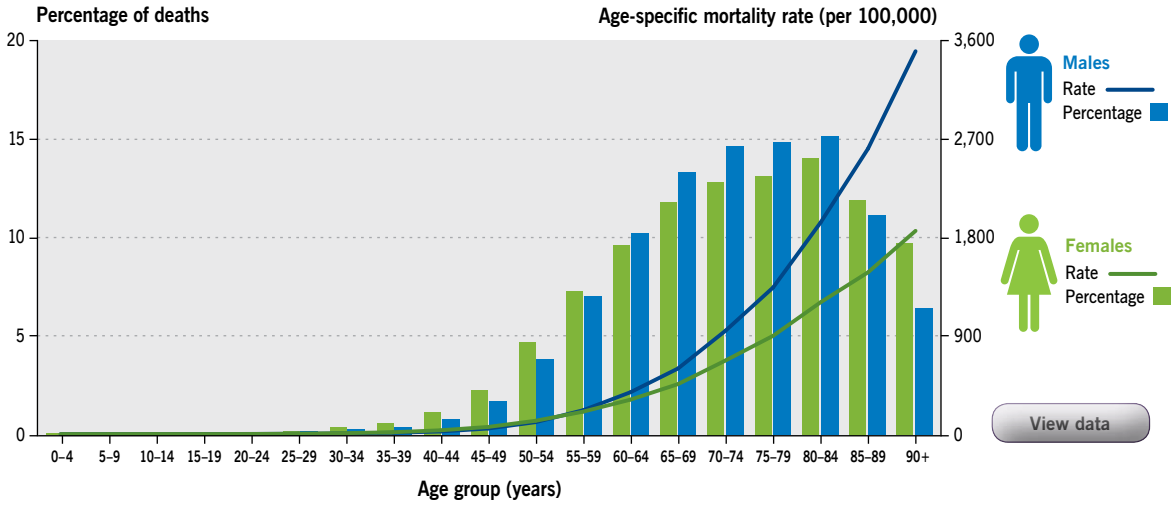
Cancer mortality rates increase dramatically with age (Figure 2.3).

- Between the ages of 25 and 54, cancer death rates are higher in females than males.
- From age 55 onward, the cancer death rate is high in males than females.
- The higher number of cancer deaths occur among Canadians ages 85 years and older. In that age group, the number of cancer deaths is higher in females than males, despite a lower ASMR.

Table 2.3 shows the projected number of cancer deaths by age groups in 2019.

- 96% of cancer deaths are expected to occur in people 50 years of age and older.
- 43% of colorectal cancer deaths are expected to occur among Canadians who fall within the age covered by the screening guidelines (50 to 74 years of age)[1]; 4% are expected to occur among Canadians who are younger than 50.
- Almost half (48%) of breast cancer deaths are expected to occur among females who fall within the age covered by the screening guidelines (50 to 74 years of age)[2]; 9% are expected to occur among Canadians who are younger than 50.
- 84% of prostate cancers are expected to occur among Canadians 70 years of age and older.
- 88% of pancreatic cancers are expected to occur among Canadians 60 years of age and older.

FIGURE 2.3 Percentage of cancer deaths and age-specific mortality rates for all cancers, by age group and sex, Canada, 2013–2015

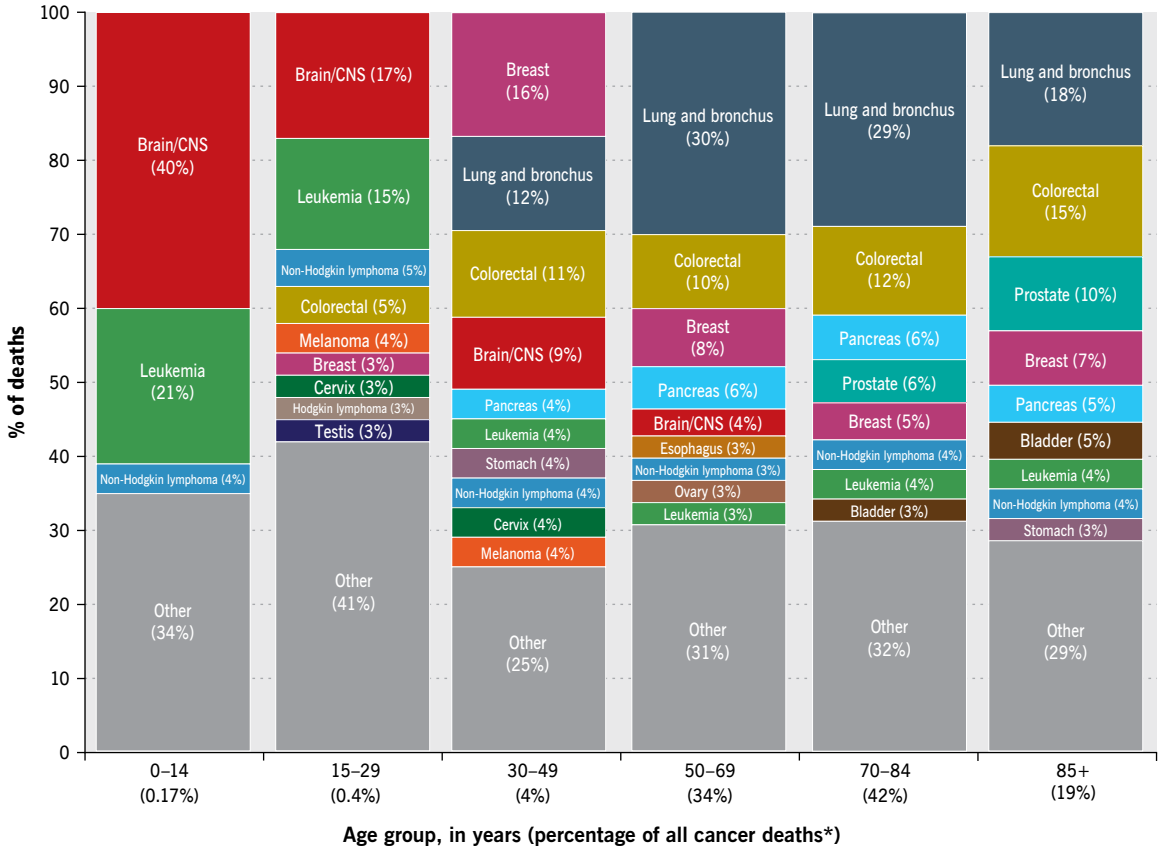


Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada
Data source: Canadian Vital Statistics Death Database at Statistics Canada

Figure 2.4 shows the most common causes of cancer death by age group.

- In the youngest age groups (0 to 14 years and 15 to 29 years), brain cancer and leukemia are the most common causes of cancer death.
- In the 30 to 49 years age group, breast is the leading cause of cancer death, accounting for 16% of all cancer deaths in that age group.
- In all older age groups (50 to 69, 70 to 84 and 85+ years), the most common causes of cancer death are lung cancer followed by colorectal cancer.

FIGURE 2.4 Distribution of cancer deaths for selected cancers by age group, Canada, 2011–2015



CNS=central nervous system; NOS=not otherwise specified

* The relative percentage is calculated based on the total number of deaths over five years (2011–2015) for each age group.

Note: The complete definition of the specific cancers included here can be found in Table A1.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death Database at Statistics Canada

Mortality by geographic region

Figure 2.5 shows the expected distribution of cancer deaths across Canada in 2019. These estimates are based on the individual's province or territory of residence at the time of death rather than the place where the death occurred.

- Similar to incidence, the mortality rates for all cancers combined are generally higher in the east and lower in the west.

Projected 2019 rates (Table 2.4) and numbers of deaths (Table 2.5) for selected cancer types by sex and province show that there are several geographic differences by cancer type.

- Lung cancer mortality rates for males are generally highest in Quebec and the Atlantic provinces.
- Colorectal cancer mortality rates are highest in Newfoundland and Labrador for both males and females. Newfoundland and Labrador also has a high incidence rate of colorectal cancer (Table 1.4).
- There is very little geographic variation in pancreatic cancer mortality rates.
- Prostate cancer mortality rates vary from about 20 per 100,000 to 30 per 100,000.

Differences in cancer mortality rates may correlate with differences in incidence due to regional variations in modifiable risk factors (*Chapter 1*), as well as differences in access to cancer services, such as screening, diagnosis, treatment and follow-up.

Importantly, these estimates do not include a measure of significance, such as confidence intervals or p-values, so we cannot determine if the differences reported are statistically significant.

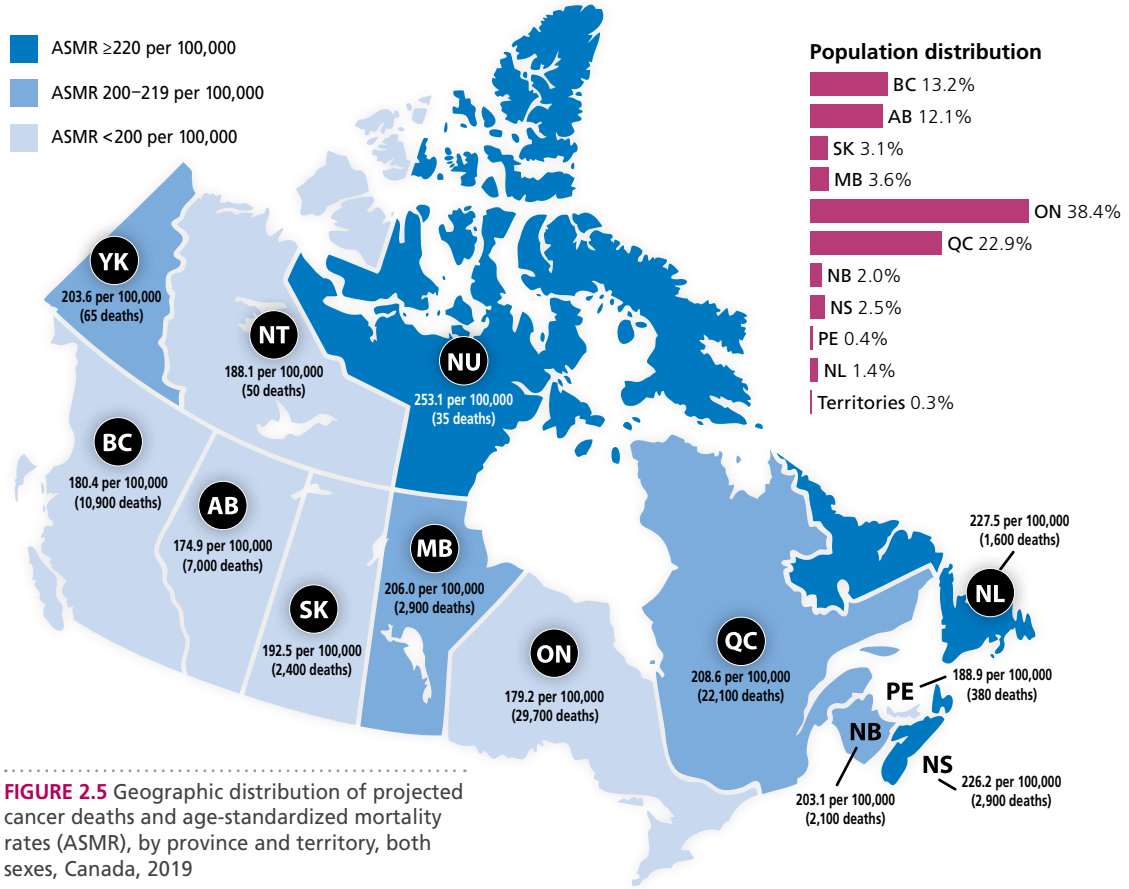


FIGURE 2.5 Geographic distribution of projected cancer deaths and age-standardized mortality rates (ASMR), by province and territory, both sexes, Canada, 2019

> Cancer mortality rates are generally higher in eastern Canada and lower in the western Canada.

* Based on projected estimates of population size in 2019.

Note: Rates are age-standardized to the 2011 Canadian population.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death Database at Statistics Canada

Mortality over time

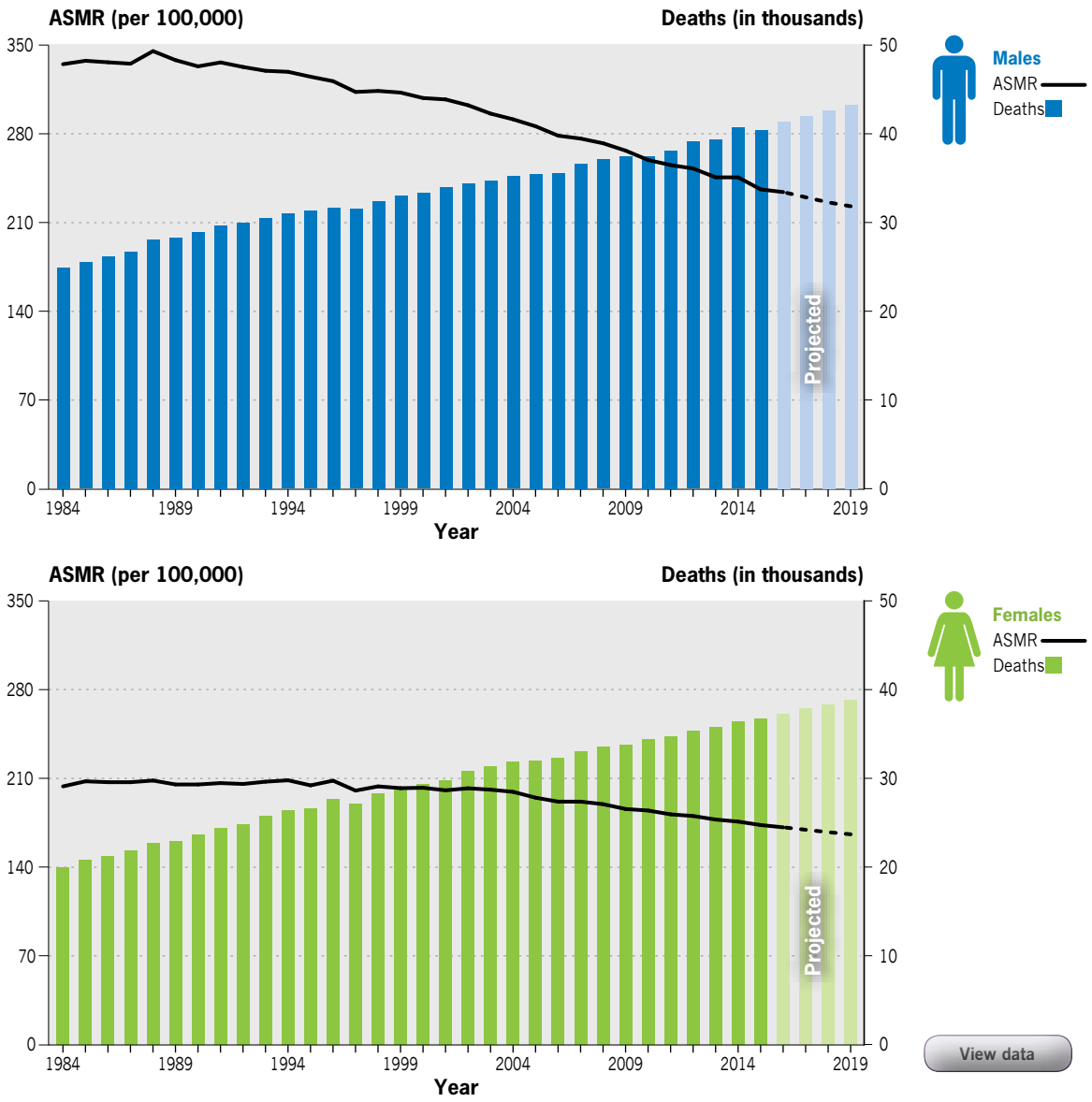
Monitoring mortality over time can help identify emerging trends, where progress has been made and where more needs to be done.

Figure 2.6 provides a high-level view of patterns in mortality over time for all cancers combined.

- Since cancer death rates peaked in 1988, they have decreased 35% in males and 20% in females.
- During the same period, the number of cancer deaths has increased from 28,100 to an expected 43,300 in males, and from 22,600 to an expected 38,700 in females. This increase is due primarily to the growing and aging population.[3,4]

The number of cancer deaths in Canada continues to increase each year.

FIGURE 2.6 Deaths and age-standardized mortality rates (ASMR) for all cancers, Canada, 1984–2019



Note: Rates are age-standardized to the 2011 Canadian population. Actual data were available to 2015 and projected thereafter.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada
Data source: Canadian Vital Statistics Death Database at Statistics Canada

Recent trends

Table 2.6 provides the complete picture of trends in cancer mortality rates between 1984 and 2015 for males and females, as measured by an annual percent change (APC). Table 2.7 draws out the most recent trends for each cancer. These recent trends are depicted in Figure 2.7

- Mortality rates for both sexes combined are decreasing at a rate of about -1.4% per year since 2002.

Annual percent change (APC)

The estimated change in the age-standardized mortality rate per year over a defined period of time in which there is no significant change in trend (i.e., no changepoint). It is reported as a percentage.

Reference year

The year corresponding to the start year of the APC.

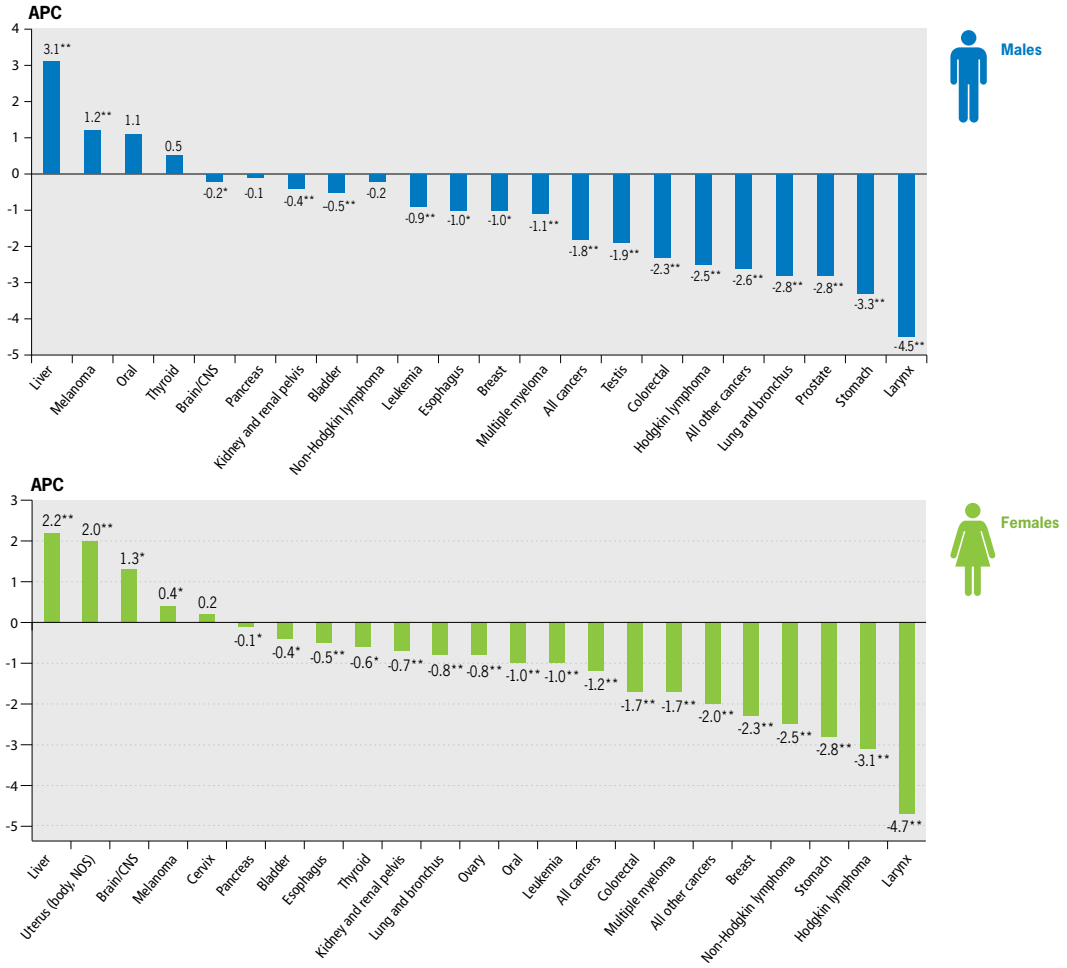
Statistical significance

Refers to a result that is unlikely due to chance given a predetermined threshold (e.g., fewer than 1 out of 20 times, which is expressed as $p<0.05$).

Confidence limits (CL)

Upper and lower values of a range that provide an indication of the precision of an estimate. Confidence limits are usually 95%, which means that, assuming no other sources of bias, one can be 95% confident the limits contain the true value for the estimate of interest.

FIGURE 2.7 Most recent annual percent change (APC)† in age-standardized mortality rates (ASMR), by sex, Canada, 1984–2015



CNS=central nervous system; NOS=not otherwise specified

* APC differs significantly from 0, $p<0.05$

** APC differs significantly from 0, $p<0.001$

† The APC was calculated using the Joinpoint Regression Program using rates from 1984–2015. If one or more significant change in the trend of rates was detected, the APC reflects the trend from the most recent significant change (reference year) to 2015. If no significant change in trend was detected, the APC reflects the trend in rates over the entire period (1984–2015). The reference year for each cancer is in Table 2.6. For further details, see *Appendix II: Data sources and methods*.

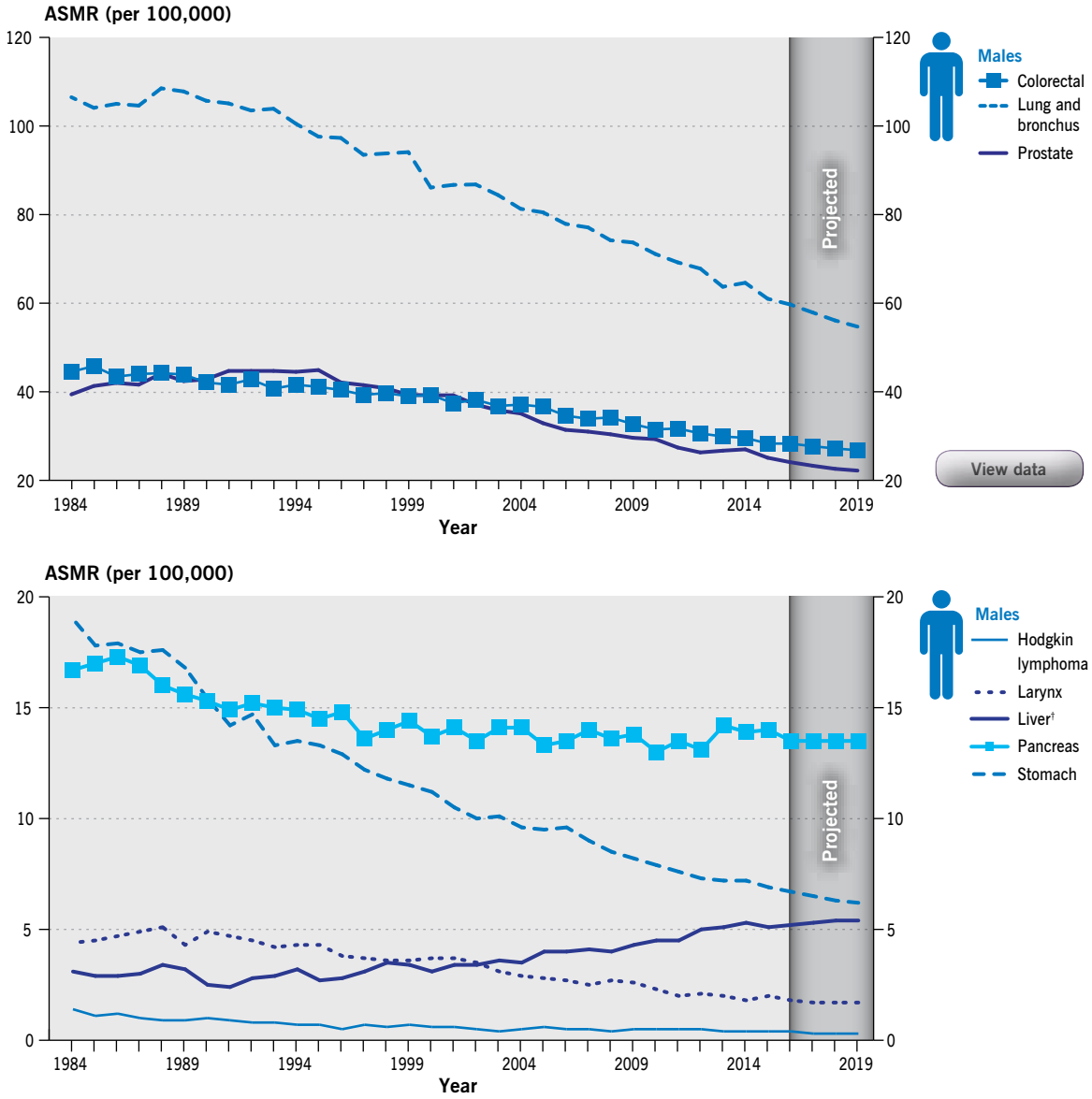
Note: The range of scales differs widely between the figures.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death Database at Statistics Canada

- In males, this decrease in mortality is largely driven by decreases in lung (-2.8%), prostate (-2.8%) and colorectal (-2.3%) cancers, along with laryngeal cancer (-4.5%), Hodgkin lymphoma (-2.5%) and stomach cancer (-3.3%).
- In females, this is largely driven by decreases in breast (-2.3%) and colorectal (-1.7%) cancers, along with laryngeal cancer (-4.7%), Hodgkin lymphoma (-3.1%), stomach cancer (-2.8%) and non-Hodgkin lymphoma (-2.5%).
- The biggest increase in mortality rates is for liver cancer in both males (3.1%) and females (2.2%).
- Mortality rates are also increasing for melanoma (1.2%) in males, and brain/CNS (1.3%) and uterine (2.0%) in females.

FIGURE 2.8 Age-standardized mortality rates (ASMR) for selected* cancers, males, Canada, 1984–2019



* Four most frequently diagnosed cancers (both sexes combined) and cancers with a statistically significant change in mortality rate of at least 2% per year, as measured by the most recent annual percent change (see Table 2.7).

† Liver cancer deaths are underestimated; see *Appendix II: Data sources and methods*.

Note: Rates are age-standardized to the 2011 Canadian population. Actual mortality data were available to 2015 and projected thereafter. The range of scales differs widely between the figures. The complete definition of the specific cancers included here can be found in Table A1.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada
Data source: Canadian Vital Statistics Death Database at Statistics Canada

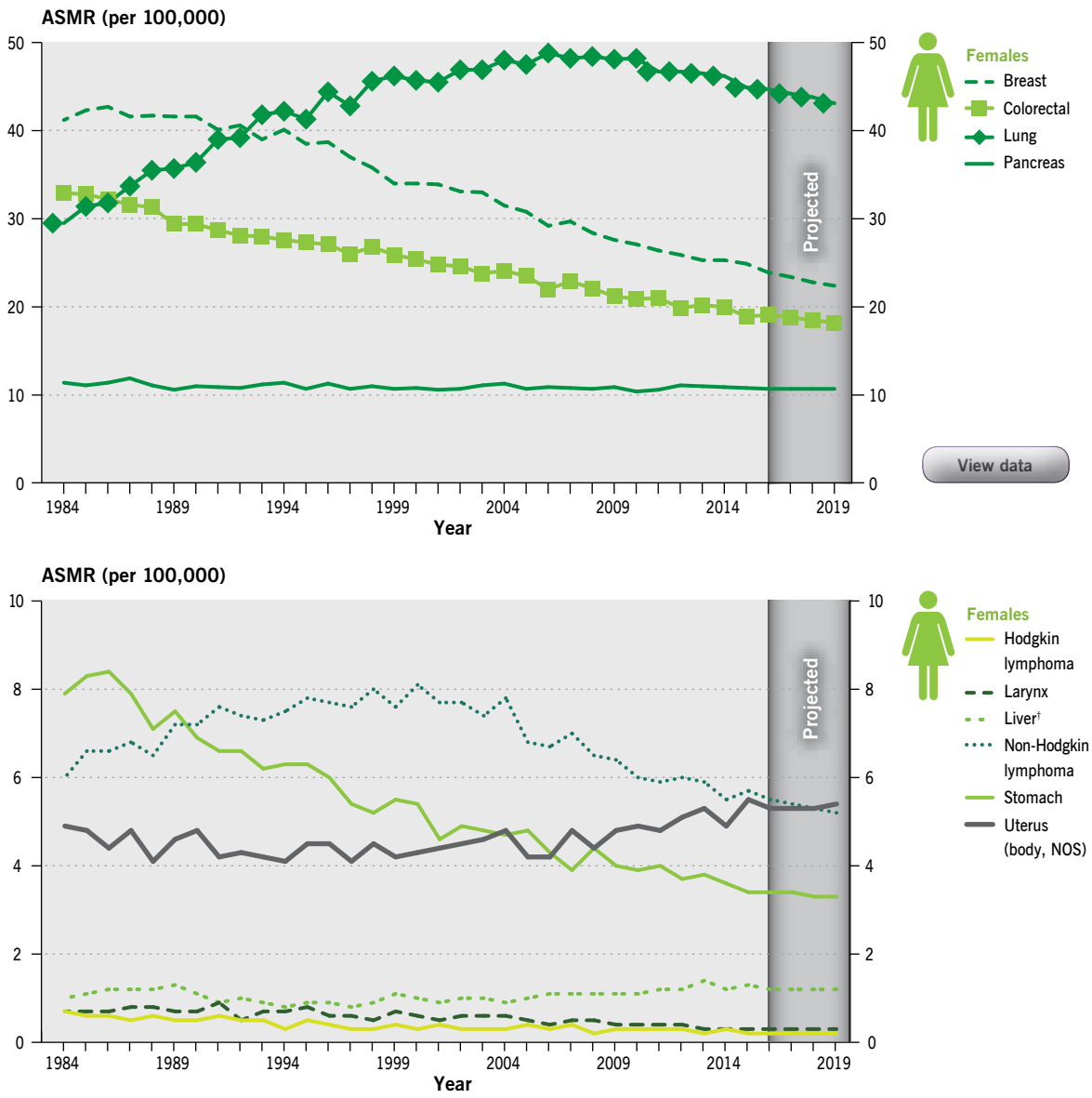
Long-term trends

Longer-term trends provide additional context for understanding the success and challenges in reducing cancer mortality. Table 2.6 shows trends in mortality rates between 1984 and 2015 by cancer type.

- For cancer mortality overall, the trend in rates was flat (0.4%) from 1984 until the late 1980s, after which the first decline (-0.6% per year) was observed. The decrease began accelerating in the early 2000s and there was a decrease of -1.4% per year between 2002 and 2015. However, the timing and rate of the changes differ considerably by type of cancer, as outlined below.

Figures 2.8 and 2.9 show the ASMR over time (projected to 2019) for the four leading causes of cancer death (lung, colorectal, pancreatic and female breast). They also show cancers that had a statistically significant change in APC of at least 2%: cancers of the larynx, stomach and liver, as well as Hodgkin lymphoma, for both sexes; non-Hodgkin lymphoma and uterine cancer in females; and prostate cancer in males.

FIGURE 2.9 Age-standardized mortality rates (ASMR) for selected* cancers, females, Canada, 1984–2019



Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada
Data source: Canadian Vital Statistics Death Database at Statistics Canada

NOS=not otherwise specified

* Four most frequent causes of cancer death (both sexes combined) and cancers with a statistically significant change in mortality rate of at least 2% per year, as measured by the most recent annual percent change (see Table 2.7).

† Liver cancer deaths are underestimated; see *Appendix II: Data sources and methods*.

Note: Rates are age-standardized to the 2011 Canadian population. Actual data for mortality were available to 2015. The range of scales differs widely between the figures. The complete definition of the specific cancers included here can be found in Table A1.

Lung and bronchus (lung) cancer

In males, the mortality rate for lung cancer was fairly stable in the 1980s and has been declining since 1991. From 1991 to 2007, the rate declined by -2.0% per year. Since then, it has declined by -2.8% per year. The mortality rate for females was still increasing until 2006, after which it has been decreasing by about -0.8% per year. The pattern in lung cancer mortality largely mirrors lung cancer incidence, which reflects past tobacco use. Despite the decreases, efforts to control tobacco use are still needed to further reduce the burden of lung cancer.[5] It continues to be the leading cause of cancer death in Canada, and approximately 15% of the Canadian population continues to smoke on a daily basis.[6] In addition, pilot studies are currently underway to investigate the feasibility of implementing lung cancer screening programs for high-risk populations.[7] The aim of these programs is to detect disease at an earlier stage when it may respond better to treatment. Currently, about 70% of lung cancers are diagnosed at a late stage (stage III or IV),[8] so these programs may help further reduce lung cancer mortality rates in the future.

Colorectal cancer

The mortality rates for colorectal cancer have declined significantly for both males (-2.3% per year between 2004 and 2015) and females (-1.7% per year between 1984 and 2015). Part of this decline may be driven by the decrease in incidence reported in Chapter 1. Additionally, it is likely that a significant portion of the decline in mortality is due to improvements in treatment.[9] Currently about 50% of colorectal cancers are detected at a late stage (stage III or IV).[8] Given the strong connection between stage at diagnosis and survival for colorectal cancer,[10,11] increased participation in colorectal cancer screening programs in Canada may help further reduce colorectal cancer mortality rates in the near future.

Pancreatic cancer

Although it is much less commonly diagnosed than many other cancers, pancreatic cancer is expected to be the third leading cause of cancer death in 2019. This is in part because there have been major decreases in mortality rates for cancers like lung, breast, prostate and colorectal, but there has been little to no change in pancreatic cancer mortality rates. For both sexes combined, there was a slight decrease in pancreatic cancer mortality rates between 1984 and 1998 (-0.9% per year), but there has been no significant change since 1998 (0.0%). The mortality rates for pancreatic cancer are almost as high as the incidence rates for this cancer due to the low survival.[12–14] Between countries, trends in pancreatic cancer mortality rates varied in the past decade. For example, the United Kingdom (UK) experienced decreases in pancreatic cancer mortality rates while the United States (US) showed increases in these rates.[15]

For more discussion about the burden of pancreatic cancer, see *Canadian Cancer Statistics 2017 (Chapter 6: Pancreatic cancer)*.[13]

Breast cancer (female)

The breast cancer mortality rate in females has been declining since the 1980s. After its peak in 1986, the ASMR has fallen 48%, from 42.7 deaths per 100,000 in 1986 to a projected rate of 22.4 deaths per 100,000 in 2019. The downward trend was estimated at -2.3% per year between 1994 and 2015, which is likely due to a combination of increased mammography screening[16] and the use of more effective therapies following breast cancer surgery.[17,18] Similar declines have been observed in the US, UK and Australia.[19]

Prostate cancer

The mortality rate for prostate cancer increased by about 1.2% per year between 1984 and 1994, but it has been declining by -2.8% per year since. The decline likely reflects improved treatment following the introduction of hormonal therapy for early and advanced-stage disease[20,21] and advances in radiation therapy.[22] The role that screening with the prostate-specific antigen (PSA) test played in the reduced mortality rate remains unclear. In 2009, two large randomized trials in the US and Europe reported conflicting results on the use of PSA testing in males older than 55 years of age.[23,24] The Canadian Task Force on Preventive Health Care does not recommend the use of the PSA test for screening based on the current evidence.[25] The ongoing follow-up with the men in these studies may help clarify whether PSA testing has a role in reducing deaths from prostate cancer.

Non-Hodgkin lymphoma

Following an era of rapidly increasing mortality from 1984 to 2000 (1.6%), the mortality rates for non-Hodgkin lymphoma are now decreasing by -2.2% per year. Meanwhile, incidence rates continue to increase in both sexes combined (Table 1.6). Therefore, the declines in mortality likely reflect recent improvements in treatment, such as immunotherapy (e.g., rituximab). In addition, the introduction of highly active antiretroviral therapy (HAART) in the late 1990s[26] for the human immunodeficiency virus (HIV) resulted in a decline of the aggressive forms of non-Hodgkin lymphoma attributable to HIV infection.

Stomach cancer

Between 1984 and 2015, mortality rates for stomach cancer declined for both males (-3.3% per year) and females (-2.8% per year). In 2019, the mortality rate for males is expected to be less than a third of what it was in 1984 and less than half of what it was in 1984 for females. The trend in mortality rates has followed the reduction in stomach cancer incidence rates during the same time period and may reflect a reduction in tobacco use, among other factors.[27]

Liver cancer

Mortality rates for liver cancer have increased significantly for both males (3.1% per year) and females (2.2% per year) since mid-1990s. The upward trend in mortality rates has followed the increase in liver cancer incidence rates (Table 1.6), that has been attributed to increased prevalence of hepatitis and alcohol consumption.[28,29]

Uterine cancer (body, not otherwise specified [NOS])

The mortality rate for uterine cancer increased by 2.0% per year between 2005 and 2015. The incidence rate for uterine cancer also increased through the mid-2000s, but it has been stable since 2011. Therefore, it is possible that the mortality rate for uterine cancer may also stop increasing in the near future. The past increase in uterine cancer incidence (and therefore mortality) has been attributed, at least in part, to increases in overweight and obesity,[30] an important risk factor for the disease.[31]

Laryngeal cancer

Mortality rates for laryngeal cancer have declined by -4.5% per year in males between 2001 and 2015, and by -4.7% per year in females between 2003 and 2015. The trend in mortality rates has followed the reduction in the laryngeal cancer incidence. Given that most laryngeal cancers are attributable to tobacco smoking,[32] sustained reductions in tobacco use[33] have likely driven the declines in incidence (and consequently mortality) rates for this cancer.

Hodgkin lymphoma

Hodgkin lymphoma mortality rates have been declining in both males and females. Initially, the decreases were very dramatic (-4.8% per year from 1984 to 1997). Then they declined less steeply (-2.3% per year from 1997 to 2015). Between 1984 and 2015, incidence rates for Hodgkin lymphoma have decreased only slightly (-0.2%). Therefore, the dramatic reductions in mortality can be largely attributed to improvements in treatment.[34]

Average annual percent change (AAPC)

Table 2.6 also shows the average annual percent change (AAPC) in cancers between 1984 and 2015. By summarizing changes in trends, the AAPC enables the comparison of changes in mortality across cancers for the same defined time period. Since 1984, the biggest improvements for both sexes combined were for Hodgkin lymphoma and cancers of the stomach and larynx, while the biggest increase was for liver cancer.

The AAPC also provides a measure of the overall change in a cancer over a period of time. For example, despite the increase in prostate cancer mortality rate between 1984 and 1994 (APC=1.2%), overall the mortality rate for this cancer has decreased since 1984 (AAPC=-1.5%). Also, while the mortality rate for lung cancer is finally decreasing for females (APC=-0.8%), overall it has increased since 1984 (AAPC=1.4%). In Canada, the mortality rate for all cancers combined has decreased by an average of 0.8% per year since 1984.

Average annual percent change (AAPC)

The weighted average of the APCs in effect during a period of time, where the weights equal the proportion of time accounted for by each APC in the interval. AAPC summarizes the change in age-standardized rates over a specified interval. It is reported as a percentage.

What do these statistics mean?

Encouragingly, the mortality rate for all cancers combined has been decreasing since the late 1980s. This is despite the fact that the incidence rate for all cancers combined has only been declining in Canada since 2011.

A decrease in the mortality rate for a specific cancer can result from a decrease in the incidence rate. For example, the relatively large decreases in mortality rates for lung and laryngeal cancers reflect the large decrease in cancer incidence rates caused by the reduction in smoking rates. As a result, it is not surprising that the patterns in mortality rates by sex, age and geographic region largely mirror the patterns reported in Chapter 1 for incidence. For example, cancer mortality rates are generally higher among males than females, most cancer deaths occur at older ages and cancer mortality rates are generally higher in the eastern than in the western Canada.

However, incidence is not the only factor that determines mortality. A decrease in the mortality rate for a specific cancer can also result from an improvement in the early detection. This is because the stage at diagnosis has a significant impact on cancer survival.[8] Improvements in treatments that increase the chances of survival also have an impact on mortality rates. As such, factors like access to cancer control interventions (e.g., screening) or variations in clinical practice patterns by province, age or sex also contribute to variations in mortality rates. There are likely also age and sex differences in the response to cancer treatment[35] that further contribute to variations in mortality rates.

Although the overall mortality rate continues to decline in Canada, the actual number of cancer deaths continues to increase due to the growth and aging of the population. This has implications for health policy and resource planning. Moreover, the mortality rate of some cancers, like liver cancer, continues to increase. Improving early detection and treatment for people diagnosed with cancer and improving supports for people living with and beyond cancer continues to be of the utmost importance.

Supplementary resources

Cancer.ca/statistics houses supplementary resources for this chapter. This includes:

- Excel spreadsheets with the statistics used to create the figures
- Excel spreadsheets with supplementary statistics
- PowerPoint images of the figures used throughout this chapter

References

1. Canadian Task Force on Preventive Healthcare. Recommendations on screening for colorectal cancer in primary care. CMAJ. 2016 Mar 15;188 340–8.
2. Klarenbach S, Sims-Jones N, Lewin G, Singh H, Theriault G, Tonelli M, et al. Recommendations on screening for breast cancer in women aged 40–74 years who are not at increased risk for breast cancer. CMAJ. 2018 Dec 10;190(49):E1441–51.
3. Statistics Canada [Internet]. Age and sex, and type of dwelling data: Key results from the 2016 Census. Ottawa, ON: The Daily: Statistics Canada; 2017. Available at: https://www150.statcan.gc.ca/n1/en/daily-quotidien/170503/dq170503a-eng.pdf?st=li6F_zjZ (accessed March 2019).
4. Statistics Canada [Internet]. Population size and growth in Canada: Key results from the 2016 Census. Ottawa, ON: The Daily: Statistics Canada; 2017. Available at: https://www.canada.ca/en/health-canada/services/canadian-tobacco-alcohol-drugs-survey/2017-summary.html (accessed March 2019).
5. Boer R, Moolgavkar SH, Levy DT. Chapter 15: Impact of tobacco control on lung cancer mortality in the United States over the period 1975–2000—summary and limitations. Risk Anal. 2012 Jul;32 Suppl 1:S190–201.
6. Statistics Canada. [Internet]. Canadian Tobacco, Alcohol and Drugs Survey (CTADS): summary of results for 2017. Ottawa, ON: Health Canada; 2017. Available at: https://www.canada.ca/en/health-canada/services/canadian-tobacco-alcohol-drugs-survey/2017-summary.html (accessed March 2019).
7. The Canadian Partnership Against Cancer [Internet]. Lung cancer screening in Canada. Toronto, ON; 2018. Available at: https://www.partnershipagainstcancer.ca/topics/lung-cancer-screening-environmental-scan-2018/ (accessed March 2019).
8. Canadian Cancer Statistics Advisory Committee [Internet]. Canadian Cancer Statistics 2018. Toronto, ON: Canadian Cancer Society; 2018. Available at: www.cancer.ca/Canadian-Cancer-Statistics-2018-EN (accessed March 2019).
9. Edwards BK, Ward E, Kohler BA, Eheman C, Zauber AG, Anderson RN, et al. Annual Report to the Nation on the Status of Cancer, 1975–2006, featuring colorectal cancer trends and impact of interventions (risk factors, screening, and treatment) to reduce future rates. Cancer. 2010 Feb;116(3):544–73.
10. White A, Joseph D, Rim SH, Johnson CJ, Coleman MP, Allemani C. Colon cancer survival in the United States by race and stage (2001–2009): Findings from the CONCORD-2 study. Cancer. 2017 Dec 15;123 Suppl 24:5014–36.
11. Joseph DA, Johnson CJ, White A, Wu M, Coleman MP. Rectal cancer survival in the United States by race and stage, 2001 to 2009: Findings from the CONCORD-2 study. Cancer. 2017 Dec 15;123 Suppl 24:5037–58.
12. Hurton S, MacDonald F, Porter G, Walsh M, Molinari M. The current state of pancreatic cancer in Canada: Incidence, mortality, and surgical therapy. Pancreas. 2014 Aug;43(6):879–85.
13. Canadian Cancer Society's Advisory Committee on Cancer Statistics [Internet]. Canadian Cancer Statistics 2017. Toronto, ON: Canadian Cancer Society; 2017. Available at: http://www.cancer.ca/Canadian-Cancer-Statistics-2017-EN (accessed March 2019).
14. Ellison LF. Progress in net cancer survival in Canada over 20 years. Health Rep. 2018 Sep;29(9):10–8.
15. Cancer Research UK [Internet]. Pancreatic cancer mortality statistics 2016. London, UK. Available at: http://www.cancerresearchuk.org/cancer-info/cancerstats/types/pancreas/mortality/uk-pancreatic-cancer-mortality-statistics (accessed March 2019).
16. Shields M, Wilkins K. An update on mammography use in Canada. Health Rep. 2009 Sep;20(3):7–19.
17. Holford TR, Cronin KA, Marriotto AB, Feuer EJ. Changing patterns in breast cancer incidence trends. J Natl Cancer Inst Monogr. 2006;36:19–25.
18. Edwards BK, Brown ML, Wingo PA, Howe HL, Ward E, Ries LA, et al. Annual report to the nation on the status of cancer, 1975–2002, featuring population-based trends in cancer treatment. J Natl Cancer Inst. 2005 Oct;97(19):1407–27.
19. Bray F, McCarron P, Parkin DM. The changing global patterns of female breast cancer incidence and mortality. Breast Cancer Res. 2004;6(6):229–39.
20. Cooperberg MR, Grossfeld GD, Lubeck DP, Carroll PR. National practice patterns and time trends in androgen ablation for localized prostate cancer. J Natl Cancer Inst. 2003 Jul 2;95(13):981–9.
21. Meng MV, Grossfeld GD, Sadetsky N, Mehta SS, Lubeck DP, Carroll PR. Contemporary patterns of androgen deprivation therapy use for newly diagnosed prostate cancer. Urology. 2002 Sep;60(3 Suppl 1):7–11; discussion 11-2.
22. Kupelian PA, Buchsbaum JC, Elshaikh MA, Reddy CA, Klein EA. Improvement in relapse-free survival throughout the PSA era in patients with localized prostate cancer treated with definitive radiotherapy: year of treatment an independent predictor of outcome. Int J Radiat Oncol Biol Phys. 2003 Nov;57(3):629–34.
23. Andriole GL, Crawford ED, Grubb RL III, Buys SS, Chia D, Church TR, et al. Mortality results from a randomized prostate-cancer screening trial. N Engl J Med. 2009;360(13):1310-9.
24. Schroder FH, Hugosson J, Roobol MJ, Tammela TL, Ciatto S, Nelen V, et al. Screening and prostate-cancer mortality in a randomized European study. N Engl J Med. 2009 Mar 26;360(13):1320–8.
25. Canadian Task Force on Preventive Health Care [Internet]. Prostate Cancer (2014): Summary of recommendations for clinicians and policy-makers. Available at: https://canadiantaskforce.ca/guidelines/published-guidelines/prostate-cancer/ (accessed March 2019).
26. Pulte D, Gondos A, Brenner H. Ongoing improvement in outcomes for patients diagnosed as having Non-Hodgkin lymphoma from the 1990s to the early 21st century. Arch Intern Med. 2008 Mar 10;168(5):469–76.
27. Chao A, Thun MJ, Henley SJ, Jacobs EJ, McCullough ML, Calle EE. Cigarette smoking, use of other tobacco products and stomach cancer mortality in US adults: The Cancer Prevention Study II. Int J Cancer. 2002 Oct 1;101(4):380–9.
28. Canadian Cancer Society's Advisory Committee on Cancer Statistics [Internet]. Canadian Cancer Statistics 2013. Toronto, ON: Canadian Cancer Society; 2013. Available at: http://www.cancer.ca/~/media/cancer.ca/CW/cancer%20information/cancer%20101/Canadian%20cancer%20statistics/canadian-cancer-statistics-2013-EN.pdf?la=en (accessed March 2019).
29. Thomas G [Internet]. Levels and Patterns of Alcohol Use in Canada: Alcohol Price Policy Series, Report 1 of 3. Ottawa, ON: Canadian Centre on Substance Abuse; 2012. Available at: http://www.ccsa.ca/Resource%20Library/CCSA-Patterns-Alcohol-Use-Policy-Canada-2012-en.pdf (accessed March 2019).
30. Twells LK, Gregory DM, Reddigan J, Midodzi WK. Current and predicted prevalence of obesity in Canada: A trend analysis. CMAJ Open. 2014 Mar 3;2(1):E18–26.
31. International Agency for Research on Cancer. IARC handbooks of cancer prevention: weight control and physical activity. Lyon, France: IARC; 2002.
32. Poirier AE, Grundy A, Khandwala F, Tamminen S, Friedenreich CM, Brenner DR. Cancer incidence attributable to tobacco in Alberta, Canada, in 2012. CMAJ Open. 2016 Oct 13;4(4):E578–87.
33. Organisation for Economic Co-operation Development (OECD) [Internet]. Daily smokers (indicator); 2015. Available at: https://data.oecd.org/healthrisk/daily-smokers.htm (accessed March 2019).
34. Koshy M, Fairchild A, Son CH, Mahmood U. Improved survival time trends in Hodgkin's lymphoma. Cancer Med. 2016 Jun;5(6):997–1003.
35. Schmetzer O, Florcken A. Sex differences in the drug therapy for oncologic diseases. Handb Exp Pharmacol. 2012(214):411–42.

TABLE 2.1 Lifetime probability of dying from cancer, Canada (excluding Quebec), 2015

	Lifetime probability of dying from cancer					
	%			One in:		
	Both sexes	Males	Females	Both sexes	Males	Females
All cancers	**24.2**	**26.2**	**22.5**	**4.1**	**3.8**	**4.4**
Lung and bronchus	5.7	6.2	5.4	17	16	19
Colorectal	2.9	3.1	2.7	35	32	37
Pancreas	1.5	1.5	1.5	68	68	68
Breast	1.6	0.0	3.1	63	2,833	33
Prostate	—	3.5	—	—	29	—
Leukemia	0.9	1.0	0.7	114	96	137
Non-Hodgkin lymphoma	1.0	1.1	0.9	102	89	117
Bladder	0.8	1.2	0.4	130	86	233
Brain/CNS	0.6	0.6	0.5	179	162	200
Esophagus	0.6	0.9	0.3	166	109	330
Stomach	0.6	0.7	0.4	173	138	225
Kidney and renal pelvis	0.6	0.7	0.4	181	140	249
Ovary	—	—	1.1	—	—	90
Multiple myeloma	0.5	0.5	0.4	213	183	250
Oral	0.4	0.5	0.3	261	193	393
Liver*	0.3	0.5	0.2	299	198	584
Melanoma	0.3	0.5	0.2	287	219	402
Uterus (body, NOS)	—	—	0.7	—	—	147
Cervix	—	—	0.2	—	—	478
Larynx	0.1	0.2	0.0	912	529	2770
Thyroid	0.1	0.1	0.1	1,353	1,567	1,189
Hodgkin lymphoma	0.0	0.0	0.0	2,924	2,532	3,460
Testis	—	0.0	—	—	7,874	—

—Not applicable; CNS=central nervous system; NOS=not otherwise specified; 0.0 value less than 0.05

* Liver cancer mortality was underestimated because deaths from liver cancer, unspecified (ICD-10 code C22.9), were excluded. For further details, see *Appendix II: Data sources and methods.*

Note: The probability of dying from cancer represents the proportion of Canadians who die of cancer in a cohort based on age-, sex-, and cause-specific mortality rates for Canada in 2015. For further details, see *Appendix II: Data sources and methods*.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death Database at Statistics Canada

TABLE 2.2 Projected deaths and age-standardized mortality rates (ASMR)* for cancers, by sex, Canada, 2019

	Deaths (2019 estimates)			Deaths per 100,000		
	Total†	Males	Females	Both sexes	Males	Females
All cancers	**82,100**	**43,300**	**38,700**	**190.3**	**222.8**	**166.0**
Lung and bronchus	21,000	10,900	10,100	48.1	54.7	43.1
Colorectal	9,500	5,200	4,400	22.1	26.8	18.2
Pancreas	5,200	2,700	2,500	12.0	13.5	10.7
Breast	5,100	55	5,000	12.2	0.3	22.4
Prostate	4,100	4,100	—	—	22.2	—
Leukemia	3,000	1,750	1,250	6.9	9.1	5.2
Non-Hodgkin lymphoma	2,800	1,600	1,250	6.6	8.3	5.2
Bladder	2,500	1,800	700	5.7	9.7	2.8
Brain/CNS	2,400	1,400	1,050	5.8	7.1	4.7
Esophagus	2,200	1,700	500	5.1	8.6	2.1
Stomach	1,950	1,200	760	4.6	6.2	3.3
Kidney and renal pelvis	1,900	1,250	670	4.4	6.4	2.8
Ovary	1,900	—	1,900	—	—	8.4
Multiple myeloma	1,550	860	690	3.6	4.4	2.9
Oral	1,450	1,050	430	3.5	5.3	1.8
Liver‡	1,400	1,100	280	3.2	5.4	1.2
Melanoma	1,300	840	450	3.1	4.4	2.0
Uterus (body, NOS)	1,250	—	1,250	—	—	5.3
Cervix	410	—	410	—	—	2.0
Larynx	400	330	75	0.9	1.7	0.3
Thyroid	230	100	130	0.5	0.5	0.5
Hodgkin lymphoma	100	60	40	0.2	0.3	0.2
Testis	35	35	—	—	0.2	—
All other cancers	10,300	5,300	4,900	23.8	27.9	20.8

— Not applicable; CNS=central nervous system; NOS=not otherwise specified

* Rates are age-standardized to the 2011 Canadian population.

† Column totals may not sum to row totals due to rounding.

‡ Liver cancer mortality was underestimated because deaths from liver cancer, unspecified (ICD-10 code C22.9), were excluded. For further details, see *Appendix II: Data sources and methods*.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death Database at Statistics Canada

TABLE 2.3 Projected deaths for the most common causes of cancer death, by age group and sex, Canada, 2019

Age	All cancers			Lung and bronchus			Colorectal		
	Both sexes*	Males	Females	Both sexes*	Males	Females	Both sexes*	Males	Females
All ages	**82,100**	**43,300**	**38,700**	**21,000**	**10,900**	**10,100**	**9,500**	**5,200**	**4,400**
0–14	110	55	50	—	—	—	—	—	—
15–29	220	120	100	—	—	—	10	5	5
30–39	640	270	370	40	10	25	75	40	30
40–49	2,100	920	1,200	290	120	170	250	140	110
50–59	7,900	4,000	3,900	1,900	920	960	870	510	370
60–69	18,400	10,100	8,400	5,600	2,900	2,600	1,900	1,150	730
70–79	24,800	13,700	11,100	7,400	3,900	3,400	2,700	1,600	1,100
80+	27,800	14,100	13,600	5,800	3,000	2,900	3,800	1,750	2,000
50–74	38,900	21,100	17,900	11,300	5,900	5,400	4,100	2,500	1,600
65+	63,000	33,600	29,400	16,400	8,600	7,800	7,500	4,000	3,500

Age	Pancreatic			Breast	Prostate
	Both sexes*	Males	Females	Females	Males
All ages	**5,200**	**2,700**	**2,500**	**5,000**	**4,100**
0–14	—	—	—	—	—
15–29	—	—	—	5	—
30–39	15	10	5	120	—
40–49	110	65	50	330	5
50–59	540	310	230	760	110
60–69	1,250	710	550	1,100	530
70–79	1,650	870	780	1,150	1,150
80+	1,650	700	930	1,600	2,300
50–74	2,700	1,500	1,150	2,400	1,150
65+	4,000	1,950	2,000	3,300	3,800

— Fewer than 3 deaths.

* Counts for both sexes may not sum to row totals due to rounding.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada
Data source: Canadian Vital Statistics Death Database at Statistics Canada

TABLE 2.4 Projected age-standardized mortality rates (ASMR) for selected cancers, by sex and province, Canada,* 2019

	CA	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Males											
All cancers	**222.8**	**205.7**	**202.4**	**221.9**	**240.6**	**210.6**	**247.2**	**245.8**	**268.4**	**233.3**	**267.6**
Lung and bronchus	54.7	42.9	45.0	52.8	49.9	47.9	71.5	73.3	69.9	72.5	75.5
Colorectal	26.8	25.8	24.4	29.1	30.6	22.7	31.2	28.0	38.4	28.4	45.8
Prostate	22.2	22.0	25.8	29.8	27.9	21.3	19.8	21.4	25.9	23.4	27.6
Pancreas	13.5	13.6	12.3	13.6	13.9	13.2	14.0	15.4	14.1	13.1	13.2
Bladder	9.7	10.1	8.8	10.4	9.5	9.4	10.1	9.7	11.4	9.8	8.3
Leukemia	9.1	8.2	8.2	9.3	11.2	9.0	9.9	8.6	10.7	8.3	6.9
Esophagus	8.6	9.5	10.3	10.3	9.9	8.6	6.7	9.4	11.0	8.0	8.4
Non-Hodgkin lymphoma	8.3	8.1	7.2	9.7	8.5	8.6	8.0	8.9	10.3	7.5	9.8
Brain/CNS	7.1	7.2	6.6	5.9	5.5	7.1	7.8	6.2	7.3	5.9	6.8
Kidney and renal pelvis	6.4	5.8	5.6	7.7	8.9	5.9	6.8	8.7	8.9	7.5	8.9
Stomach	6.2	5.1	5.2	4.1	6.1	6.3	7.3	5.7	5.2	—	11.2
Liver†	5.4	6.9	5.0	2.7	4.5	5.5	5.3	4.5	5.5	—	3.0
Oral	5.3	4.6	4.1	4.0	3.5	6.2	5.4	4.0	3.7	3.7	5.7
Multiple myeloma	4.4	3.7	4.1	3.8	5.6	4.5	4.8	4.2	4.5	5.6	3.8
Melanoma	4.4	3.6	3.6	4.0	3.9	5.3	3.8	3.5	6.2	4.2	2.6
Larynx	1.7	1.1	1.7	1.5	1.1	1.5	2.1	1.8	2.2	—	3.8
Thyroid	0.5	0.5	0.6	0.6	0.4	0.6	0.5	0.5	—	—	—
Hodgkin lymphoma	0.3	0.3	0.2	—	—	0.3	0.4	—	—	—	—
Breast	0.3	0.2	0.4	—	—	0.3	0.3	—	0.6	—	—
Testis	0.2	0.2	0.2	—	—	0.2	0.2	—	—	—	—
Females											
All cancers	**166.0**	**160.1**	**154.4**	**169.8**	**180.9**	**155.7**	**181.5**	**171.0**	**195.4**	**155.6**	**197.2**
Lung and bronchus	43.1	39.1	41.0	45.2	46.3	36.3	54.6	46.7	54.4	46.4	44.6
Breast	22.4	21.3	22.0	24.8	24.7	21.8	23.3	20.6	24.3	16.6	26.6
Colorectal	18.2	19.9	15.4	20.0	19.8	16.2	19.6	17.7	22.4	19.6	31.9
Pancreas	10.7	10.5	11.1	10.8	11.0	10.4	11.0	10.9	11.8	10.7	9.0
Ovary	8.4	8.8	7.6	9.7	9.1	8.0	8.6	9.7	10.0	6.4	9.2
Non-Hodgkin lymphoma	5.2	4.7	4.6	5.4	4.9	5.3	5.2	6.7	6.9	7.4	6.8
Leukemia	5.2	5.4	4.6	5.1	5.1	5.2	5.4	5.6	5.8	8.0	4.2
Uterus (body, NOS)	5.3	4.9	4.9	4.7	4.8	5.8	5.0	4.7	7.4	3.6	4.8
Brain/CNS	4.7	4.9	4.0	4.0	3.8	4.7	5.2	4.3	4.7	—	5.5
Stomach	3.3	2.8	3.0	2.2	2.8	3.4	3.6	3.0	2.1	3.4	4.7
Bladder	2.8	2.8	2.4	2.2	2.6	2.9	3.0	2.5	2.7	—	2.9
Multiple myeloma	2.9	3.0	2.6	3.1	3.4	2.7	2.9	3.4	3.0	—	3.0
Kidney and renal pelvis	2.8	2.3	2.5	3.6	3.8	2.4	3.1	4.2	3.9	—	5.6
Esophagus	2.1	2.5	2.2	2.0	1.6	2.2	1.8	2.4	2.6	—	1.8
Melanoma	2.0	1.9	2.0	1.8	1.8	2.2	1.8	1.9	2.6	—	1.6
Oral	1.8	2.1	1.6	1.6	1.9	1.8	2.1	1.4	1.1	—	0.8
Cervix	2.0	1.6	1.8	3.7	2.2	2.0	1.9	2.3	1.7	—	3.0
Liver†	1.2	1.5	1.4	0.6	1.2	1.3	1.1	—	0.7	—	1.1
Thyroid	0.5	0.6	0.6	—	0.6	0.6	0.5	0.5	—	—	1.0
Larynx	0.3	0.2	0.3	—	—	0.2	0.6	—	0.5	—	—
Hodgkin lymphoma	0.2	0.1	0.1	—	—	0.3	0.3	—	—	—	—

— ASMR based on fewer than 3 deaths; CNS=central nervous system; NOS=not otherwise specified

* Canada totals include provincial and territorial estimates. Territories are not listed due to small numbers.

† Liver cancer deaths are underestimated; see *Appendix II: Data sources and methods*.

Note: Rates are age-standardized to the 2011 Canadian population. The complete definition of thespecific cancers listed here can be found in Table A1.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death Database at Statistics Canada

TABLE 2.5 Projected deaths for selected cancers by sex and province, Canada,* 2019

	CA†	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Males											
All cancers	**43,300**	**5,800**	**3,700**	**1,250**	**1,550**	**15,600**	**11,700**	**1,150**	**1,550**	**210**	**850**
Lung and bronchus	10,900	1,250	840	310	320	3,600	3,500	350	420	65	250
Colorectal	5,200	720	450	170	200	1,650	1,450	130	220	25	150
Prostate	4,100	600	430	160	170	1,500	880	90	140	20	80
Pancreas	2,700	380	230	80	90	1,000	670	75	80	10	45
Bladder	1,800	280	150	60	60	680	460	45	65	10	25
Leukemia	1,750	230	140	50	70	660	460	40	60	10	20
Esophagus	1,700	270	200	60	65	650	320	45	65	10	25
Non-Hodgkin lymphoma	1,600	220	130	55	55	630	370	40	55	5	30
Brain/CNS	1,400	190	140	35	35	520	370	30	40	5	20
Kidney and renal pelvis	1,250	160	110	45	55	440	320	40	50	5	30
Stomach	1,200	140	95	25	40	460	350	25	30	—	35
Liver‡	1,100	200	100	15	30	430	260	25	35	—	10
Oral	1,050	130	80	25	25	470	260	20	20	5	20
Multiple myeloma	860	110	75	20	35	330	230	20	25	5	15
Melanoma	840	100	65	25	25	390	170	15	35	5	10
Larynx	330	30	35	10	5	110	100	10	15	—	10
Thyroid	100	15	10	5	5	45	20	5	—	—	—
Hodgkin lymphoma	60	10	5	—	—	25	20	—	—	—	—
Breast	55	5	5	—	—	20	10	—	5	—	—
Testis	35	5	5	—	—	15	10	—	—	—	—
Females											
All cancers	**38,700**	**5,100**	**3,300**	**1,150**	**1,400**	**14,100**	**10,400**	**950**	**1,350**	**170**	**740**
Lung and bronchus	10,100	1,250	870	300	360	3,300	3,100	260	380	50	170
Breast	5,000	650	470	170	180	1,900	1,300	110	160	15	95
Colorectal	4,400	650	330	140	160	1,500	1,200	100	160	20	120
Pancreas	2,500	340	240	70	85	960	650	60	85	10	35
Ovary	1,900	280	160	60	65	700	480	50	70	5	35
Non-Hodgkin lymphoma	1,250	150	100	40	40	490	310	40	50	10	25
Leukemia	1,250	170	100	35	40	480	320	30	40	10	15
Uterus (body, NOS)	1,250	150	110	30	35	520	290	25	50	5	20
Brain/CNS	1,050	140	85	25	25	400	280	20	30	—	20
Stomach	760	90	65	15	20	310	210	15	15	5	20
Bladder	700	95	50	15	20	280	180	15	20	—	10
Multiple myeloma	690	100	55	20	25	260	180	20	20	—	10
Kidney and renal pelvis	670	75	55	25	30	220	180	25	30	—	20
Esophagus	500	80	50	15	15	200	110	15	20	—	5
Melanoma	450	60	45	10	15	190	95	10	15	—	5
Oral	430	65	35	10	15	160	120	10	10	—	5
Cervix	410	45	40	20	15	160	95	10	10	—	10
Liver‡	280	45	30	5	10	120	65	—	5	—	5
Thyroid	130	20	15	—	5	50	25	5	—	—	5
Larynx	75	5	5	—	—	20	35	—	5	—	—
Hodgkin lymphoma	40	5	5	—	—	20	15	—	—	—	—

— Fewer than 3 deaths; CNS=central nervous system; NOS=not otherwise specified

* Canada totals include provincial and territorial estimates. Territories are not listed due to small numbers.

† Canadian counts may not sum to row totals due to rounding.

‡ Liver cancer deaths are underestimated; see *Appendix II: Data sources and methods*.

Note: The complete definition of the specific cancers listed here can be found in Table A1.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death Database at Statistics Canada

TABLE 2.6 Annual percentage change (APC) and average annual percent change (AAPC) in age-standardized mortality rates (ASMR) for selected cancers, by sex, Canada, 1984–2015

	Both sexes			Males			Females		
	Period	APC (95% CL)	AAPC (95% CL), 1984–2015	Period	APC (95% CL)	AAPC (95% CL), 1984–2015	Period	APC (95% CL)	AAPC (95% CL), 1984–2015
All cancers	**1984–1988**	**0.4 (-0.2, 1.1)**	**-0.8 (-0.9, -0.7)**	**1984–1988**	**0.6 (-0.1, 1.4)**	**-1.1 (-1.2, -1.0)**	**1984–2002**	**-0.1 (-0.2, -0.1)**	**-0.6 (-0.6, -0.5)**
	1988–2002	**-0.6 (-0.7, -0.5)**		**1988–2001**	**-0.8 (-1.0, -0.7)**		**2002–2015**	**-1.2 (-1.3, -1.1)**	
	2002–2015	**-1.4 (-1.5, -1.4)**		**2001–2015**	**-1.8 (-1.9, -1.7)**				
Lung and bronchus	1984–1992	1.0 (0.5, 1.5)	-0.6 (-0.7, -0.4)	1984–1991	0.2 (-0.5, 0.9)	-1.7 (-1.9, -1.5)	1984–1993	3.8 (3.2, 4.3)	1.4 (1.1, 1.6)
	1992–2007	-0.7 (-0.9, -0.6)		1991–2007	-2.0 (-2.2, -1.8)		1993–2006	1.3 (1.0, 1.6)	
	2007–2015	-1.8 (-2.2, -1.5)		2007–2015	-2.8 (-3.2, -2.3)		2006–2015	-0.8 (-1.2, -0.5)	
Colorectal	1984–2004	-1.3 (-1.4, -1.2)	-1.6 (-1.7, -1.5)	1984–2004	-1.0 (-1.2, -0.9)	-1.5 (-1.6, -1.4)	1984–2015	-1.7 (-1.8, -1.6)	-1.7 (-1.8, -1.6)
	2004–2015	-2.1 (-2.3, -1.8)		2004–2015	-2.3 (-2.6, -2.1)				
Pancreas	1984–1998	-0.9 (-1.2, -0.5)	-0.4 (-0.6, -0.2)	1984–1998	-1.5 (-1.9, -1.1)	-0.7 (-1.0, -0.5)	1984–2015	-0.1 (-0.2, -0.0)	-0.1 (-0.2, -0.0)
	1998–2015	-0.0 (-0.2, 0.2)		1998–2015	-0.1 (-0.4, 0.2)				
Breast	1984–1994	-0.6 (-1.0, -0.2)	-1.8 (-2.0, -1.7)	1984–2015	-1.0 (-1.6, -0.4)	-1.0 (-1.6, -0.4)	1984–1994	-0.7 (-1.1, -0.3)	-1.8 (-1.9, -1.6)
	1994–2015	-2.4 (-2.5, -2.3)					1994–2015	-2.3 (-2.4, -2.2)	
Prostate				1984–1994	1.2 (0.6, 1.8)	-1.5 (-1.7, -1.3)			
				1994–2015	-2.8 (-3.0, -2.6)				
Leukemia	1984–2015	-0.9 (-1.0, -0.8)	-0.9 (-1.0, -0.8)	1984–2015	-0.9 (-1.0, -0.8)	-0.9 (-1.0, -0.8)	1984–2015	-1.0 (-1.1, -0.8)	-1.0 (-1.1, -0.8)
Non-Hodgkin lymphoma	1984–2000	1.6 (1.2, 1.9)	-0.3 (-0.5, -0.1)	1984–2000	1.8 (1.5, 2.2)	0.1 (-0.3, 0.4)	1984–2000	1.4 (1.0, 1.8)	-0.5 (-0.8, -0.3)
	2000–2015	-2.2 (-2.5, -2.0)		2000–2011	-2.4 (-2.9, -1.9)		2000–2015	-2.5 (-2.9, -2.1)	
				2011–2015	-0.2 (-2.2, 1.8)				
Bladder	1984–2015	-0.3 (-0.5, -0.2)	-0.3 (-0.5, -0.2)	1984–2015	-0.5 (-0.6, -0.3)	-0.5 (-0.6, -0.3)	1984–2015	-0.4 (-0.6, -0.2)	-0.4 (-0.6, -0.2)
Brain/CNS	1984–2005	-0.6 (-0.8, -0.4)	-0.2 (-0.4, 0.0)	1984–2015	-0.2 (-0.4, -0.1)	-0.2 (-0.4, -0.1)	1984–2006	-0.7 (-1.0, -0.5)	-0.1 (-0.4, 0.1)
	2005–2015	0.8 (0.3, 1.2)					2006–2015	1.3 (0.5, 2.1)	
Esophagus	1984–1999	0.8 (0.4, 1.1)	0.3 (0.1, 0.5)	1984–2008	0.6 (0.4, 0.8)	0.2 (-0.0, 0.5)	1984–2015	-0.5 (-0.7, -0.3)	-0.5 (-0.7, -0.3)
	1999–2015	-0.2 (-0.5, 0.0)		2008–2015	-1.0 (-1.9, -0.1)				
Stomach	1984–2015	-3.0 (-3.1, -2.9)	-3.0 (-3.1, -2.9)	1984–2015	-3.3 (-3.4, -3.2)	-3.3 (-3.4, -3.2)	1984–2015	-2.8 (-3.0, -2.7)	-2.8 (-3.0, -2.7)
Kidney and renal pelvis	1984–2015	-0.5 (-0.6, -0.3)	-0.5 (-0.6, -0.3)	1984–2015	-0.4 (-0.6, -0.2)	-0.4 (-0.6, -0.2)	1984–2015	-0.7 (-0.9, -0.5)	-0.7 (-0.9, -0.5)
Ovary							1984–2015	-0.8 (-0.9, -0.6)	-0.8 (-0.9, -0.6)
Multiple myeloma	1984–2015	-0.9 (-1.0, -0.8)	-0.9 (-1.0, -0.8)	1984–1994	0.9 (-0.6, 2.4)	-0.4 (-1.0, 0.1)	1984–2002	-0.0 (-0.5, 0.5)	-0.7 (-1.1, -0.3)
	1994–2015	-1.0 (-1.3, -0.8)		1994–2015	-1.1 (-1.4, -0.7)		2002–2015	-1.7 (-2.4, -1.0)	
Oral	1984–2009	-1.8 (-2.0, -1.6)	-1.3 (-1.7, -0.9)	1984–2009	-2.2 (-2.5, -1.9)	-1.5 (-2.0, -1.1)	1984–2015	-1.0 (-1.3, -0.8)	-1.0 (-1.3, -0.8)
	2009–2015	1.0 (-0.9, 2.9)		2009–2015	1.1 (-1.2, 3.5)				
Liver*	1984–1996	-1.0 (-2.2, 0.1)	1.5 (1.0, 2.0)	1984–1995	-0.6 (-2.1, 1.0)	1.8 (1.2, 2.4)	1984–1989	3.1 (-1.9, 8.4)	0.6 (-0.7, 2.0)
	1996–2015	3.1 (2.6, 3.5)		1995–2015	3.1 (2.7, 3.6)		1989–1994	-8.1 (-14.3, -1.5)	
							1994–2015	2.2 (1.8, 2.7)	
Melanoma	1984–2015	0.9 (0.7, 1.1)	0.9 (0.7, 1.1)	1984–2015	1.2 (1.0, 1.5)	1.2 (1.0, 1.5)	1984–2015	0.4 (0.1, 0.6)	0.4 (0.1, 0.6)
Uterus (body, NOS)							1984–2005	-0.8 (-1.1, -0.5)	0.1 (-0.2, 0.4)
							2005–2015	2.0 (1.1, 2.8)	

Continued on next page

TABLE 2.6 Annual percentage change (APC) and average annual percent change (AAPC) in age-standardized mortality rates (ASMR) for selected cancers, by sex, Canada, 1984–2015

	Both sexes			Males			Females		
	Period	APC (95% CL)	AAPC (95% CL), 1984–2015	Period	APC (95% CL)	AAPC (95% CL), 1984–2015	Period	APC (95% CL)	AAPC (95% CL), 1984–2015
Cervix							1984–2008	-2.8 (-3.1, -2.5)	-2.1 (-2.6, -1.7)
							2008–2015	0.2 (-1.7, 2.2)	
Larynx	1984–1991	0.9 (-1.2, 3.1)	-2.6 (-3.2, -2.1)	1984–1988	2.8 (-1.7, 7.6)	-2.8 (-3.5, -2.2)	1984–2003	-1.6 (-2.6, -0.6)	-2.8 (-3.7, -1.9)
	1991–2015	-3.7 (-4.0, -3.3)		1988–2001	-2.7 (-3.5, -1.9)		2003–2015	-4.7 (-6.5, -2.8)	
				2001–2015	-4.5 (-5.1,-3.8)				
Thyroid	1984–2015	-0.2 (-0.6, 0.2)	-0.2 (-0.6, 0.2)	1984–2015	0.5 (-0.2, 1.2)	0.5 (-0.2, 1.2)	1984–2015	-0.6 (-1.1, -0.0)	-0.6 (-1.1, -0.0)
Hodgkin lymphoma	1984–1997	-4.8 (-5.9, -3.5)	-3.3 (-4.0, -2.7)	1984–1996	-5.2 (-6.6, -3.8)	-3.5 (-4.3,-2.8)	1984–2015	-3.1 (-3.5, -2.7)	-3.1 (-3.5, -2.7)
	1997–2015	-2.3 (-3.2, -1.5)		1996–2015	-2.5 (-3.3,-1.6)				
Testis				1984–2015	-1.9 (-2.6, -1.2)	-1.9 (-2.6, -1.2)			
All other cancers	1984–1998	1.1 (0.5, 1.6)	0.0 (-0.6, 0.6)	1984–2004	1.6 (1.2, 2.0)	0.1 (-0.2, 0.5)	1984–2003	1.4 (1.0, 1.7)	0.0 (-0.3, 0.3)
	1998–2002	3.5 (-1.1, 8.4)		2004–2015	-2.6 (-3.3, -1.8)		2003–2015	-2.0 (-2.6, -1.5)	
	2002–2015	-2.2 (-2.6, -1.7)							

CL=confidence limits; CNS=central nervous system; NOS=not otherwise specified

* Liver cancer deaths are underestimated; see *Appendix II: Data sources and methods*.

Note: The APC and the AAPC were calculated using the Joinpoint Regression Program using rates from 1984–2015. For further details, see *Appendix II: Data sources and methods*. The complete definition of the specific cancers listed here can be found in Table A1. Rates are standardized to the 2011 Canadian population.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death Database at Statistics Canada

TABLE 2.7 Most recent annual percent change (APC) in age-standardized mortality rates (ASMR) for selected cancers, by sex, Canada, 1984–2015

	Both sexes		Males		Females	
	Reference year	APC* (95% CL)	Reference year	APC* (95% CL)	Reference year	APC* (95% CL)
All cancers	**2002**	**-1.4 (-1.5, -1.4)**	**2001**	**-1.8 (-1.9, -1.7)**	**2002**	**-1.2 (-1.3, -1.1)**
Lung and bronchus	2007	-1.8 (-2.2, -1.5)	2007	-2.8 (-3.2, -2.3)	2006	-0.8 (-1.2, -0.5)
Colorectal	2004	-2.1 (-2.3, -1.8)	2004	-2.3 (-2.6, -2.1)	1984	-1.7 (-1.8, -1.6)
Pancreas	1998	0.0 (-0.2, 0.2)	1998	-0.1 (-0.4, 0.2)	1984	-0.1 (-0.2, -0.0)
Breast	1994	-2.4 (-2.5, -2.3)	1984	-1.0 (-1.6, -0.4)	1994	-2.3 (-2.4, -2.2)
Prostate	—	—	1994	-2.8 (-3.0, -2.6)	—	—
Leukemia	1984	-0.9 (-1.0, -0.8)	1984	-0.9 (-1.0, -0.8)	1984	-1.0 (-1.1, -0.8)
Non-Hodgkin lymphoma	2000	-2.2 (-2.5, -2.0)	2011	-0.2 (-2.2, 1.8)	2000	-2.5 (-2.9, -2.1)
Bladder	1984	-0.3 (-0.5, -0.2)	1984	-0.5 (-0.6, -0.3)	1984	-0.4 (-0.6, -0.2)
Brain/CNS	2005	0.8 (0.3, 1.2)	1984	-0.2 (-0.4, -0.1)	2006	1.3 (0.5, 2.1)
Esophagus	1999	-0.2 (-0.5, 0.0)	2008	-1.0 (-1.9, -0.1)	1984	-0.5 (-0.7, -0.3)
Stomach	1984	-3.0 (-3.1, -2.9)	1984	-3.3 (-3.4, -3.2)	1984	-2.8 (-3.0, -2.7)
Kidney and renal pelvis	1984	-0.5 (-0.6, -0.3)	1984	-0.4 (-0.6, -0.2)	1984	-0.7 (-0.9, -0.5)
Ovary	—	—		—	1984	-0.8 (-0.9, -0.6)
Multiple myeloma	1994	-1.0 (-1.3, -0.8)	1994	-1.1 (-1.4, -0.7)	2002	-1.7 (-2.4, -1.0)
Oral	2009	1.0 (-0.9, 2.9)	2009	1.1 (-1.2, 3.5)	1984	-1.0 (-1.3, -0.8)
Liver†	1996	3.1 (2.6, 3.5)	1995	3.1 (2.7, 3.6)	1994	2.2 (1.8, 2.7)
Melanoma	1984	0.9 (0.7, 1.1)	1984	1.2 (1.0, 1.5)	1984	0.4 (0.1, 0.6)
Uterus (body, NOS)	—	—	—	—	2005	2.0 (1.1, 2.8)
Cervix	—	—	—	—	2008	0.2 (-1.7, 2.2)
Larynx	1991	-3.7 (-4.0, -3.3)	2001	-4.5 (-5.1, -3.8)	2003	-4.7 (-6.5, -2.8)
Thyroid	1984	-0.2 (-0.6, 0.2)	1984	0.5 (-0.2, 1.2)	1984	-0.6 (-1.1, -0.0)
Hodgkin lymphoma	1997	-2.3 (-3.2, -1.5)	1996	-2.5 (-3.3, -1.6)	1984	-3.1 (-3.5, -2.7)
Testes	—	—			—	—
All other cancers	2002	-2.2 (-2.6, -1.7)	2004	-2.6 (-3.3, -1.8)	2003	-2.0 (-2.6, -1.5)

—Not applicable; CL=confidence limits; CNS=central nervous system; NOS=not otherwise specified

* The APC was calculated using the Joinpoint Regression Program using rates from 1984–2015. If one or more significant change in the trend of rates was detected, the APC reflects the trend from the more recent significant change (reference year) to 2015. Otherwise, the APC reflects the trend in rates over the entire period (1984–2015).

† Liver cancer deaths are underestimated; see *Appendix II: Data sources and methods*.

Note: Rates are age-standardized to the 2011 Canadian population. The complete definition of the specific cancers listed here can be found in Table A1.

Analysis by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death Database at Statistics Canada

Chapter 3

What is the probability of surviving cancer in Canada?

Net survival by sex, age, geography and year

Population-based cancer survival includes all people diagnosed with cancer in a defined geographic area (such as a province) regardless of their age, health status or access to health insurance and medical care. It provides useful "average" estimates of survival and does not reflect any individual's prognosis. Along with incidence and mortality data, population-based cancer survival is a key metric by which to evaluate cancer care and screening initiatives in the population.[1,2]

Predicted five-year net survival is 63%.

Key findings

- For 2012 to 2014, the age-standardized predicted five-year net survival for all cancers combined was 63%. This was up from 55% in the early 1990s.
- The highest five-year net survival was for cancers of the thyroid (98%), testis (97%) and prostate (93%). It was lowest for cancers of the pancreas (8%), esophagus (15%), lung and bronchus (lung) (19%) and liver (19%).
- Females have higher net survival compared to males for most of the cancers studied.
- Net survival generally decreased with advancing age.
- 84% of children diagnosed with cancer survived at least five years.

Net survival

The survival probability that would be observed in the hypothetical situation where the cancer of interest is the only possible cause of death (i.e., the survival as far as the cancer of interest is concerned). Net survival is the preferred method for comparing cancer survival in population-based cancer studies because it adjusts for the fact that different populations may have different levels of background risk of death. It can be measured over various timeframes but, as is standard in other reports, five years has been chosen as the primary duration of analysis for this publication.

Predicted survival

Predicted (period) survival provides a more up-to-date estimate of survival by exclusively using the survival experienced by cancer cases during a recent period (e.g., 2012–2014). When there is an increasing trend in survival, predicted estimates provide a more up-to-date, though conservative, measure of recent survival.[3,4]

Five- and 10-year net survival

Population-based net cancer survival provides a measure of the prognosis for a cancer. Table 3.1 shows the predicted five- and 10-year net survival by sex for people diagnosed with cancer at ages 15 to 99 years.

- For all cancers combined, net survival is 63% at five years and 57% at 10 years.
- Five- and 10-year net survival were highest for cancers of the thyroid (98%, 97%), testis (97%, 96%) and prostate (93%, 90%).
- Five-year net survival is lowest for pancreatic (8%), esophageal (15%), lung (19%) and liver (19%) cancers. Although not presented in this publication, a recent study noted that survival is also low for mesothelioma (7%).[5]
- Where feasible, estimates of survival were also provided for individual cancers (e.g., colon cancer and rectum cancer) within a group of cancers (e.g., colorectal cancer). This was done because survival can vary considerably within a group. For example, five-year survival is significantly lower for acute myeloid leukemia (21%) than for chronic lymphocytic leukemia (83%), while survival for all leukemias combined is 59%.

Cancer survival generally decreases over time, particularly in the first few years following a diagnosis. Figure 3.1 shows the predicted net survival up to 10 years after diagnosis.

Age-standardized net survival

The net survival that would have occurred if the age distribution at diagnosis of the group of people with the cancer under study had been the same as that of the standard population. For each cancer, the standard population was based on persons diagnosed with that cancer in Canada (excluding Quebec) from 2010 to 2014. This facilitates the comparison of net survival between geographic areas and over time.

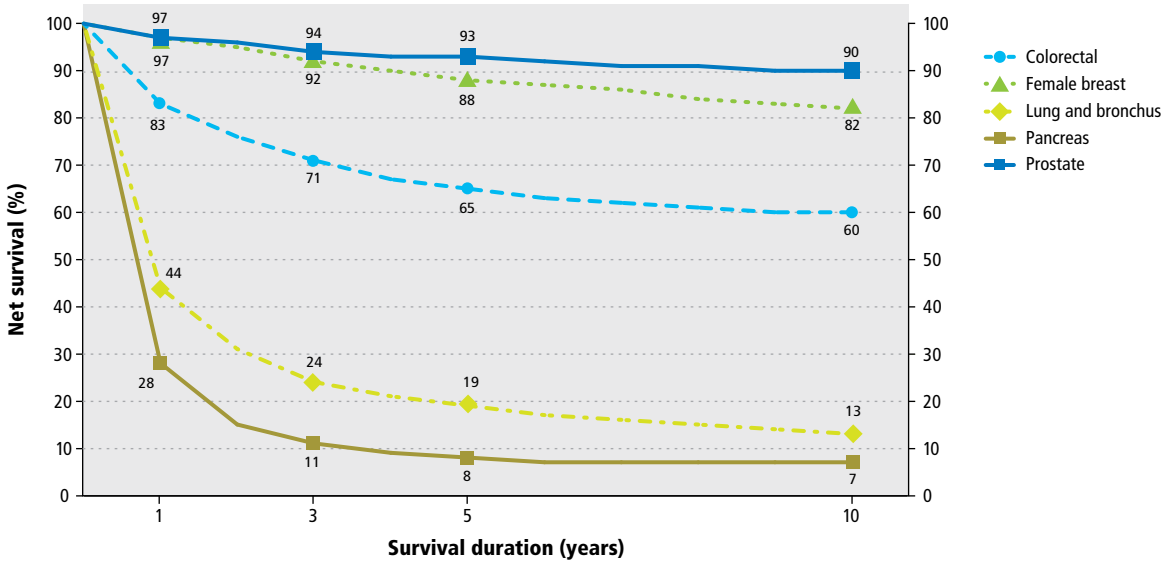
Confidence interval (CI)

A range of values that provides an indication of the precision of an estimate. Confidence intervals are usually 95%, which means that, assuming no other sources of bias, one can be 95% confident the range contains the true value for the estimate of interest.

All cancers combined

Survival estimates for all cancers combined were calculated as a weighted average of estimates for individual cancers. This is the "all cancer" net survival that would have occurred if the distribution of cancers under study had been the same as the distribution of cancers in Canada (excluding Quebec) from 2010 to 2014. This adjustment facilitates the comparison of net survival for all cancers combined between geographic areas and over time.

FIGURE 3.1 Predicted net survival for leading causes of cancer death by survival duration, ages 15–99, Canada (excluding Quebec*), 2012–2014



* Does not include Quebec because cases diagnosed in Quebec from 2011 onward have not been submitted to the Canadian Cancer Registry.

Note: The complete definition of the specific cancers listed here can be found in Table A1.

Analysis by: Centre for Population Health Data, Statistics Canada

Data sources: Canadian Cancer Registry death linked file (1992–2014) and life tables at Statistics Canada

- For prostate cancer and female breast cancer, net survival declined relatively gradually over the first 10 years, though less gradually for breast cancer.
- For colorectal cancer, net survival declined from 83% to 71% between one and three years after diagnosis, and then more gradually from years 3 to 10, at which point survival was 60%.
- For lung cancer and pancreatic cancer, net survival declined sharply during the first three years after diagnosis (to 24% and 11%, respectively) and more gradually thereafter.

Survival by sex

Differences in survival between males and females are shown in Table 3.1.

- For males, five-year net survival was highest for cancers of the testis (97%), thyroid (94%) and prostate (93%).
- For females, five-year net survival was highest for thyroid cancer (99%), melanoma (91%) and breast cancer (88%).
- For both sexes combined, the lowest net survival was for pancreatic cancer, followed by esophageal cancer.
- For all cancers combined, females had higher five-year net survival (65%) than males (61%).
- For most cancers, net survival was higher in females or similar between males and females. Survival was only lower in females than males for acute lymphoblastic leukemia (45% vs. 56%), bladder cancer (73% vs. 75%) and laryngeal cancer (57% vs. 63%), but these differences were not statistically significant.

The higher net survival among females is mirrored by the observation that females have a significantly lower excess risk of dying from their cancer than males, particularly for people younger than 55 years of age.[6]

Survival is typically lower among males than females.

Survival by age

For most cancers diagnosed in adults, net survival decreases with advancing age at diagnosis.[3] Table 3.2 shows predicted five-year net survival by age group.

- Survival for prostate cancer is consistently high (≥95%) among males diagnosed before 75 years of age and lowest (57%) among males aged 85 years and older.
- Survival for breast cancer is relatively high (≥84%) among females diagnosed before 85 years of age, after which survival drops to about 75%.
- For both sexes combined, survival for lung cancer is twice as high (35%) among Canadians diagnosed between 15 and 44 years of age as it is among those diagnosed between 75 and 84 years of age (15%) and between 85 and 99 years of age (9%).
- There is a considerable difference in survival among those diagnosed with pancreatic cancer between 15 and 44 years of age (39%) and those diagnosed between 75 and 84 years of age (5%) or older (1%).

Childhood cancer survival

Cancer in children (under the age of 15 years) is uncommon (Table 1.3), and deaths due to cancer are even more uncommon (Table 2.3). In general, cancer survival is relatively high for many of the most commonly diagnosed cancers in this age group. Table 3.3 shows one- and five-year predicted observed survival for children by childhood cancer diagnostic group.[7]

- For all cancers combined, one-year survival is 93% and five-year survival is 84%.
- Five-year survival for Hodgkin lymphoma, retinoblastoma, nephroblastoma and malignant gonadal germ cell tumours are all over 95%.
- Five-year survival is lowest for acute myeloid leukemia (64%), intracranial and intraspinal embryonal tumours (69%), malignant bone tumours (70%) and soft tissue sarcomas (71%).

Five-year survival among children is about 84%.

Observed survival

The proportion of people with cancer who are alive after a given period of time (e.g., five years) following diagnosis. In this publication, observed survival is only used to describe cancer in children (0 to 14 years of age).

Survival by geographic region

Table 3.4 shows age-standardized five-year net survival for selected cancers by province (except Quebec).

- There is little provincial variation in five-year net survival for cancers of the prostate, female breast, thyroid, uterus and pancreas.
- There is more variation in survival for cancers like colorectal cancer, which range from 60% (Nova Scotia) to 67% (Ontario) and lung cancer, which ranged from 16% (Saskatchewan and Nova Scotia) to 21% (Manitoba).
- Some of this variation may reflect variations in the stage at which cancers are typically diagnosed in different provinces.[8]

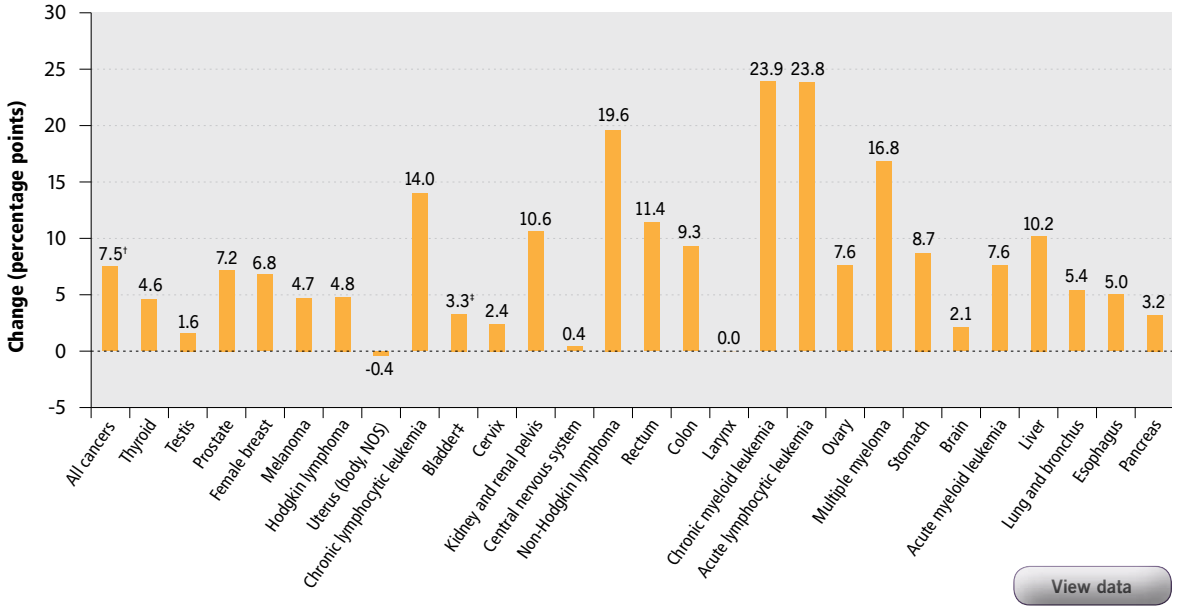
Survival over time

Examining trends in net survival alongside trends in incidence and mortality can give important information about progress in cancer treatment and control. Figure 3.2 shows the predicted change in five-year age-standardized net survival over 20 years.

- Survival for all cancers combined rose by 8 percentage points, from 55% in 1992–1994 to 63% in 2012–2014.
- Survival has increased for most cancers but has remained relatively unchanged for cancers of the uterus, central nervous system (CNS) and larynx.
- The largest increases between the two time periods were for chronic myeloid leukemia (24 percentage points) and acute lymphocytic leukemia (24 percentage points), followed by non-Hodgkin lymphoma (20 percentage points), multiple myeloma (17 percentage points) and chronic lymphocytic leukemia (14 percentage points).
- The improvements observed for leukemia are likely the result of improvements in treatment.[9]

Some of the biggest increases in survival have been for blood-related cancers.

FIGURE 3.2 Predicted change in five-year age-standardized net survival between 1992–1994 and 2012–2014 for selected cancers, ages 15–99, Canada (excluding Quebec*)



Analysis by: Centre for Population Health Data, Statistics Canada

Data sources: Canadian Cancer Registry death linked file (1992–2014) and life tables at Statistics Canada. Partially adapted from Table 2 in Ellison LF. Progress in net cancer survival in Canada over 20 years. Health Reports 2018; 29(9):10–8.

NOS=not otherwise specified

* Does not include Quebec because cases diagnosed in Quebec from 2011 onward have not been submitted to the Canadian Cancer Registry.

† Estimates for all cancers combined were calculated as a weighted average of estimates for individual cancers. For further details, see *Appendix II: Data sources and methods*.

‡ Does not include *in situ* cases for Ontario diagnosed prior to 2010 because they were not submitted to the Canadian Cancer Registry.

Note: For each cancer in turn, the age distribution of persons recorded as being diagnosed with the given cancer in Canada, excluding Quebec, from 2010 to 2014 was used as the standard (see *Appendix II: Data sources and methods*). The complete definition of the specific cancers listed here can be found in Table A1.

Conditional net survival

Conditional survival is often more meaningful for clinical management and prognosis than the five-year survival measured from the date of diagnosis.[10] Since the risk of death due to cancer is often greatest in the first few years after diagnosis (Figure 3.1), prognosis can substantially improve among people surviving one or more years. For these people, the five-year net survival measured at diagnosis (Table 3.1) no longer applies. Table 3.5 shows the five-year predicted conditional net survival, which is calculated from the date of cancer diagnosis among people who have survived the first year after their cancer diagnosis. It also presents one-year predicted net survival.

- Typically, the biggest differences between five-year net survival and five-year conditional net survival were for cancers with a low one-year survival. For example, one-year net survival for pancreatic cancer is 28%, while five-year net survival is 8% and five-year conditional net survival is 29%.
- In contrast, since the potential for improvement is limited for cancers that have a good prognosis at diagnosis, there was little difference between five-year net survival and five-year conditional net survival for these cancers. For example, given the high one-year net survival for breast cancer (97%), there was only a 3-point difference between the five-year net survival (88%) and the five-year conditional net survival (91%).

What do these statistics mean?

Survival statistics are important indicators of the effectiveness of cancer detection and treatment. A number of factors influence survival, including sex (females have better survival than males), age (survival typically decreases with age) and access to quality care (which can vary between regions).

Conditional net survival

A measure that reflects improvements in prognosis for people who have already survived a given number of years (e.g., one year) since diagnosis. This is measured in the hypothetical situation where the cancer of interest is the only possible cause of death.

Fortunately, we are making progress. Cancer survival has improved for most cancers over the last 20 years in Canada. The most notable improvements have been for blood-related cancers, including leukemia and non-Hodgkin lymphoma, which can be largely attributed to improvements in treatment.

While colorectal cancer survival has also improved, its five-year survival is still only 65%. This likely reflects that fact that almost 50% of colorectal cancers are diagnosed at stage III or IV.[8] However, population-based colorectal cancer screening programs exist across the country. With increased participation in these programs, it is expected that more cancers will be diagnosed early and colorectal cancer survival will increase. This is based on cancers such as female breast, where most cases are diagnosed early[8] and survival is high, which likely reflects the success of well-established screening programs.

Despite these notable successes, there remains a lot of room for improvement because some cancers continue to have low net survival. This includes lung cancer—the most commonly diagnosed cancer and leading cause of cancer death in Canada—and pancreatic cancer, which is a less commonly diagnosed cancer but is projected to be the third leading cause of cancer death in Canada in 2019. The low survival probabilities for these cancers are largely reflected in the late stage at which they are diagnosed.[8] In the near future, lung cancer screening programs may increase early detection and improve survival. With pancreatic cancer, research in improving early detection and treatment are key to improving survival.

Continuing to monitor cancer survival by sex, age, geography and time helps point to areas where greater efforts are required to detect, diagnose and treat cancer, or where more research is needed to develop better treatments.

International comparison

Population-based cancer survival in Canada is among the highest in the world for many common cancers.[11] Even among high-income countries with similar cancer registration and universal healthcare, survival is reported to be high in Canada.[12] In part, this may result from a more favourable stage distribution at diagnosis, when treatment is often more effective.[13]

Comparison of population-based cancer survival among countries can help assess the overall effectiveness of a country's healthcare system to deliver services to all people with cancer and cancer survivors. To help facilitate international comparison of survival estimates with Canada, survival estimates for selected cancers by sex were age-standardized using both the Canadian Standard Weights and the International Cancer Survival Standard (ICSS) weights are provided online (Table S3.1).[14]

Supplementary resources

Cancer.ca/statistics houses supplementary resources for this chapter. This includes:

- Excel spreadsheets with the statistics used to create the figures
- Excel spreadsheets with supplementary statistics
- PowerPoint images of the figures used throughout this chapter

References

1. Coleman MP. Cancer survival: Global surveillance will stimulate health policy and improve equity. Lancet. 2014 Feb 8;383(9916):564–73.
2. Dickman PW, Adami HO. Interpreting trends in cancer patient survival. J Intern Med. 2006 Aug;260(2):103–17.
3. Ellison LF. An empirical evaluation of period survival analysis using data from the Canadian Cancer Registry. Ann Epidemiol. 2006 Mar;16(3):191–6.
4. Brenner H, Arndt V. Recent increase in cancer survival according to age: higher survival in all age groups, but widening age gradient. Cancer causes & control: CCC. 2004;15(9):903–10.
5. Ellison LF. Progress in net cancer survival in Canada over 20 years. Health Rep. 2018 Sep 19; 29(9):10–18.
6. Ellison LF. Differences in cancer survival in Canada by sex. Health Rep. 2016 Apr;27(4):19–27.
7. National Cancer Institute [Internet]. International classification of childhood cancer (ICCC) Recode ICD-0-3/WHO 2008. Bethesda, MD: Surveillance Epidemiology, and End Results Program (SEER); 2008. Available at: https://seer.cancer.gov/iccc/iccc-who2008.html (accessed March 2019).
8. Canadian Cancer Statistics Advisory Committee [Internet]. Canadian Cancer Statistics 2018 Toronto, ON: Canadian Cancer Society; 2018. Available at: www.cancer.ca/Canadian-Cancer-Statistics-2018-EN (accessed March 2019).
9. Ellison LF. Increasing survival from leukemia among adolescents and adults in Canada: A closer look. Health Rep. 2016 Jul 20;27(7):19–26.
10. Ellison LF, Bryant H, Lockwood G, Shack L. Conditional survival analyses across cancer sites. Health Rep. 2011 Jun;22(2):21–5.
11. Allemani C, Matsuda T, Di Carlo V, Harewood R, Matz M, Nikšić M, et al CONCORD Working Group. Global surveillance of trends in cancer survival 2000–14 (CONCORD-3): Analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. Lancet. 2018 Mar 17;391(10125):1023–75.
12. Coleman MP, Forman D, Bryant H, Butler J, Rachet B, Maringe C, et al. Cancer survival in Australia, Canada, Denmark, Norway, Sweden, and the UK, 1995–2007 (the International Cancer Benchmarking Partnership): An analysis of population-based cancer registry data. Lancet. 2011 Jan 8;377(9760):127–38.
13. Walters S, Maringe C, Butler J, Rachet B, Barrett-Lee P, Bergh J, et al. Breast cancer survival and stage at diagnosis in Australia, Canada, Denmark, Norway, Sweden and the UK, 2000–2007: A population-based study. Br J Cancer. 2013 Mar 19;108(5):1195–208.
14. Corazziari I, Quinn M, Capocaccia R. Standard cancer patient population for age standardising survival ratios. Eur J Cancer. 2004 Oct;40(15):2307–16.

TABLE 3.1 Predicted five- and 10-year net survival for selected cancers by sex, ages 15–99, Canada (excluding Quebec*), 2012–2014

	5-year net survival (%) (95% CI)			10-year net survival (%) (95% CI)		
	Both sexes	Males	Females	Both sexes	Males	Females
All cancers†	**63 (63–63)**	**61 (61–61)**	**65 (64–65)**	**57 (57–58)**	**56 (55-56)**	**59 (59-60)**
Thyroid	98 (97–98)	94 (92–95)	99 (98–99)	97 (96–98)	91 (88-94)	98 (97-99)
Testis	—	97 (96–97)	—	—	96 (94-98)	—
Prostate	—	93 (92–93)	—	—	90 (89-90)	—
Breast	88 (88–89)	80 (73–85)	88 (88–89)	82 (81–83)	65 (52-74)	82 (82-83)
Melanoma	88 (87–88)	84 (83–86)	91 (90–92)	87 (85–88)	83 (80-85)	91 (89-93)
Hodgkin lymphoma	86 (84–87)	85 (82–87)	87 (84–89)	81 (78–83)	79 (76-82)	83 (79-86)
Uterus (body, NOS)	—	—	83 (83–84)	—	—	80 (79-82)
Bladder‡	75 (74–76)	75 (74–76)	73 (72–75)	66 (63–69)	66 (63-70)	66 (61-70)
Cervix	—	—	72 (70–74)	—	—	67 (65-69)
Kidney and renal pelvis	71 (70–72)	70 (69–72)	72 (70–74)	63 (61–64)	61 (59-63)	64 (61-67)
Non-Hodgkin lymphoma	68 (67–69)	67 (66–68)	70 (68–71)	59 (56–61)	58 (56-60)	60 (55-64)
Colorectal	65 (65–66)	65 (64–66)	65 (65–66)	60 (59–61)	60 (58-61)	61 (60-63)
Rectum	66 (65–67)	65 (64–66)	67 (65–68)	62 (60–63)	62 (60-64)	61 (58-64)
Colon	65 (64–66)	65 (64–66)	65 (64–66)	61 (59–62)	59 (57-61)	62 (60-64)
Oral	64 (63–65)	64 (62–65)	66 (63–68)	56 (54–58)	54 (52-57)	59 (56-62)
Larynx	62 (59–64)	63 (60–65)	57 (51–62)	49 (46–53)	51 (48-55)	41 (32-50)
Leukemia	59 (58–60)	59 (58–61)	59 (57–60)	49 (48–51)	49 (47-51)	50 (47-52)
Chronic lymphocytic leukemia	83 (81–84)	81 (79–83)	86 (83–88)	67 (65–70)	65 (61-68)	72 (67-76)
Chronic myeloid leukemia	60 (57–63)	60 (55–63)	62 (57–67)	50 (47–54)	51 (46-55)	51 (44-56)
Acute lymphocytic leukemia	51 (47–56)	56 (50–62)	45 (38–52)	47 (42–52)	55 (47-61)	38 (30-45)
Acute myeloid leukemia	21 (19–22)	19 (17–21)	23 (20–25)	18 (17–20)	16 (14-18)	20 (18-23)
Ovary	—	—	45 (44–47)	—	—	36 (35-38)
Multiple myeloma	44 (43–46)	44 (42–46)	45 (42–47)	32 (30–34)	25 (22-27)	39 (36-43)
Stomach	28 (27–29)	27 (26–29)	29 (27–31)	27 (25–29)	27 (25-29)	27 (25-30)
Brain/CNS	23 (22–24)	22 (21–24)	24 (22–26)	17 (16–19)	17 (15-18)	19 (17-20)
CNS	71 (64–76)	66 (57–75)	75 (66–82)	63 (55–71)	60 (48-70)	67 (54-77)
Brain	21 (19–22)	20 (19–22)	21 (19–23)	15 (14–16)	15 (14-16)	16 (14-18)
Liver	19 (18–20)	18 (17–20)	21 (18–23)	13 (12–15)	13 (11-14)	14 (11-17)
Lung and bronchus	19 (18–19)	15 (15–16)	22 (22–23)	13 (13–13)	11 (10-11)	16 (15-16)
Esophagus	15 (14–16)	15 (13–16)	17 (15–20)	12 (10–13)	11 (10-13)	13 (10-17)
Pancreas	8 (7–9)	8 (7–9)	8 (8–9)	7 (6–8)	6 (4-7)	8 (7-9)

—Not applicable; CI=confidence interval; CNS=central nervous system; NOS=not otherwise specified

* Does not include Quebec because cases diagnosed in Quebec from 2011 onward have not been submitted to the Canadian Cancer Registry.

† Estimates for all cancers combined were calculated as a weighted average of estimates for individual cancers. For further details, see *Appendix II: Data sources and methods*.

‡ Does not include *in situ* cases for Ontario diagnosed prior to 2010 because they were not submitted to the Canadian Cancer Registry.

Note: The complete definition of the specific cancers listed here can be found in Table A1.

Analysis by: Centre for Population Health Data, Statistics Canada

Data sources: Canadian Cancer Registry death linked file (1992–2014) and life tables at Statistics Canada

TABLE 3.2 Predicted five-year net survival for selected cancers by age group, Canada (excluding Quebec*), 2012–2014

Age group (years)	Net survival (%) (95% CI)					
	Prostate	Breast (female)	Colorectal	Lung and bronchus	Thyroid	Melanoma
15–44	95 (90–98)	88 (87–89)	73 (71–75)	35 (31–39)	100 (99–100)	92 (91–93)
45–54	97 (96–97)	91 (90–91)	72 (70–73)	24 (22–25)	99 (98–99)	91 (90–92)
55–64	97 (97–97)	90 (90–91)	70 (69–70)	22 (21–23)	97 (96–98)	89 (88–90)
65–74	97 (96–97)	91 (90–92)	68 (67–69)	21 (20–21)	95 (93–97)	87 (85–88)
75–84	87 (85–88)	84 (82–85)	61 (60–62)	15 (14–16)	91 (85–95)	83 (80–85)
85–99	57 (53–61)	75 (71–79)	50 (47–52)	9 (7–10)	—	80 (72–86)

Age group (years)	Net survival (%) (95% CI)				
	Uterus (body, NOS)	Bladder†	Kidney and renal pelvis	Non-Hodgkin lymphoma	Pancreas
15–44	90 (87–92)	89 (85–92)	88 (86–90)	84 (82–86)	39 (33–45)
45–54	88 (87–90)	87 (84–89)	82 (80–84)	81 (79–83)	16 (14–19)
55–64	88 (87–89)	82 (80–83)	77 (76–79)	77 (76–79)	11 (9–12)
65–74	82 (80–83)	79 (77–80)	70 (68–72)	70 (68–71)	7 (6–8)
75–84	73 (70–76)	70 (68–72)	59 (56–62)	57 (55–59)	5 (4–6)
85–99	58 (49–65)	57 (53–62)	33 (28–39)	40 (35–44)	1 (1–2)

— standard error greater than 0.1, so deemed too unreliable; CI=confidence interval; NOS=not otherwise specified

* Does not include Quebec because cases diagnosed in Quebec from 2011 onward have not been submitted to the Canadian Cancer Registry.

† Does not include *in situ* cases for Ontario diagnosed prior to 2010 because they were not submitted to the Canadian Cancer Registry.

Note: The complete definition of the specific cancers listed here can be found in Table A1.

Analysis by: Centre for Population Health Data, Statistics Canada

Data sources: Canadian Cancer Registry death linked file (1992–2014) and life tables at Statistics Canada. Partially adapted from Table 3 in Ellison LF. Progress in net cancer survival in Canada over 20 years. *Health Reports* 2018;29(9):10–8.

TABLE 3.3 Predicted one- and five-year observed survival proportions (OSP) by diagnostic group and selected subgroups, ages 0–14 at diagnosis, Canada (excluding Quebec*), 2010–2014

Diagnostic group†	OSP(%) (95% CI)	
	1-year	5-year
All groups‡	**93 (92–94)**	**84 (83–85)**
I. Leukemias, myeloproliferative diseases, and myelodysplastic diseases	95 (94–96)	89 (87–91)
a. Lymphoid leukemias	98 (97–99)	94 (92–95)
b. Acute myelogenous leukemias	80 (73–85)	64 (56–71)
II. Lymphomas and reticuloendothelial neoplasms	96 (94–97)	92 (90–94)
a. Hodgkin lymphomas	99 (95–100)	97 (93–99)
b. Non-Hodgkin lymphomas (except Burkitt lymphoma)	94 (90–97)	89 (84–93)
c. Burkitt lymphoma	91 (80–96)	89 (78–95)
III. CNS and miscellaneous intracranial and intraspinal neoplasms	86 (83–88)	72 (69–75)
b. Astrocytomas	89 (85–92)	81 (77–85)
c. Intracranial and intraspinal embryonal tumours	84 (78–89)	69 (61–75)
IV. Neuroblastoma and other peripheral nervous cell tumours	96 (93–98)	81 (76–86)
V. Retinoblastoma	100 (..– ..)	96 (89–99)
VI. Renal tumours	98 (94–99)	96 (92–98)
a. Nephroblastoma and other non-epithelial renal tumours	98 (94–99)	96 (92–98)
VII. Hepatic tumours	88 (75–94)	*75 (61–84)*
VIII. Malignant bone tumours	93 (88–96)	70 (62–77)
IX. Soft-tissue and other extraosseous sarcomas	89 (84–92)	71 (65–76)
a. Rhabdomyosarcomas	97 (92–99)	75 (66–82)
X. Germ cell tumours, trophoblastic tumours, and neoplasms of gonads	95 (90–98)	95 (89–97)
b. Malignant extracranial and extragonadal germ cell tumours	94 (79–99)	94 (79–99)
c. Malignant gonadal germ cell tumours	96 (85–99)	96 (85–99)
XI. Other malignant epithelial neoplasms and malignant melanomas	94 (89–97)	92 (86–95)
XII. Other and unspecified malignant neoplasms	*77 (58–88)*	*72 (54–84)*

.. estimate can not be calculated; CI=confidence interval; CNS=central nervous system

* Does not include Quebec because cases diagnosed in Quebec from 2011 onward have not been submitted to the Canadian Cancer Registry.

† Cancers were classified according to the Surveillance, Epidemiology, and End Results Program (SEER) update of the International Classification of Childhood Cancer, Third Edition (ICCC-3).[7] Only selected sub-groups within each diagnostic group are listed.

‡ Estimates for all childhood cancers combined were calculated as a weighted average of diagnostic group-specific estimates (see *Appendix II: Data sources and methods*).

Note: Estimates associated with a standard error >0.05 and ≤0.10 are italicized.

Analysis by: Centre for Population Health Data, Statistics Canada
Data source: Canadian Cancer Registry death linked file (1992–2014)

TABLE 3.4 Predicted five-year age-standardized net survival for selected cancers by province, ages 15–99, Canada (excluding Quebec*), 2012–2014

Province	Net survival (%) (95% CI)						
	Prostate	Breast (female)	Colorectal	Lung and bronchus	Thyroid	Melanoma	Uterus (body, NOS)
Canada*	**93 (92–93)**	**88 (88–89)**	**65 (64–66)**	**19 (18–19)**	**98 (97–98)**	**88 (87–88)**	**83 (83–84)**
British Columbia (BC)	92 (92–93)	88 (87–89)	64 (63–66)	17 (16–18)	95 (93–96)	89 (87–91)	85 (83–87)
Alberta (AB)	91 (89–92)	90 (88–91)	63 (61–64)	17 (16–18)	97 (95–98)	90 (86–92)	84 (82–87)
Saskatchewan (SK)	90 (88–92)	89 (87–91)	63 (60–66)	16 (15–18)	97 (90–99)	85 (78–90)	83 (78–87)
Manitoba (MB)	91 (89–93)	89 (87–91)	63 (60–65)	21 (19–23)	97 (93–99)	88 (82–92)	84 (80–87)
Ontario (ON)	93 (93–94)	88 (88–89)	67 (66–68)	20 (19–20)	98 (98–99)	86 (85–87)	83 (81–84)
New Brunswick (NB)	93 (90–94)	89 (86–90)	66 (63–69)	20 (18–22)	97 (93–99)	90 (84–94)	84 (78–88)
Nova Scotia (NS)	94 (91–96)	88 (86–90)	60 (58–62)	16 (15–18)	96 (92–98)	92 (87–96)	81 (76–85)
Prince Edward Island (PE)	92 (86–96)	85 (78–89)	61 (53–67)	..	92 (79–97)	89 (74–96)	*85 (68–93)*
Newfoundland and Labrador (NL)	93 (90–96)	85 (82–88)	62 (59–66)	18 (16–21)	96 (90–99)	89 (79–94)	83 (77–88)

Province	Net survival (%) (95% CI)			
	Bladder†	Kidney and renal pelvis	Non-Hodgkin lymphoma	Pancreas
Canada*	**75 (74–75)**	**71 (70–72)**	**68 (67–69)**	**8 (7– 9)**
British Columbia (BC)	74 (72–76)	66 (63–68)	68 (66–70)	8 (6– 9)
Alberta (AB)	77 (74–80)	70 (67–73)	70 (68–73)	8 (6– 9)
Saskatchewan (SK)	74 (69–78)	65 (60–69)	68 (63–72)	6 (4–10)
Manitoba (MB)	72 (67–77)	66 (61–70)	70 (65–74)	8 (5–11)
Ontario (ON)	74 (73–75)	73 (72–74)	68 (67–69)	9 (8–10)
New Brunswick (NB)	76 (71–81)	73 (68–78)	70 (64–75)	..
Nova Scotia (NS)	78 (73–82)	73 (69–77)	61 (56–65)	4 (2–7)
Prince Edward Island (PE)	..	..	*69 (55–79)*	..
Newfoundland and Labrador (NL)	72 (64–78)	74 (68–79)	71 (64–77)	9 (5–14)

.. estimate can not be calculated as one or more of the age-specific estimates are undefined; CI=confidence interval; NOS=not otherwise specified

* Does not include Quebec because cases diagnosed in Quebec from 2011 onward have not been submitted to the Canadian Cancer Registry.

† Does not include in situ cases for Ontario diagnosed prior to 2010 because they were not submitted to the Canadian Cancer Registry.

Note: For each cancer in turn, the age distribution of persons recorded as being diagnosed with the given cancer in Canada, excluding Quebec, from 2010–2014 was used as the standard (for further details, see *Appendix II: Data sources and methods*). The complete definition of the specific cancers listed here can be found in Table A1. Estimates associated with a standard error >0.05 and ≤0.10 are italicized.

Analysis by: Centre for Population Health Data, Statistics Canada

Data sources: Canadian Cancer Registry death linked file (1992–2014) and life tables at Statistics Canada

TABLE 3.5 Predicted net survival for one year and for five years from diagnosis (conditional on having survived one year), for selected cancers, by sex, ages 15–99, Canada (excluding Quebec*), 2012–2014

	1-year net survival (%) (95% CI)			5-year conditional net survival (%) (95%CI)		
	Both Sexes	Males	Females	Both sexes	Males	Females
Thyroid	99 (98–99)	97 (96–98)	99 (99–99)	99 (99–99)	97 (95–98)	100 (99–100)
Testis	—	98 (97–99)	—	—	99 (98–99)	—
Prostate	—	97 (97–98)	—	—	95 (95–96)	—
Breast	97 (97–97)	93 (90–96)	97 (97–97)	91 (91–91)	86 (80–91)	91 (91–91)
Melanoma	96 (95–96)	94 (94–95)	97 (97–98)	92 (91–92)	89 (88–90)	94 (93–95)
Uterus (body, NOS)	—	—	93 (93–94)	—	—	90 (89–90)
Hodgkin lymphoma	92 (91–93)	91 (89–93)	93 (91–94)	93 (92–95)	93 (91–95)	94 (91–95)
Bladder†	89 (88–89)	90 (89–90)	86 (85–87)	84 (83–85)	84 (83–85)	85 (84–87)
Cervix	—	—	88 (87–89)	—	—	82 (80–83)
Larynx	84 (83–86)	85 (84–87)	78 (73–82)	73 (71–76)	73 (70–76)	73 (66–78)
Oral	84 (83–85)	84 (83–85)	83 (81–84)	77 (75–78)	75 (74–77)	79 (77–81)
Kidney and renal pelvis	84 (83–84)	84 (83–84)	83 (82–85)	85 (84–86)	84 (83–85)	87 (85–88)
Colorectal	83 (82–83)	83 (83–84)	82 (81–82)	79 (78–79)	78 (77–79)	80 (79–81)
Rectum	86 (85–86)	86 (85–86)	86 (85–87)	77 (76–78)	76 (75–77)	78 (77–80)
Colon	81 (81–81)	82 (81–82)	80 (80–81)	80 (79–81)	79 (78–80)	80 (79–81)
Non–Hodgkin lymphoma	80 (80–81)	80 (79–81)	81 (80–82)	85 (84–86)	84 (82–85)	86 (85–88)
Multiple myeloma	76 (75–77)	76 (75–78)	76 (74–78)	58 (56–60)	58 (55–60)	59 (56–61)
Ovary	—	—	76 (74–77)	—	—	60 (58–62)
Leukemia	74 (74–75)	75 (74–76)	73 (72–75)	80 (78–81)	79 (78–81)	80 (78–82)
Chronic lymphocytic leukemia	94 (93–94)	93 (92–94)	95 (93–96)	89 (87–90)	87 (85–89)	91 (89–93)
Chronic myeloid leukemia	83 (81–85)	81 (79–84)	85 (82–88)	74 (70–77)	74 (69–78)	74 (69–79)
Acute lymphocytic leukemia	70 (66–74)	73 (67–78)	66 (59–72)	73 (68–78)	77 (70–83)	68 (59–76)
Acute myeloid leukemia	42 (40–44)	41 (39–44)	43 (40–45)	50 (46–53)	46 (42–50)	54 (49–58)
Stomach	51 (50–52)	52 (50–53)	50 (48–52)	55 (53–57)	53 (50–55)	59 (55–62)
Brain/CNS	49 (48–51)	49 (47–51)	50 (48–52)	46 (44–48)	45 (43–48)	48 (45–51)
CNS	87 (82–90)	85 (77–90)	88 (81–93)	82 (75–87)	79 (69–86)	85 (76–91)
Brain	48 (46–49)	47 (46–49)	48 (45–50)	43 (41–45)	43 (40–45)	44 (41–47)
Liver	45 (44–47)	45 (44–47)	46 (43–48)	42 (39–44)	41 (38–44)	45 (40–50)
Lung and bronchus	44 (44–45)	40 (39–41)	49 (48–50)	42 (41–43)	39 (38–40)	45 (44–46)
Esophagus	42 (41–44)	43 (41–45)	41 (38–44)	36 (33–38)	34 (31–37)	42 (37–47)
Pancreas	28 (27–29)	28 (27–30)	27 (26–28)	29 (27–31)	27 (24–30)	31 (29–34)

—Not applicable; CI=confidence interval; CNS=central nervous system; NOS=not otherwise specified

* Does not include Quebec because cases diagnosed in Quebec from 2011 onward have not been submitted to the Canadian Cancer Registry.

† Does not include *in situ* cases for Ontario diagnosed prior to 2010 because they were not submitted to the Canadian Cancer Registry.

Note: The complete definition of the specific cancers listed here can be found in Table A1.

Analysis by: Centre for Population Health Data, Statistics Canada

Data sources: Canadian Cancer Registry death linked file (1992–2014) and life tables at Statistics Canada

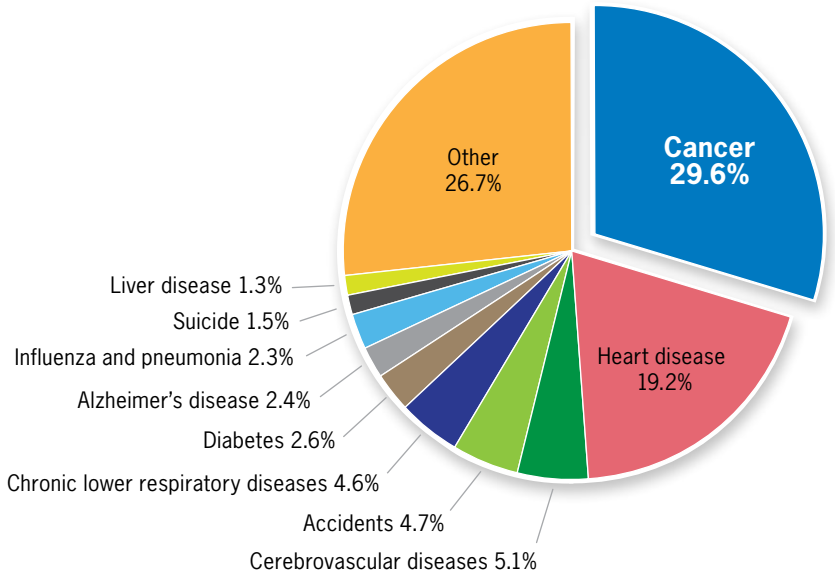
Chapter 4

Cancer in context: The cancer burden in Canada

Cancer is the leading cause of death in Canada

Cancer poses an enormous burden on both the health of Canadians and the Canadian healthcare system. This publication shows that almost half of Canadians are expected to be diagnosed with cancer in their lifetime and more than one-quarter are expected to die of the disease. In fact, a significantly higher proportion of Canadians die from cancer than any of the other leading causes of death, including heart disease (19.2%) and cerebrovascular diseases (5.1%) (Figure 4.1).

FIGURE 4.1 Proportion of deaths due to cancer and other causes, Canada, 2016

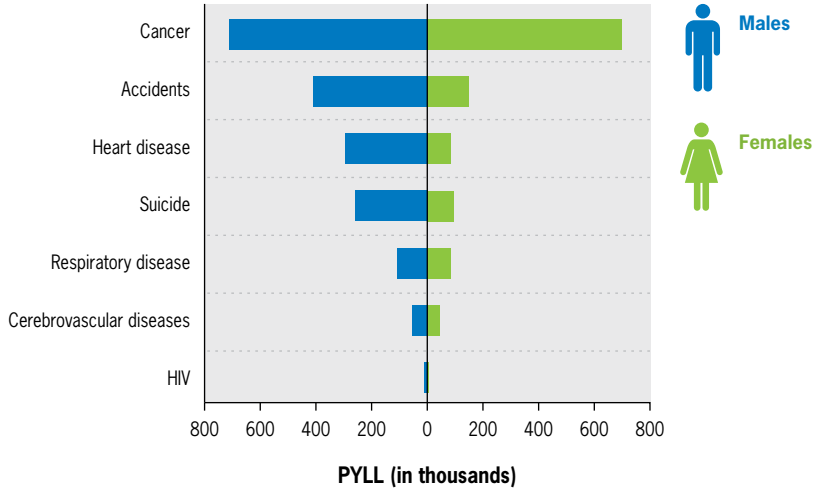


Note: The total of all deaths in 2016 in Canada was 267,213.

Data source: Canadian Vital Statistics Death Database at Statistics Canada; Deaths and age-specific mortality rates, by selected grouped causes, Table 13-10-0392-01.

Cancer is also the leading cause of premature death in Canada, which means that people are dying from cancer at younger ages than the average age of death from other causes. Premature mortality is often reported in terms of potential years of life lost (PYLL). PYLL is an estimate of the additional number of years a person would have lived if they had not died prematurely (e.g., before the age of 75). For example, if a person dies from cancer at 60 years of age, they have lost 15 potential years of life, while dying at 70 years of age results in 5 years of life lost. During the period from 2014 to 2016, the PYLL for all cancers combined was about 1,411,100 (Figure 4.2), which was considerably higher than any of the other leading causes of premature death in Canada.

FIGURE 4.2 Selected causes of death* and their associated potential years of life lost (PYLL), Canada, 2014–2016



*See *Appendix II: Data Sources and methods* for definitions of causes of death.

Note: Figures are displayed in decreasing order of total PYLL for males and females combined

Analysis by: Statistics Canada

Data sources: Canadian Vital Statistics Death Database at Statistics Canada; Mortality and potential years of life lost, by selected causes of death and sex, three-year total,† Canada, provinces, territories, health regions and peer groups, Table 13-10-0742-01

† There is an error in the online table title. The numbers are three-year totals, not three-year averages.

Cancer is a complex disease

Cancer is a complex disease that is influenced by many factors, including the environment, lifestyle and genetics. Cancer is not just one disease, but a group of more than 100 different diseases characterized by uncontrolled growth of abnormal cells that have the propensity to invade nearby tissues. This abnormal cell growth can begin almost anywhere in the body, and it can behave differently depending on the origin.

How cancers are categorized

Cancers are categorized based on the organ, tissue or body system in which they originate (primary site) and their cellular characteristics (histology). Some types of cells have a greater tendency to become cancerous than others, leading to higher incidence rates for those cancers. This is one reason cancer in the breast, for example, is much more common than cancer in the liver.

How cancer spreads

Any type of cancer can spread (metastasize) from the organ it originated in to another site in the body. Whether or not a cancer spreads will depend on several factors, such as the type of cancer, the aggressiveness of the cancer cells, the location of the primary tumour, how long it has been in the body, and the type and effectiveness of available treatments. Once a cancer has spread, it is more difficult to treat. This can lead to lower survival rates for certain cancers. For example, almost half of all lung cancer cases diagnosed in Canada are stage IV (cancer has spread)[1] and, as a result, its survival rate is very low.

How cancer is detected

Detecting cancer at an early stage can improve outcomes. Our ability to detect a cancer early depends on the availability and effectiveness of screening and early detection tools, or on the location and depth of the tumour and when symptoms become noticeable. This helps explain why cancer of the pancreas, which resides deep in the body and is generally asymptomatic in early stages, is detected so much later than cancer of the testes.[1] Cancers that are more likely to be detected early, such as breast cancer, have a much higher chance of survival than cancers that tend to be detected late, as is the case with lung cancer.

Cancer outcomes in Canada are among the best in the world

Comparable measures of cancer burden for different countries can be found through various international resources, such as those provided in *Appendix I*.[2–6] These resources generally indicate that Canada compares favourably to other countries on several measures, including survival rates. For example, the recent International Cancer Benchmarking Partnership study showed that Canada's cancer survival rate ranks among the highest in the world.[7]

Cancer has a substantial economic burden on Canadians and Canadian society

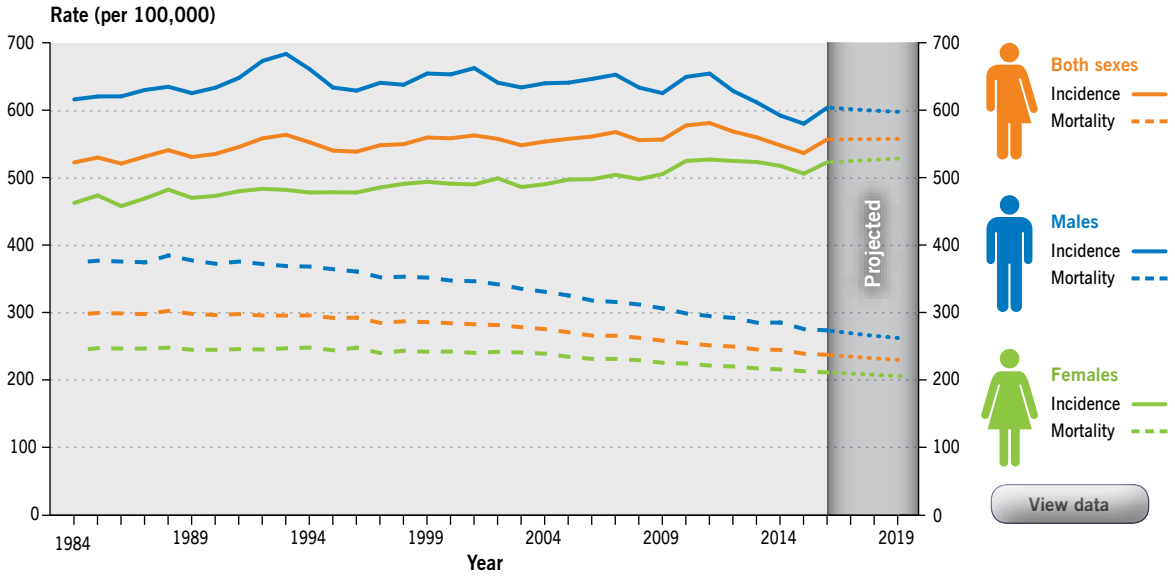
Cancer is a costly illness, which means that it has major implications for people diagnosed with cancer, their families and Canadian society as a whole. It is difficult to obtain reliable measures of the true economic cost of cancer, and different approaches can produce a wide range of estimates. A recent report on the economic burden of cancer in Canada noted that the costs of cancer care rose steadily over the period studied, from 2.9 billion in 2005 to 7.5 billion in 2012.[8] Similarly, a study in the United States (US) estimated that the cost of cancer care would increase by 27% between 2010 and 2020.[9] Given the increasing number of cancer cases diagnosed each year in Canada,[10] the cost of cancer care is also likely to continue to rise for the foreseeable future.

A report on the financial hardship of cancer in Canada showed that beyond the physical and emotional challenges related to the disease, people with cancer also face significant financial pressures following the cancer diagnosis. These challenges can result from a loss of income after diagnosis and an increase in day-to-day costs caused by unforeseen expenses, such as medical equipment, childcare, homecare and transportation fees.[11]

Progress has been made but the challenge continues

There is no doubt that a lot of progress has been made in the fight against cancer, despite the high burden of disease. Today, more is known about what causes cancer, how it develops and how best to prevent and treat it. This progress is reflected by decreases in incidence rates over time and even more so in trends in mortality rates, which have decreased about 35% in males and 20% in females since the cancer death rate peaked in 1988 (Figure 4.3).

FIGURE 4.3 Age-standardized incidence and mortality rates for all cancers combined, by sex, Canada, 1984–2019



Note: Rates are age-standardized to the 2011 Canadian population. Projected rates are based on long-term historic data and may not always reflect recent changes in trends. Incidence excludes non-melanoma skin cancer (neoplasms, NOS; epithelial neoplasms, NOS; and basal and squamous). Actual incidence and mortality data were available to 2015 for all provinces and territories except for Quebec. For further details, see *Appendix II: Data sources and methods*. Dotted lines represent projected rates.

Analyses by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry, National Cancer Incidence Reporting System and Canada Vital Statistics Death Database at Statistics Canada

The challenge of a growing and aging population

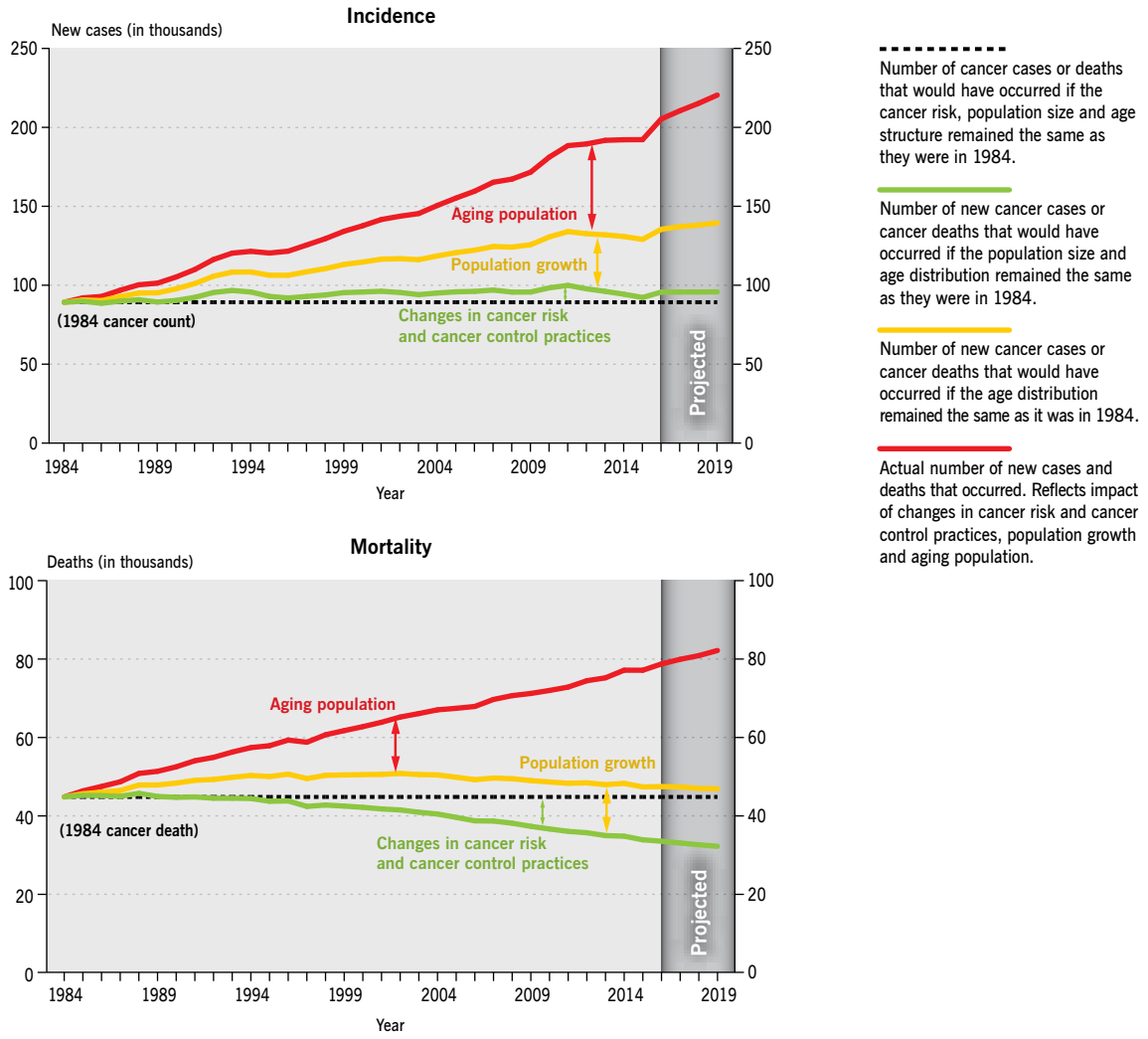
As presented in this publication, the total number of new cases of cancer and the number of cancer deaths continues to increase each year in Canada, a phenomenon that can largely be explained by the aging and growing population.

Figure 4.4 illustrates how the number of new cases of cancer and deaths from cancer each year are affected by changes in cancer risk factors and cancer control practices, the aging population and population growth. Since 1988, changes in cancer risks and cancer control practices have had a small influence on reducing the overall number of cancer cases diagnosed. But they have had a more meaningful influence on reducing the number of Canadians who die from cancer. Unfortunately, this progress has been outweighed by the impact of population aging, followed by population growth, both of which have contributed to a dramatic increase in the number of cancer cases and cancer deaths each year.

Because the Canadian population is continuing to grow and age,[12] the average annual number of cancer cases is projected to be 79% higher in 2028–2032 than it was in 2003–2007.[10,13] As a result, the Canadian healthcare system is expected to continue to face increasing demand for cancer services, including diagnostics, treatment and palliative care.

In addition, an increasing percentage of Canadians are surviving their cancer diagnosis, meaning there is an increasing number of cancer survivors in the population. Individuals who survive a cancer diagnosis often go on to live productive and rewarding lives, but the cancer experience presents many physical, emotional, spiritual and financial challenges that can persist

FIGURE 4.4 Trends in new cases and deaths (in thousands) for all cancers and ages, attributed to changes in cancer risk and cancer control practices, population growth and aging population, Canada, 1984–2019



Note: New cases exclude non-melanoma skin cancer (neoplasms, NOS; epithelial neoplasms, NOS; and basal and squamous). Actual incidence and mortality data were available to 2015 for all provinces and territories except for Quebec. For further details, see *Appendix II: Data sources and methods*. The range of scales differs between the graphs.

Analyses by: Centre for Surveillance and Applied Research, Public Health Agency of Canada

Data sources: Canadian Cancer Registry, National Cancer Incidence Reporting System and Canadian Vital Statistics Death Database at Statistics Canada

long after the disease is treated,[14] which means that support and services for the growing population of survivors are also required.

How these statistics can help guide cancer control

The wide variation we observe in incidence, mortality and survival across cancers reflects the complexity of the disease. But additional factors must also be taken into account when assessing how to address the ongoing burden of cancer in Canada. For example, prevention, screening and early detection, treatment and survivorship all play an important role in the fight against cancer.

Figure 4.5 presents a simplified approach to categorizing cancers based on their relative burden in Canada and the extent to which they can be prevented and detected early. The figure displays a relative rating for the most commonly diagnosed cancer types in relation to their preventability, detectability, incidence, survival and mortality using the statistics in this publication and information about modifiable risk factors and early detection programs.

It is recognized that other measures, such as the PYLL and economic impacts described earlier, must also be considered when assessing the cancer burden. Also, this approach does not take into account the fact that less common cancers and pediatric cancers can still have a devastating impact on people with cancer and their families. Despite these limitations, Figure 4.5 aims to illustrate that, when assessed together, the statistics reported in this publication can be used to highlight gaps and opportunities in population-based cancer control strategies and identify priority areas for clinical and health services research.

FIGURE 4.5 Summary of key cancer control and outcome characteristics by cancer type

	Preventability	Detectability	Incidence	Survival	Mortality
Lung and bronchus					
Breast					
Colorectal					
Prostate					
Bladder					
Non-Hodgkin lymphoma					
Thyroid					
Melanoma					
Kidney and renal pelvis					
Uterus (body, NOS)					
Leukemia					
Pancreas					
Oral					
Stomach					
Multiple myeloma					
Brain/CNS					
Ovary					
Liver					
Esophagus					
Cervix					
Larynx					
Testis					
Hodgkin lymphoma					

CNS=central nervous system; NOS=not otherwise specified

Preventability — Relative ratings are assigned to each cancer site based primarily on the population attributable risk reported by Canadian Population Attributable Risk of Cancer (ComPARe) study. Green represents cancers for which it is estimated that at least 50% of cancers are preventable or for which screening programs can detect treatable precancerous lesions, yellow where 25%–49% are preventable and red where less than 25% are preventable. Where information was not available through ComPARe, Cancer Research UK was used.

Detectability — Relative ratings were assigned as green if organized screening programs are available in Canada, yellow if opportunistic early detection is available and red if no organized screening and limited early detection procedures are available.

Incidence — Relative ratings were assigned as green if there were less than 5,000 cases, yellow if there were less than 15,000 cases and red if there at least 15,000 cases in 2019 (Table 1.2).

Survival — Relative ratings are assigned based on predicted five-year net survival probabilities listed in Table 3.1. Red represents a survival of less than 50%, yellow represents 50%–79% and green represents 80% or more.

Mortality — Relative ratings were assigned as green if there were less than 1,000 deaths, yellow if there were 1,000–4,000 deaths and red if there were more than 4,000 deaths in 2019 (Table 2.2).

Preventability

The World Health Organization suggests that prevention offers the most cost-effective, long-term strategy for controlling cancer and other non-communicable diseases.[15] Research suggests that a large number of cases of various types of cancers can be prevented through reductions in exposure to adverse environmental, behavioural and infectious factors.[16] Efforts to reduce cancer risk through the implementation of prevention programs targeted at both the individual and the population level can have a substantial impact on the future cancer burden in Canada.

Lung cancer is an excellent example of a high-burden disease (high incidence, high mortality and poor survival) that has the potential to be largely eradicated through preventive measures, such as eliminating tobacco use and exposure to radon and asbestos.[17,18] This underscores the need for continued advocacy and health promotion efforts. It is also expected that lung cancer screening programs for high-risk populations will be implemented in the near future,[19–21] which will likely improve lung cancer survival and mortality rates.

Detectability

Detecting cancer early (e.g., through screening tests) and being treated for precancerous conditions can significantly reduce the burden of some cancers. For example, cervical cancer once had high incidence and mortality rates.[22] But due to the success of widespread cervical cancer screening, it now has a moderate incidence rate and relatively low mortality rate. Because of additional prevention opportunities that currently exist through human papillomavirus (HPV) vaccination and further improvements in screening, many believe this cancer could be virtually eradicated in some countries.[23]

Incidence, survival and mortality

There also are many cancers with low to medium incidence rates that are considered medium to high burden because they do not have definitively preventable risk factors, are not easily detected through current diagnostic modalities and do not have noticeable early symptoms. As a result, these cancers tend to be diagnosed at a later stage, have limited treatment options and have low survival. Examples include brain and pancreatic cancers. It is important to note that the development and progression of these cancers are not as well understood as other cancers because the short survival time makes it difficult to conduct meaningful clinical research. Nevertheless, there is a need to intensify efforts to better understand the etiology of these diseases and identify more effective diagnostic and treatment strategies to reduce the burden.

On the other side of the spectrum are thyroid and prostate cancers, which have high incidence rates but relatively good survival. However, both of these cancers have come under scrutiny for over-diagnosis.[24,25] Given the significant toll each diagnosis takes on individuals and the healthcare system, when and how cancers are diagnosed and treated must always be taken into careful consideration.

Summary

Despite the limitations of the approach taken in generating Figure 4.5, it is an example of an exercise that can help focus cancer control efforts. It also helps reinforce that measures of cancer burden must be assessed in a variety of ways and alongside each other. They also need to be examined in relation to the extent to which we are currently able to reduce the burden through improved primary prevention, timely and effective early detection and screening, and evidence-based and person-centred diagnosis and treatment. Such comprehensive assessments can help take the statistics reported in the publication to the next level by highlighting gaps and opportunities in population-based cancer control strategies and identifying priority areas for clinical and health services research.

Supplementary resources

Cancer.ca/statistics houses supplementary resources for this chapter. This includes:

- Excel spreadsheets with the statistics used to create the figures
- PowerPoint images of the figures used throughout this chapter

References

1. Canadian Cancer Statistics Advisory Committee [Internet]. Canadian Cancer Statistics 2018 Toronto, ON: Canadian Cancer Society; 2018. Available at: www.cancer.ca/Canadian-Cancer-Statistics-2018-EN (accessed March 2019).
2. International Agency for Research on Cancer [Internet]. Global Cancer Observatory (GCO).Lyon, FR: International Agency for Research on Cancer; 2019. Available at: http://gco.iarc.fr/ (accessed March 2019).
3. Forman D, Bray F, Brewster DH, Gombe Mbalawa C, Kohler B, Pineros M, et al [Internet]. CI5: Cancer Incidence in Five Continents, Vol. X (electronic version). Lyon, FR: International Agency for Research on Cancer; 2013. Available at: http://ci5.iarc.fr/ (accessed March 2019).
4. Ferlay J, Colombet M, Bray F [Internet]. CI5: Cancer Incidence in Five Continents. Lyon, FR: International Agency for Research on Cancer; 2018. Available at: http://ci5.iarc.fr (accessed March 2019).
5. Cancer Research UK [Internet]. International Cancer Benchmarking Partnership (ICBP). London, UK: Cancer Research UK. Available at: https://www.cancerresearchuk.org/health-professional/data-and-statistics/international-cancer-benchmarking-partnership-icbp (accessed March 2019).
6. Allemani C, Matsuda T, Di Carlo V, Harewood R, Matz M, Niksic M, et al. Global surveillance of trends in cancer survival 2000–14 (CONCORD-3): Analysis of individual records for 37,513,025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries 2018. Lancet. 2018 Mar 17;391(10125): 1023–75.
7. Arnold M, Rutherford M, Bardot A, Ferlay J, Anderson T, Myklebust TA, et al. Progress in cancer control: survival, mortality and incidence in seven high-income countries 1995-2014 (the ICBP SURVMARK-2 project). Lancet Oncol. Forthcoming 2019.
8. de Oliveira C, Weir S, Rangrej J, Krahn MD, Mittmann N, Hoch JS, et al. The economic burden of cancer care in Canada: A population-based cost study. CMAJ Open. 2018 Jan 4;6(1):E1–10.
9. Mariotto AB, Yabroff KR, Shao Y, Feuer EJ, Brown ML. Projections of the cost of cancer care in the United States: 2010–2020. J Natl Cancer Inst. 2011 Jan 19;103(2):117–28.
10. Canadian Cancer Society's Advisory Committee on Cancer Statistics [Internet]. Canadian Cancer Statistics 2015. Toronto, ON: Canadian Cancer Society; 2015. Available at www.cancer.ca/Canadian-Cancer-Statistics-2015-EN (accessed March 2019).
11. Canadian Cancer Action Network and Canadian Cancer Society, Manitoba Division [Internet]. Five-year Action Plan to Address the Financial Hardship of Cancer in Canada: A Call for Action. Toronto, ON: Cancer Action Netwrok; 2010. Available at: http://www.cancer.ca/~/media/cancer.ca/MB/get%20involved/take%20action/financial%20hardship%20of%20cancer%20in%20canada/financialhardshipofcancer-MB-EN.pdf?la=en (accessed March 2019).
12. Statistics Canada [Internet]. Population projections for Canada, provinces and territories: 2009 to 2036 (Catalogue No. 91-520-X). Ottawa, ON: Ministry of Industry; 2010. Available at: http://www.statcan.gc.ca/pub/91-520-x/91-520-x2010001-eng.htm (accessed March 2019).
13. Xie L, Semenciw R, Mery L. Cancer incidence in Canada: Trends and projections (1983–2032). Health Promot Chronic Dis Prev Can. 2015 Spring;35 Suppl 1:2–186.
14. Canadian Partnership Against Cancer [Internet]. Living with Cancer: A Report on the Patient Experience. Toronto, ON: Canadian Partnership Against Cancer; 2018. Available at: https://www.systemperformance.ca/report/living-with-cancer-patient-experience/ (accessed March 2019).
15. World Health Organization [Internet]. Cancer Prevention. Geneva, Switzerland: World Health Organization; 2019. Available at: http://www.who.int/cancer/prevention/en/ (accessed March 2019)
16. Poirier AE, Ruan Y, Volesky K, King WD, O'Sullivan DE, Gogna P, et at. The current and future burden of cancer attributable to modifiable risk factors in Canada: Summary of results. Prev Med. 2019;122:140–147.
17. Cancer Research UK [Internet]. Statistics on Preventable Cancers. London, UK: Cancer Research UK. Available at: http://www.cancerresearchuk.org/health-professional/cancer-statistics/risk/preventable-cancers#heading-One (accessed March 2019).
18. Alberta Health Services [Internet]. Together, we can reduce the risk of cancer in Alberta by about 45%. Alberta Health Services. Available at: http://www.albertapreventscancer.ca/preventable-cancers/ (accessed March 2019).
19. Canadian Task Force on Preventive Health Care [Internet]. Lung Cancer (2016): Summary of recommendations for clinicians and policy-makers. Available at: https://canadiantaskforce.ca/guidelines/published-guidelines/lung-cancer/ (accessed March 2019).
20. Canadian Partnership Against Cancer [Internet]. Pan-Canadian Lung Cancer Screening Initiative: Lung Cancer Screening Framework for Canada. Toronto, ON: Canadian Partnership Against Cancer; 2014. Available at: https://s22457.pcdn.co/wp-content/uploads/2019/01/Lung-Cancer-Screening-Framework-2014-EN.pdf (accessed March 2019).
21. Cancer Care Ontario [Internet]. Lung Cancer Screening Pilot for People at High Risk. Toronto, ON: Cancer Care Ontario. Available at: https://www.cancercareontario.ca/en/guidelines-advice/cancer-continuum/screening/lung-cancer-screening-pilot-people-at-high-risk (accessed March 2019).
22. Dickinson JA, Stankiewicz A, Popadiuk C, Pogany L, Onysko J, Miller AB. Reduced cervical cancer incidence and mortality in Canada: National data from 1932 to 2006. BMC Public Health. 2012 Nov 16;12:992.
23. Hall MT, Simms KT, Lew JB, Smith MA, Brotherton JM, Saville M, et al. The projected timeframe until cervical cancer elimination in Australia: A modelling study. Lancet Public Health. 2019 Jan;4(1):e19–27.
24. Vaccarella S, Franceschi S, Bray F, Wild CP, Plummer M, Dal Maso L. Worldwide thyroid-cancer epidemic? The increasing impact of overdiagnosis. N Engl J Med. 2016 Aug 18;375(7):614–7.
25. Bell N, Connor Gorber S, Shane A, Joffres M, Singh H, Dickinson J, et al. Recommendations on screening for prostate cancer with the prostate-specific antigen test. CMAJ. 2014 Nov 4;186(16):1225–34.

APPENDIX I

Related resources

Additional cancer surveillance statistics

Statistics Canada offers a series of online tables of aggregate statistics that can be manipulated to the user's specifications. The tables were previously referred to as CANSIM.

Statistics Canada also offers a series of online data tables that provide the public with fast and easy access to the latest statistics available in Canada relating to demography, health, trade, education and other key topics. This includes a number of tables related to cancer. These tables can be accessed from the Statistics Canada website at https://www150.statcan.gc.ca/n1/en/type/data.

Users can browse available data tables by topic or search by keywords or a table number. Users can generate customized statistical summaries of tables using some the data functions (e.g., "Add/Remove data"). Final summaries can be exported using the download function.

Which tables are relevant and how do I use them?

The table on the right contains a list of tables most relevant to this publication. Many have been referenced in this publication. This is not a complete list of all tables available. Additional tables can be found by browsing the Statistics Canada website.

Table number	Title and description
13-10-0111-01	**Number and rates of new cases of primary cancer (based on the November 2017 CCR tabulation file), by cancer type, age group and sex** Provides counts of new cancer cases and crude incidence rates (and 95% confidence intervals) for Canada and provinces and territories by cancer type, age group, sex and year
13-10-0747-01	**Number of new cases and age-standardized rates of primary cancer (based on the November 2017 CCR tabulation file), by cancer type and sex** Provides counts of new cancer cases and age-standardized incidence rates (and 95% confidence intervals) for Canada and provinces and territories by cancer type, sex and year
13-10-0109-01	**Cancer incidence, by selected sites of cancer and sex, three-year average, Canada, provinces, territories and health regions (2015 boundaries)** Provides counts of new cancer cases and crude age-standardized incidence rates (and 95% confidence intervals) for Canada and provinces and territories by cancer type, sex, geography and year
13-10-0112-01	**Cancer incidence, by selected sites of cancer and sex, three-year average, census metropolitan areas** Provides cancer cases and crude and age-standardized cancer rates (and confident intervals) for metropolitan areas, by sex and cancer site for 2001 to 2003.
13-10-0142-01	**Deaths, by cause, Chapter II: Neoplasms (C00 to D48)** Provides the annual number of cancer deaths for Canada by cancer cause of death, age group, sex and year
13-10-0392-01	**Deaths and age-specific mortality rate, by selected grouped causes** Provides the annual number of deaths and crude mortality rates for Canada by cause of death, age group, sex and year
13-10-0800-01	**Deaths and mortality rate (age-standardization using 2011 population), by selected grouped causes** Provides the annual number of deaths and the crude and age-standardized mortality rates for Canada or provinces and territories by sex, year and cause of death
17-10-0005-01	**Population estimates on July 1st, by age and sex** Provides population counts for Canada and provinces and territories by age, year and sex
13-10-0158-01	**Age-specific five-year net survival estimates for primary sites of cancer, by sex, three years combined** Provides estimates of age-specific five-year net survival (and 95% confidence intervals) for Canada (with and without Quebec) by cancer type, sex and overlapping three-year time periods
13-10-0159-01	**Age-specific five-year net survival estimates for selected cancers with age distributions of cases skewed to older ages, by sex, three years combined** Provides estimates of age-specific five-year net survival (and 95% confidence intervals) for Canada (with and without Quebec) by selected cancers with age distributions of cases skewed to older ages, by sex and overlapping three-year time periods
13-10-0160-01	**Age-standardized five-year net survival estimates for primary sites of cancer, by sex, three years combined** Provides estimates of age-standardized five-year net survival (and 95% confidence intervals) for Canada (with and without Quebec) by cancer type, sex and overlapping three-year time periods
13-10-0161-01	**Age-standardized and all-ages five-year net survival estimates for selected primary sites of cancer, by sex, three years combined, by province** Provides estimates of all-ages and age-standardized five-year net survival (and 95% confidence intervals) for provinces by selected cancers, sex and overlapping three-year time periods

A detailed description of how to access, modify and download these data tables is provided online.

What if I need statistics that are not available in the tables?

Custom tabulations are available on a cost-recovery basis upon request from Statistics Canada. Analytical articles appear regularly in Health Reports, Statistics Canada, Catalogue no. 82-003.

Other information about the data Statistics Canada offers is available through their website (statcan.gc.ca).

Why do some statistics in this publication differ from the statistics in these tables?

Users of Statistics Canada's data tables should be aware that there are some differences between the data compiled for this publication and those used in Statistics Canada's tables. For additional details on those data, users should review the footnotes provided under each table on the Statistics Canada website. The information in those footnotes can be compared to the details provided in *Appendix II* of this publication.

Chronic disease surveillance

The Public Health Agency of Canada hosts a series of online data tools, indicator frameworks and infographics on their Public Health Infobase, which allows users to access and view public health data. This includes the Canadian Chronic Disease Indicator (CCDI) tool, which is a comprehensive pan-Canadian resource on the burden of chronic diseases and associated determinants. Among other indicators, the CCDI provides the rate of cancer incidence, morality, prevalence and screening practices over time and by sex, age and province/territory. PHAC also regularly publishes fact sheets, infographics and blogs on cancer in Canada (https://www.canada.ca/en/public-health/services/chronic-diseases.html).

Childhood cancer surveillance

The Public Health Agency of Canada funds and manages the Cancer in Young People in Canada (CYP-C) program, which is a national, population-based surveillance system studying all children and youth with cancer in Canada. This program is a partnership with the C[17] Council, the network of all seventeen children's cancer hospitals across Canada. CYP-C products include a full report[1] and fact sheets. In the near future, a data dashboard is expected.

Cancer system performance

The Canadian Partnership Against Cancer is an independent organization funded by the federal government to accelerate action on cancer control for all Canadians. As part of that work, they produce cancer system performance data to see how jurisdictions compare and to identify gaps in care. This includes information related to prevention, screening, diagnosis, treatment, the person-centered perspective and research. Online tools and reports are available at https://www.systemperformance.ca.

Cancer prevention

The Canadian Cancer Society maintains up-to-date, accurate information on cancer prevention at www.cancer.ca/prevention. This includes It's My Life, which is an online, interactive tool designed to teach the public how different risk factors affect the risk of getting cancer and what can be done to reduce the risk.

This year, the Canadian Population Attributable Risk of Cancer (ComPARe) project was released. It quantified the number and percentage of cancers in Canada, now and in the future, attributable to modifiable risk factors. All results from that study are available through a data dashboard at www.prevent.cancer.ca. Using the dashboard, users can select the cancer and risk factor of interest and investigate the data by age, sex and year.

International cancer surveillance

Comparable cancer indicators for different countries can be found through various international resources. Those listed below represent reputable resources for that information.

- The Global Cancer Observatory (GCO) is an interactive web-based platform that focuses on the visualization of cancer statistics to show the changing scale, epidemiologic profile and impact of the disease worldwide.
- The Cancer Incidence in Five Continents series provides comparable data on cancer incidence from a range of geographical locations.
- The Cancer in North America (CiNA) publications are produced annually to provide the most current incidence and mortality statistics for the United States (US) and Canada.
- The International Cancer Benchmarking Partnership (ICBP) quantifies international differences in cancer survival and identifies factors that might influence observed variations.
- CONCORD is a program for worldwide surveillance of cancer survival. The most recent CONCORD publication is CONCORD-3.[2]

References

1. Public Health Agency of Canada [Internet]. Cancer in Young People in Canada: A Report from the Enhanced Childhood Cancer Surveillance System. Ottawa, ON: Public Health Agency of Cancda; 2017. Available at: https://www.canada.ca/content/dam/hc-sc/documents/services/publications/science-research-data/cancer-young-people-canada-surveillance-2017-eng.pdf (accessed March 2019).
2. Allemani C, Matsuda T, Di Carlo V, Harewood R, Matz M, Niksic M, et al. Global surveillance of trends in cancer survival 2000–14 (CONCORD-3): Analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. Lancet. 2018 Mar 17;391(10125): 1023–75.

APPENDIX II

Data sources and methods

Summary

Who was involved?

The Centre for Surveillance and Applied Research at the Public Health Agency of Canada and the Centre for Population Health Data at Statistics Canada conducted the analyses that are presented in this publication. The provincial and territorial cancer registries were consulted in the preparation of the cancer incidence and mortality projections for their jurisdictions. The Canadian Cancer Statistics Advisory Committee advised on the methodology and interpretation of results and wrote the accompanying text. The Canadian Cancer Society coordinated the production of this publication and the work of the committee.

What data were used?

- Actual cancer incidence data used for this publication were for the period 1984 to 2015 (except for Quebec, for which data were available to 2010). The Canadian Cancer Registry (CCR) was used for incidence data between 1992 and 2015, and the National Cancer Incidence Reporting System (NCIRS) was used for incidence data prior to 1992.
- Actual cancer mortality data were also for the period 1984 to 2015. These data were obtained from the Canadian Vital Statistics Death Database (CVSD); Quebec cancer mortality was estimated based information available in published tables.
- Survival analyses were based on a death-linked analytic file that covered the period from 1992 to 2014.
- Additional sources of data included population life tables, population estimates and forecasts on population growth.

Which analytic approaches were used?

- Estimates of the lifetime probability of developing and dying from cancer were estimated using DevCan.[1]
- Cancer incidence and mortality projections were estimated using CANPROJ.[2]
- Joinpoint analysis[3] was applied to estimate trends in incidence and mortality over time.
- Net survival was calculated using the Pohar Perme estimator. The cohort method was used to estimate actual (non-predictive) estimates of survival for 1992–1994, while the period method was used to estimate predictive estimates of survival for 2012–2014 for adult cancers and from 2010-2014 for childhood cancer.

Data sources

Incidence data: The Canadian Cancer Registry (CCR)

Actual cancer incidence data used in this publication cover the period of 1984 to 2015 (except Quebec, for which data from 1984 to 2010 were used). Data for 1992 to 2015 were obtained from the PHAC shared version of the CCR,[4] which was based on the November 2017 CCR Tabulation Master File, released January 29, 2018 (see Data methods and issues). Data for years that precede the CCR (before 1992) were retrieved from its predecessor, the National Cancer Incidence Reporting System (NCIRS). The NCIRS is a fixed, tumour-oriented database containing cases diagnosed between 1969 and 1991.

- Incidence data originate with the provincial and territorial cancer registries (PTCR), which provide data annually to Statistics Canada for inclusion in the CCR.
- The CCR is a person-oriented database that includes clinical and demographic information about residents of Canada diagnosed with new cases of cancer.
- Incidence estimates are based on the individuals' province or territory of residence at the time of diagnosis which may differ from the jurisdiction in which the diagnosis occurred.
- The Centre for Population Health Data at Statistics Canada maintains the CCR. An annual

process is in place to identify and remove duplicate person and tumour records. Records from Quebec have not been de-duplicated within or between provinces since the last provincial process, which was completed for cases diagnosed to December 31, 2008.

- Cancer diagnoses are classified according to the *International Classification of Diseases for Oncology, 3rd Edition* (ICD-O-3) from 1992 onward.[5] Cancer diagnoses in the NCIRS (i.e., prior to 1992) were classified according to the *International Statistical Classification of Diseases and Related Health Problems, Ninth Revision* (ICD-9).[6]
- The International Agency for Research on Cancer (IARC) rules[7] for multiple primaries were used for cases from the CCR (see *Data and methods issues*) from 1992 onwards for all provinces except Ontario who had slightly more conservative IARC rules until the 2010 diagnosis year. During the period covered by the NCIRS, registries other than Quebec and Ontario used multiple primary rules that allowed a small percentage of additional cases.

Mortality data: The Canadian Vital Statistics—Death database (CVSD)

The actual mortality data used in this publication cover the period of 1984 to 2015 and were obtained from the PHAC shared version of the Canadian Vital Statistics—Death Database (CVSD) for all provinces except Quebec.[8]

- Death records originate with the provincial and territorial registrars of vital statistics and are provided regularly to Statistics Canada for inclusion in the CVSD.
- The CVSD includes information on demographics and cause of death for all Canadian residents and non-residents who died in Canada from 1950 onward. Information on non-residents is not used for this publication.
- Due to data sharing agreements, information regarding deaths occurring in Quebec was not available on the CVSD file provided to PHAC for 2001 onward. Information regarding the year, sex, age and cause of deaths occurring in Quebec was obtained by subtracting the national total from publicly available sources,[9] which includes all deaths occurring among residents of Canada (including Quebec), from the national total (excluding Quebec), which is available in the PHAC version of the CVSD.
- Mortality estimates are based on the individuals' province or territory of residence at the time of death rather than the place where the death occurred.
- Data are also included for Canadian residents who died in a small number of states within the United States (US) from which abstracted death data were received. Starting with the 2010 data year, this information is no longer available.
- The Centre for Population Health Data at Statistics Canada maintains the CVSD.
- Cause of death is classified according to the ninth and 10th revisions of the *International Statistical Classification of Diseases and Related Health Problems* (ICD): ICD-9[6] from 1979 to 1999 and ICD-10 from 2000 onward.[10]
- Cancer deaths are those for which some form of cancer, as certified by a physician, is the primary underlying cause of death.

Population data: Census of the population

- Population estimates for 1984 to 2017 were obtained from Statistics Canada.[11,12]
- Projected population estimates are used for 2018 and 2019, as prepared by Statistics Canada under assumptions of medium growth (scenario M1).[13] Scenario M1 incorporates medium-growth and historical trends (1991/1992 to 2010/2011) of interprovincial migration.
- All population estimates include non-permanent residents and are adjusted for net census undercoverage and Canadians returning from abroad.

Survival data

- A death-linked analytic file was created by Statistics Canada by linking the November 2017 CCR tabulation file to mortality information complete through December 31, 2014. This information was obtained from the CVSD[8] and T1 Personal Master Files (as reported on tax returns). The analytic file follows the multiple primary coding rules of IARC.[7]
- Survival time is measured in days and variables for age at diagnosis and diagnosis year are available to three decimal places.
- More information on the linkage process and the resulting death-linked analytic file is available upon request.[14]
- Expected survival probabilities necessary for the calculation of net survival were mostly obtained from sex-specific annual provincial life tables.[15]
- As complete life tables were not available for Prince Edward Island or the territories, expected survival for these jurisdictions were

derived, up to the age of 99 years, from abridged life tables for Canada and the affected jurisdictions[16] and from complete Canadian life tables[15] using a method suggested by Dickman et al.[17] For ages 100 to 109, where this was not possible for these jurisdictions, complete Canadian life values were directly used.

Cancer definitions

- Cancer cases were defined according to ICD-9[6] prior to 1992 and ICD-O-3[5] thereafter. Cancer deaths were defined according to ICD-9[6] prior to 2000 and ICD-10[10] thereafter. Table A1 outlines the ICD-9, ICD-O-3 and ICD-10 codes used to identify cancer cases and deaths by cancer type for this publication.
- Some definitions have changed slightly over time. Changes occurring since the 2004 edition of this publication are outlined in Tables A2-1 and A2-2.
- For Figures 1.4 and Table 3.3, new cancers for children (aged 0–14 years) were classified and reported according to the Surveillance, Epidemiology and End Results Program (SEER) update[18] of the *International Classification of Childhood Cancer, Third Edition* (ICCC-3).[19] The update was in response to new morphology codes introduced by the World Health Organization.[20] The classification system is more appropriate for reporting childhood cancers because it acknowledges the major differences between cancers that develop during childhood and those that occur later in life. Non-malignant tumours were excluded.

Methods

Incidence and mortality rates

- Records from each province or territory were extracted from the relevant incidence or mortality files and then classified by year of diagnosis or death and by sex, five-year age group (e.g., 0–4, 5–9, …, 85–89, 90+ years) and cancer type.
- Rates for each category were calculated by dividing the number of cases or deaths in each category (i.e., sex, age group, year, cancer type and province or territory) by the corresponding population figure. These formed the basis for calculations of age-standardized rates and for projections beyond the most recent year of actual data.
- Age-standardized rates were calculated using the direct method, which involves weighting the age-specific rates for each five-year age group according to the age distribution of the 2011 Canadian standard population (see table on the right). In order to use the CANPROJ projection package, all age-standardized rates were based on 18 age groups instead of 19, whereby the last two age categories were combined into a new 85+ age group and assigned a weight of 0.018725 (see *Projection of incidence and mortality for 2019* below).
- Age-standardized rates computed for age categories (e.g. 0–19, 20–29, …, 70–79 and 80+ years) used adjusted weights. Specifically, the weight assigned to each age group in the category was divided by the sum of the weights in the age category.

2011 Canadian standard population

Age group	Population	Standard weight
0–4	1,899,064	0.055297
5–9	1,810,433	0.052717
10–14	1,918,164	0.055853
15–19	2,238,952	0.065194
20–24	2,354,354	0.068555
25–29	2,369,841	0.069006
30–34	2,327,955	0.067786
35–39	2,273,087	0.066188
40–44	2,385,918	0.069474
45–49	2,719,909	0.079199
50–54	2,691,260	0.078365
55–59	2,353,090	0.068518
60–64	2,050,443	0.059705
65–69	1,532,940	0.044636
70–74	1,153,822	0.033597
75–79	919,338	0.026769
80–84	701,140	0.020416
85–89	426,739	0.012426
90+	216,331	0.006299
Total	34,342,780	1.000000

Note: The Canadian population distribution is based on the final postcensal estimates of the July 1, 2011, Canadian population, adjusted for census undercoverage.

Data source: Census and Demographics Branch, Statistics Canada

Figure 4.4 (in *Chapter 4: Cancer in context*) shows the relative number of new cases and deaths that can be attributed to changes in cancer risk and cancer control practices, population size and aging of the population.

The series shown in Figure 4.4 were calculated as follows:

- Uppermost series (red) — The actual and projected annual number of Canadian cancer cases or deaths for both sexes combined
- Next-to-uppermost series (orange) — Annual total population multiplied by the annual age-standardized rate, using the 1984 population distribution for males and females as the standard weights
- Next-to-baseline series (green) — The 1984 total population multiplied by the annual age-standardized rate, using the 1984 population distribution for males and females as the standard weights
- Baseline (dotted line) — The observed number of Canadian cancer cases or deaths during 1984 for both sexes combined.

Projection of incidence and mortality rates and counts for 2019

The CANPROJ R-package was used to produce annual incidence and mortality projections of rates and counts. Six options are available in CANPROJ, including four regression models and two average methods. All regression models are based on a Power5 linked function (although this option can be changed), and a negative binomial distribution is used instead of a Poisson distribution when there is overdispersion. The projection options available are: the age-drift-period-cohort (AdPC) model, also known as the Nordpred model when the Poisson distribution is used; the age-cohort model; the hybrid models that incorporate age and period effects (age-specific or common to all ages); the hybrid model that incorporates only age (equivalent to a long-term average); and the 5-year average method.

CANPROJ is equipped with a decision tree that determines which of these options is the most suitable for projecting the data based on the significance of the variables that are included in the AdPC model (age, drift, period and cohort).

To allow for a damping of the impact of current trends in the future time periods, a "cut-trend" option was used, which is a vector of proportions indicating how much to cut the trend estimate for each five-year projection period. A gradual reduction in the drift parameter of 5% and 10% in the second and third five-year period, respectively, was used as the default.

Age was included in all models as a factor. Trends in age-specific incidence and mortality rates were then extrapolated to 2019. The projected numbers of cancer cases and deaths in 2019 were calculated by multiplying these extrapolated rates by the sex-, age- and province-specific population projections for the same year.

Selection of "best" projections

The process for selecting the "best" projected counts and rates by sex, cancer type and geography went as follows:

- The CANPROJ package decision tree was used to select the model that best suited the actual data, according to the statistical tests performed within CANPROJ. When counts were small, the five-year average projection was used. This happened more often in the territories and Prince Edward Island.
- Figures created with the CANPROJ -selected models were visually inspected for face validity by at least two independent reviewers. In instances where the CANPROJ -selected model looked problematic (e.g., the estimates were at least 10% different than what would be expected), an alternate model was selected and approved through group consensus.
- The proposed estimates (counts and age-standardized rates) were sent to the provincial and territorial cancer registries for approval.
- In instances where the province or territory disagreed with an estimate based on in-house projections, knowledge of local trends or access to more recent data, they had the opportunity to provide this information to the committee for consideration.
- If the committee approved the rationale, they recommended an alternate model to the registry.

Through this consultation process, the "best" model was selected. All cancer-specific provincial and territorial projections reported in this publication were approved by a representative from the respective cancer registry as well as by the Canadian Cancer Statistics Advisory Committee.

Quebec incidence projections

Because cancer incidence data were only available for Quebec to 2010, an alternative projection method was used to estimate Quebec-specific cases and rates for 2011–2019. Specifically:

- Sex-, age- and cancer-specific correction factors were calculated as the ratio of sex-, age-, and cancer-specific estimates for Quebec relative to Canada (excluding Quebec) for the 2006–2010 years.
- Actual (2011–2015) and projected (2016–2019) Canada rates that excluded Quebec by year, sex and five-year age group were applied to the 2011 to 2019 Quebec population to estimate preliminary Quebec-specific counts.
- The correction factors were applied to the preliminary Quebec-specific counts to produce the counts and rates used for this publication.

This method assumes the ratio of rates between Quebec and the rest of Canada remained constant over time, which may not be the case. Given the assumptions made for this analysis, extra caution should be taken when interpreting Quebec projected data. For example, upon review of the projected QC data, it was raised that the projections likely underestimate melanoma and prostate because of recent improvements in data collection.[21]

In this publication, cases were reported for Quebec because of their importance in determining the national total projected number of cancer cases. However, age-standardized rates were not reported for Quebec since they were estimated differently than other regions and therefore should not be compared.

Combined projections

For each province or territory, the "all cancers" projection was calculated as the sum of the cancer-specific projections, and "both sexes" was calculated as the sum of male and female counts. Projections for Canada as a whole were computed as sums of the projections for the individual provinces and territories.

More information about the projection method used for this publication is available upon request at ccc-ssc@phac-aspc.gc.ca.

Rounding for reporting

Predicted estimates of incidence and mortality presented in this publication have been rounded as follows:

- Numbers between 0 and 99 were rounded to the nearest 5.
- Numbers between 100 and 999 were rounded to the nearest 10.
- Numbers between 1,000 and 1,999 were rounded to the nearest 50.
- Numbers greater than or equal to 2,000 were rounded to the nearest 100.

Age-specific and sex-specific numbers were combined before rounding, so it is possible that totals in the tables do not add exactly. However, any such discrepancies are within the precision of the rounding units described above.

Throughout the publication, actual incidence and mortality frequencies are randomly rounded up or down to a multiple of 5.[22]

Precision of 2019 projections

The precision of a projection depends primarily on the number of observed cases and the population size for each combination of cancer type, age, sex and province or territory. Therefore, caution must be taken when interpreting differences in counts or rates, particularly for the smaller provinces and territories, as these differences may not be statistically significant.

Annual percent change (APC) and average annual percent change (AAPC) in cancer incidence and mortality rates

- Using Joinpoint,[3] the APC was calculated for each cancer type by fitting a piecewise linear regression model, assuming a constant rate of change in the logarithm of the annual age-standardized rates in each segment. The models incorporated estimated standard errors of the age-standardized rates. The tests of significance used a Monte Carlo Permutation method. The estimated slope from this model was then transformed back to represent an annual percentage change in the rate.
- Joinpoint analysis was applied to annual age-standardized rates (1984 to 2015 for incidence and mortality) to determine years in which the APC changed significantly. Such years are referred to as changepoints.
- After consultation, 1984 was chosen as the start year because the quality of the data is considered good for all the provinces and territories from that year onward.
- Projected cancer incidence rates for Quebec were not included in the Joinpoint analysis.
- The minimum time span on which to report a trend was set at five years. Thus, the most recent possible trend period in this study was 2011 to 2015 for incidence and mortality. A maximum of five joinpoints was allowed. An uncorrelated error model was selected for the autocorrelated errors options and the permutation test was used for the model selection.

- The year corresponding to the most recent changepoint detected (reference year) and the APC for the years beyond the changepoint are reported in Tables 1.6 and 2.6, as well as Figures 1.7 and 2.7. In the absence of a changepoint, the reference year is 1984.
- Cancers that demonstrated a statistically significant APC of at least 2% since the reference year), as well as the four most commonly diagnosed cancers (for incidence) and the four leading causes of cancer death (for mortality), are highlighted in the text. The trends for these notable cancers are depicted in Figures 1.8 and 1.9 for incidence and 2.8 and 2.9 for mortality.
- To summarize the trend(s) over specified periods, the average annual percent change (AAPC) was calculated for the entire time period (1984 to 2015) and the most recent 10 years (2006 to 2015). AAPC is computed as a weighted average of the APCs in effect during the specified period with the weights equal to the proportion of the period accounted for by each APC.
- Bladder cancer included *in situ* carcinomas, which are considered invasive for the purpose of incidence reporting for all provinces and territories. At the time of analysis, data on *in situ* carcinomas of the bladder for Ontario were limited to 2010 to 2015. Because a large proportion of Canadians live in Ontario and since a significant proportion of bladder cancers are *in situ* carcinomas, the trend analysis for bladder cancer incidence was modified to account for the artificial jump in rates that occurred between 2009 and 2010. Specifically, the 1984 to 2015 data were divided into two time periods, 1984 to 2009 and 2010 to 2015, and the Joinpoint analysis was performed on each period separately. Because of this, no AAPCs are provided for incident bladder cancer.

Probability of developing or dying from cancer

Probabilities of developing or dying from cancer were calculated using the software application DevCan.[1] Using cross-sectional data on first cancer diagnoses, cancer deaths, all deaths and population estimates, DevCan employs statistical modelling to compute the probability of developing or dying from cancer.[23, 24]

Estimating the probability of developing or dying from cancer assumes the current incidence and mortality rates at each age stay constant throughout the lifetime of the hypothetical cohort of 10,000,000 live births. Since this assumption may not be true, the probabilities should be regarded only as approximations. Further, the estimated probabilities are for the general Canadian population and should not be interpreted as an individual's risk.

Probability of developing cancer

Age-, sex- and cancer-specific case and death counts, age- and sex-specific all-cause death counts and population estimates for Canada (excluding Quebec) in 2015 were calculated using 20 age groups (0 to <1, 1–4, 5–9, 10–14, …, 85–89 and 90+ years) and analyzed in DevCan using the default all ages with five-year intervals. Quebec could not be included because data were only available to 2010.

- The lifetime probability of developing cancer was calculated by dividing the total number of cancers occurring over the complete life (age 0–90+) by the hypothetical cohort of 10,000,000 live births. This calculation does not assume that an individual lives to any particular age.
- Probabilities were calculated for all cancers combined and by cancer type, by sex.

Probability of dying from cancer

Age-, sex- and cancer-specific death counts, age- and sex-specific all-cause death counts and population estimates for Canada in 2015 (excluding Quebec) were calculated using 20 age groups (0 to <1, 1–4, 5–9, 10–14, …, 85–89 and 90+ years) and analyzed in DevCan using the default all ages with five-year intervals.

- The lifetime probability of dying from cancer is the total number of cancer deaths occurring over the complete life (age 0–90+) divided by the hypothetical cohort of 10,000,000 live births. This calculation does not assume that an individual lives to any particular age.
- Probabilities were calculated for all cancers combined and by cancer type, by sex.

Potential Years of Life Lost (PYLL)

PYLL was calculated by taking the exact age of each person dying before the age of 75 years and subtracting that from 75 to calculate individual years lost. The sum of all these values represents the total PYLL. Figure 4.2 presents the total PYLL for people aged 0–74 for the years 2014 to 2016 combined using data from the CVSD.[25]

The following ICD-10 codes were used to create the categories presented in Figure 4.2.

Category	ICD-10 cause of death terminology	ICD-10 Codes
Cancer	All malignant neoplasms	C00-C97
Accidents	Unintentional injuries	V01-X59, Y85-Y86
Heart disease	Ischaemic heart diseases	I20-I25
Suicide	Suicides and self-inflicted injuries	X60-X84, Y87.0
Respiratory disease	Respiratory diseases	J00-J99
Cerebrovascular diseases	Cerebrovascular diseases	I60-I69
HIV	Human immunodeficiency virus (HIV) disease	B20-B24

Survival

- Records from the death-linked analytic file used for survival were excluded in a stepwise manner. Records were initially excluded if the diagnosis had been established through autopsy only or death certificate only, or if the year of birth or death was unknown. The data set was then further restricted to first primary cancers per site[26–29] diagnosed from 1992 to 2014. Next, incident cases from the province of Quebec were excluded because cancer incidence data from this province have not been submitted to the CCR since the 2010 data year.
- With the exception of specific analyses on childhood cancers (ages 0 to 14), all analyses were based on cases between the ages of 15 and 99.
- Unstandardized (crude) survival analysis estimates were derived using an algorithm[30] that has been augmented by Ron Dewar of the Nova Scotia Cancer Care Program (Dewar R, 2018, email communication, 19th April) to include the Pohar Perme estimator of net survival[31] using the hazard transformation approach.
- Cases with the same date of diagnosis and death (not including those previously excluded because they were diagnosed through autopsy only or death certificate only) were assigned one day of survival because the program automatically excludes cases with zero days of survival. Exclusion of these cases would have biased estimates of survival upward.
- For five-year survival, three-month subintervals were used for the first year of follow-up, then six-month subintervals for the remaining four years, for a total of 12 subintervals. Where the analysis was extended to 10 years, one-year subintervals were used for the sixth through 10th years.
- Estimating net survival in a relative survival framework requires that the non-cancer mortality rate in a group of people diagnosed with cancer is the same as that in the population-based life table.[32] To better satisfy this assumption, expected survival data used in the calculation of net survival for prostate and female breast cancer were adjusted for cancer-specific mortality rates in the general population.[33–35] In each case, the proportion of deaths among Canadian residents due to the specific cancer, by sex, five-year age group and year of death, was used for the adjustment. Provincial-specific mortality estimates were used for those aged 55 to 59 and older age groups. Otherwise, national estimates were used.[36]
- Conditional five-year net survival[37,38] was calculated as per five-year net survival using only the data of people who had survived at least one year after diagnosis. That is, the survival estimates for an additional four years among people who had already survived one year.
- Net survival estimates for both sexes and all cancers combined were adjusted by sex and individual cancer type (case-mix) to mitigate the effect on these estimates of differences in the distribution of cancer cases over time by these variables. Similarly, sex-specific estimates for all cancers combined were separately adjusted for case-mix. In both cases, the weights employed were based on the sex and case-mix distribution of people aged 15 to 99 diagnosed with cancer in Canada, excluding Quebec, from 2010 to 2014. These weights are available upon request.
- Observed survival estimates for all childhood cancers combined were calculated as a weighted average of diagnostic group-specific estimates. The weights used were based on the diagnostic group case-mix distribution of people aged 0 to 14 diagnosed with cancer in Canada, excluding Quebec, from 2010 to 2014. These weights are available upon request.

- Age-standardized estimates were calculated using the direct method by weighting age-specific estimates for a given cancer to the age distribution of people aged 15 to 99 diagnosed with that cancer. The incident age distributions were based on cases diagnosed from 2010 to 2014 in Canada excluding Quebec.[36] Canadian survival standard weights for individual and grouped cancers are provided as online-only supplementary data.
- All weights described above were derived using the IARC version of the November 2017 CCR tabulation file.
- A comparison of five-year net survival estimates age-standardized using the Canadian cancer survival standard weights described above and, alternatively, weights developed from data collected for the EUROCARE-2 study[39] is provided as online-only supplementary data.
- Standard errors for age-standardized estimates were estimated by taking the square root of the sum of the squared, weighted, age-specific standard errors.
- Predicted survival estimates for the most recent period, typically 2012–2014, were derived using period analysis.[40] The period approach to survival analysis provides up-to-date predictions of cancer survival.[41] With this method, follow-up data do not relate to a fixed cohort of people with cancer. Rather, estimates of period survival are based on the assumption that persons diagnosed in the period of interest will experience the most recently observed conditional probabilities of survival.
- When survival is generally improving, a period estimate tends to be a conservative prediction of the survival that is eventually observed.
- The cohort method was used to derive non-predictive (actual) estimates of survival for 1992–1994.
- Observed survival proportions were reported for the analysis of childhood cancers.
- Net survival probabilities and observed survival proportions were expressed as percentages.
- Survival estimates associated with standard errors greater than 0.10 were omitted. Estimates associated with standard errors greater than 0.05 but less than or equal to 0.10 were italicized.

Data and methods issues

Incidence

Although the Canadian Council of Cancer Registries and its standing Data Quality and Management Committee make every effort to achieve uniformity in defining and classifying new cancer cases, reporting procedures and completeness still vary across the country. The standardization of case-finding procedures, including linkage to provincial or territorial mortality files, has improved the registration of cancer cases and comparability of data across the country. Some specific issues remain:

- Benign and borderline tumours and carcinomas *in situ* are not routinely captured or reported except for *in situ* carcinomas of the bladder, which are considered invasive for the purpose of incidence reporting for all provinces and territories. At the time of analysis, data on *in situ* carcinomas of the bladder for Ontario were limited to 2010 to 2015.
- In previous editions of this publication, it was noted that data from Newfoundland and Labrador (NL) were potentially affected by under-reporting of cases due to incomplete linkage of cancer and vital statistics information. The NL Cancer Registry has implemented death clearance processes to improve case ascertainment and have also improved the reporting of cases from sub-provincial regions that previously under-reported cases. As a result of the enhancements to the NL Cancer Registry, case ascertainment is improved in the 2006 data onward. However, underreporting persists in this province in years prior to 2006. For example, the total number of cases reported to the CCR by NL for 2005 is 21% lower than the corresponding count for 2006.
- Because the Quebec registry relied primarily on hospital data for the period included in the present publication, the numbers of cases of some cancers are underestimated, particularly for those where pathology reports represent the main source of diagnostic information. Prostate cancer, melanoma and bladder cancer are affected in particular.[42] The 2019 projections for these cancer types may be an underestimate because an increase in cases in the registry is expected with the inclusion of pathology reports starting with 2011 data (these data are not yet available).
- At the time of publication, no death certificate only (DCO) cases had been reported to the CCR from Ontario for 2014 and 2015, for Manitoba for 2013 to 2015 and for Quebec for 2010. DCO cases for Ontario were imputed by randomly assigning DCO cases diagnosed in 2012 to 2013 to the time period 2014 to 2015. DCO cases for 2013 to 2015 in Manitoba were estimated by using the DCO cases diagnosed in 2010 to 2012 and randomly assigning them to the time period 2013 to 2015. These DCO cases were all

assumed to be first cancer diagnoses when calculating the probability of developing cancer. DCOs for Quebec in 2010 were not imputed.

- In October 2014, Ontario implemented a new cancer reporting system. The new system has several enhancements that permit the identification of cancer cases that previously went unrecorded. These include the use of more liberal rules for counting multiple primary sites, the use of additional source records and the inclusion of records that were previously not included. The new system has applied these changes retrospectively to the 2010 diagnosis year onward. The relative number of cases of certain types of cancer—including bladder, non-Hodgkin lymphoma, leukemia, multiple myeloma, melanoma and stomach—reported to the CCR from Ontario increased considerably following this implementation, while for many other cancers studied in this publication there was little change.
- Non-melanoma skin cancers (neoplasms, NOS; epithelial neoplasms, NOS; basal and squamous) are not included since most PTCRs do not collect incidence data on this type of cancer. These cancers are difficult to register because they may be diagnosed and/or treated in a variety of settings that do not report to the PTCRs, including dermatologist offices.
- Some PTCRs experience delays in submitting all cases for a reference period to Statistics Canada due to timing of collection and/or reporting within their own registry systems.[4] Cases delayed for one data submission are often reported in the next submission year and the missing cases are added to their appropriate diagnosis year. Generally, the reporting delay for the most recent year ranges between 2% and 3% nationally, which may impact the estimates in this publication.

Multiple primaries

- There are two common systems of rules used to determine when a second or subsequent cancer should be considered a new primary cancer, as opposed to a relapse or duplicate of a previously registered cancer: one from the International Agency for Cancer Research (referred to as the "IARC rules") and one from the Surveillance, Epidemiology, and End Results Program (referred to as "SEER rules"). IARC rules tend to yield lower total case counts than the SEER rules because IARC rules generally do not permit multiple cancers to be diagnosed at the same site within a single individual.
- Although all provinces and territories now register cancers according to the SEER rules for multiple primaries, historically, some did not. Since this publication uses historical data, data were collapsed into the IARC rules for all regions. Consequently, cancer counts for some provinces may appear lower in this publication than cancer counts in provincial cancer reports. The magnitude of difference between the two systems varies by province, cancer, sex and diagnosis year. For example, analyses performed by the Public Health Agency of Canada using CCR data showed British Columbia would report approximately 6% more female breast cancer cases under the SEER rules compared with the IARC rules for diagnosis year 2010.[43] For melanoma among males in British Columbia, the number of new cases in 2010 under the SEER rules would be about 8% higher than under the IARC rules. A recent paper from the United States based on data from the SEER program reported similar differences between statistics based on SEER and IARC rules[44] and also examined the impact of the rules on reported trends.

Mortality

Although procedures for registering and allocating cause of death have been standardized both nationally and internationally, some lack of specificity and uniformity is inevitable. The description of cancer type provided on the death certificate is usually less accurate than that obtained by the cancer registries from hospital and pathology records. Although there have been numerous small changes in definitions over the years (see Tables A2-1 and A2-2), there are a few of note:

- In the versions of this publication published before 2003, mortality due to colorectal cancer was based on ICD-9[6] codes 153–154, which was consistent with other publications. However, this definition is expected to underestimate colorectal cancer mortality because some deaths registered as ICD-9 code 159.0 (intestine, not otherwise specified) are colorectal cancer. Starting in the 2003 edition of this publication, these deaths were included in the definition of colorectal cancer. As a consequence, mortality figures for colorectal cancer appearing in this publication cannot be directly compared with those appearing in publications prior to 2003.

- The liver cancer mortality definition currently used differs from that used by some other North American publications (http://www.naaccr.org/dataandpublications/ cinapubs.aspx; http://seer. cancer.gov/csr/1975_2012/). SEER Cancer Statistics Review presents estimates for liver and intrahepatic bile duct (C22.0 to C22.9), while Cancer in North America (CINA) presents estimates for liver (C22.0, C22.2 to C22.9). Consistent with CINA, estimates of liver cancer mortality in this publication exclude cancers of the intrahepatic bile duct (C22.1). However, unlike SEER and CINA, this publication also excludes liver, unspecified (C22.9). This decision was based on unpublished analyses performed by the Public Health Agency of Canada indicating a consequential number of CCR decedents without a registered primary liver cancer had C22.9 as their underlying cause of death. In other words, C22.9 likely includes a substantial number of deaths from cancers that metastasized to the liver. Nevertheless, given C22.9 also contains primary liver cancer deaths, its exclusion from the liver cancer mortality definition used in this publication results in underestimated liver cancer deaths. The impact of adding liver, unspecified (C22.9) to the current liver cancer mortality definition would be substantial, increasing the number of liver cancer deaths in Canada in 2012 by about 45.9% (from 1,059 to 1,545 deaths). Therefore, the method of defining liver cancer mortality should be acknowledged when comparing estimates across sources. The Canadian Cancer Statistics Advisory Committee will continue to examine this issue when deciding on the definition to use for future publications.
- As previously mentioned, information regarding the year, sex, age and cause of deaths occurring in Quebec was obtained by subtracting the national total from publicly available sources,[9] which includes all deaths occurring among residents of Canada (including Quebec), from the national total (excluding Quebec), which is available in the PHAC version of the CVSD.

Survival

Survival analyses do not include data from Quebec because cases diagnosed in this province from 2011 onward have not been submitted to the Canadian Cancer Registry.

References

1. National Cancer Institute. DevCan: Probability of developing or dying of cancer software, Version 6.7.4. Surveillance Research Program, Statistical Methodology and Applications; 2012.
2. Qiu Z, Hatcher, J. CANPROJ—The R package of cancer projection methods based on generalized linear models for age, period, and/or cohort. Alberta: Alberta Health Services: Technique Report for Cancer Projections Network (C-Proj); 2011.
3. Joinpoint Regression Program. Version 4.2.0.2 ed. Statistical Methodology and Applications Branch, Surveillance Research Program: National Cancer Institute; June 2015.
4. Statistics Canada [Internet]. Canadian Cancer Registry (CCR). Ottawa, ON: Statistics Canada; 2019. Available at: http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3207 (accessed March 2019).
5. Fritz A, Percy C, Jack A, Shanmugaratnam K, Sobin L, Parkin D, et al (eds.). International Classification of Diseases for Oncology, Third edition, First revision. Geneva, Switzerland: World Health Organization; 2013.
6. World Health Organization. International Classification of Diseases, Ninth Revision. Volume 1 and 2. Geneva, Switzerland: World Health Organization; 1977.
7. International Agency for Research on Cancer. International Rules for Multiple Primary Cancers (ICD-O Third Edition) [Internet] Lyon, FR: International Agency for Research on Cancer; 2004.
8. Statistics Canada [Internet]. Canadian Vital Statistics—Death Database (CVS: D). Ottawa, ON: Statistics Canada; 2018. Available at: http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&lang=en&db=imdb&adm=8&dis=2&SDDS=3233 (accessed March 2019).
9. World Health Organization. International Statistical Classification of Disease and Related Health Problems, Tenth Revision. Volumes 1 to 3. Geneva, Switzerland: World Health Organization; 1992.
10. Statistics Canada [Internet]. Annual Demographic Estimates: Canada, Provinces and Territories: 2017 (Catalogue no. 91-215-X). Ottawa, ON: Statistics Canada; 2017. Available at: https://www150.statcan.gc.ca/n1/en/pub/91-215-x/91-215-x2017000-eng.pdf?st=XxsDlULM (accessed March 2019).
11. Statistics Canada [Internet]. Table 051-0001: Population estimates on July 1st, by age group and sex, Canada, provinces or territory. CANSIM (database). Available at: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=0510001&paSer=&pattern=&stByVal=1&p1=1&p2=31&tabMode=dataTable&csid= (accessed December 2018).
12. Statistics Canada [Internet]. Population projections for Canada (2013 to 2063), Provinces and Territories (2013 to 2038) (Catalogue no. 91-520-X). Ottawa, ON: Statistics Canada; 2015. Available at: https://www150.statcan.gc.ca/n1/pub/91-520-x/91-520-x2014001-eng.htm (accessed March 2019).
13. Statistics Canada. Linkage of the Canadian Cancer Registry to the Canadian Vital Statistics—Death Database and T1 Personal Master File: Ascertaining the Death Information. Available upon request at STATCAN.infostats-infostats.STATCAN@canada.ca.
14. Statistics Canada [Internet]. Life Tables, Canada, Provinces and Territories, 2013 to 2015 (Catalogue no. 84-537). Ottawa, ON: Statistics Canada. Available at: https://www150.statcan.gc.ca/n1/en/catalogue/84-537-X2018001 (accessed March 2019).
15. Statistics Canada. Special request tabulation completed by Demography Division. 2018.
16. Dickman PW, Auvinen A, Voutilainen ET, Hakulinen T. Measuring social class differences in cancer patient survival: Is it necessary to control for social class differences in general population mortality? A Finnish population-based study. J Epidemiol Community Health. 1998 Nov;52(11):727–34.
17. National Cancer Institute [Internet]. International classification of childhood cancer (ICCC) Recode ICD-O-3/WHO 2008. Bethesda, MD: Surveillance, Epidemiology, and End Results Program (SEER); 2008. Available at: http://seer.cancer.gov/iccc/iccc-who2008.html (accessed March 2019).
18. Steliarova-Foucher E, Stiller C, Lacour B, Kaatsch P. International Classification of childhood Cancer, Third Edition. Cancer. 2005 Apr 1;103:1457–67.
19. Swerdlow SH, Campo E, Harris NL. WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues. Geneva, Switzerland: World Health Organization; 2008.
20. Gouvernement du Québec. Registre québécois du cancer Incidence du cancer au Québec pour l'année 2011 : données préliminaires et considérations méthodologiques Quebec2018 [Available from: http://publications.msss.gouv.qc.ca/msss/fichiers/2017/17-902-36W.pdf.
21. Statistics Canada [Internet]. 2011 Census: Data Quality and Confidentiality Standards and Guidelines. Ottawa, ON: Statistics Canada. Available at: http://www12.statcan.ca/census-recensement/2011/ref/DQ-QD/conf-eng.cfm (accessed March 2019).
22. Fay MP, Pfeiffer R, Cronin KA, Le C, Feuer EJ. Age-conditional probabilities of developing cancer. Stat Med. 2003 Jun 15;22(11):1837–48.
23. Fay MP. Estimating age conditional probability of developing disease from surveillance data. Popul Health Metr. 2004 Jul;2(1):6.
24. Statistic Canada. Life Tables, Canada, Provinces and Territories 1980/1092 to 2014/2016 2018 [Available from: https://www150.statcan.gc.ca/n1/pub/84-537-x/84-537-x2018002-eng.htm.
25. Statistics Canada. Table 13-10-0742-01 Mortality and potential years of life lost, by selected causes of death and sex, three-year average, Canada, provinces, territories, health regions and peer groups. Available at: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310074201 (accessed March 2019).
26. Rosso S, De Angelis R, Ciccolallo L, Carrani E, Soerjomataram I, Grande E, et al. Multiple tumours in survival estimates. Eur J Cancer. 2009 Apr;45(6):1080–94.
27. Brenner H, Hakulinen T. Patients with previous cancer should not be excluded in international comparative cancer survival studies. Int J Cancer. 2007 Nov 15;121(10):2274–8.
28. Ellison LF. Measuring the effect of including multiple cancers in survival analyses using data from the Canadian Cancer Registry. Cancer Epidemiol. 2010 Oct;34(5):550–5.
29. Ellis L, Woods LM, Esteve J, Eloranta S, Coleman MP, Rachet B. Cancer incidence, survival and mortality: explaining the concepts. Int J Cancer. 2014 oct 15;135(8):1774–82.
30. Dickman PW. Estimating and modelling relative survival using SAS. Available at: http://www.pauldickman.com/software/sas/sas (accessed June 2019).
31. Perme MP, Stare J, Esteve J. On estimation in relative survival. Biometrics. 2012(68):113–20.
32. Lambert PC, Dickman PW, Rutherford MJ. Comparison of different approaches to estimating age standardized net survival. BMC Med Res Methodol. 2015 Aug 15;15:64.
33. Ellison LF. Adjusting relative survival estimates for cancer mortality in the general population. Health Rep. 2014 Nov;25(11):3–9.
34. Talback M, Dickman PW. Estimating expected survival probabilities for relative survival analysis—exploring the impact of including cancer patient mortality in the calculations. Eur J Cancer. 2011 Nov;47(17):2626–32.
35. Hinchliffe SR, Dickman PW, Lambert PC. Adjusting for the proportion of cancer deaths in the general population when using relative survival: a sensitivity analysis. Cancer Epidemiol. 2012 Apr;36(2):148–52.
36. Ellison LF. Progress in net cancer survival in Canada over 20 years. Health Rep. 2018 Sep 19;29(9):10–8.
37. Ellison LF, Bryant H, Lockwood G, Shack L. Conditional survival analyses across cancer sites. Health Rep. 2011 Jun;22(2):21–5.
38. Henson DE, Ries LA. On the estimation of survival. Semin Surg Oncol. 1994 Jan-Feb;10(1):2–6.
39. Corazziari I, Quinn M, Capocaccia R. Standard cancer patient population for age standardising survival ratios. Eur J Cancer. 2004 Oct;40(15):2307–16.
40. Ellison LF, Gibbons L. Survival from cancer—up-to-date predictions using period analysis. Health Rep. 2006 May;17(2):19–30.
41. Ellison LF. An empirical evaluation of period survival analysis using data from the Canadian Cancer Registry. Annals of epidemiology. 2006 Mar;16(3):191–6.
42. Brisson J, Major D, Pelletier E. Evaluation of the completeness of the Fichier des tumeurs due Quebec. Institut national de la sante publique du Quebec 2003.
43. Zakaria D. The Impact of Multiple Primary Rules on Cancer Statistics in Canada, 1992 to 2012. J Registry Manag.45(1):8-20.
44. Weir HK, Johnson CJ, Ward KC, Coleman MP. The effect of multiple primary rules on cancer incidence rates and trends. Cancer Causes Control. 2016 Mar;27(3):377–90.

TABLE A1 Cancer definitions

Cancer	ICD-O-3 Site/type	ICD-9	ICD-10	ICD-9
	Incidence (1992–2015)	Incidence (1984–1991)	Mortality (2000–2015)	Mortality (1984–1999)
Oral	C00–C14	140–149	C00–C14	140–149
Esophagus	C15	150	C15	150
Stomach	C16	151	C16	151
Colorectal	C18–C20, C26.0	153, 159.0, 154.0, 154.1	C18–C20, C26.0	153, 159.0, 154.0, 154.1
Liver	C22.0	155	C22.0, C22.2–C22.7	155
Pancreas	C25	157	C25	157
Larynx	C32	161	C32	161
Lung and bronchus	C34	162.2, 162.3, 162.4, 162.5, 162.8, 162.9	C34	162.2, 162.3, 162.4, 162.5, 162.8, 162.9
Melanoma	C44 (Type 8720–8790)	172	C43	172
Breast	C50	174, 175	C50	174, 175
Cervix	C53	180	C53	180
Uterus (body, NOS)	C54–C55	179, 182	C54–C55	179, 182
Ovary	C56.9	183	C56	183
Prostate	C61.9	185	C61	185
Testis	C62	186	C62	186
Bladder (including *in situ* for incidence)	C67	*188, 233.7*	C67	188
Kidney and renal pelvis	C64.9, C65.9	189.0, 189.1	C64–C65	189.0, 189.1
Brain/CNS	C70–C72	191, 192	C70–C72	191, 192
Thyroid	C73.9	193	C73	193
Hodgkin lymphoma*	Type 9650–9667	201	C81	201
Non-Hodgkin lymphoma*	Type 9590–9597, 9670–9719, 9724–9729, 9735, 9737, 9738	200, 202.0, 202.1, 202.2, 202.8, 202.9	C82–C85, C96.3	200, 202.0, 202.1, 202.2, 202.8, 202.9
	Type 9811–9818, 9823, 9827, 9837 all sites except C42.0,.1,.4			
Multiple myeloma*	Type 9731, 9732, 9734	203.0, 238.6	C90.0, C90.2	203.0, 238.6
Leukemia*	Type 9733, 9742, 9800–9801, 9805–9809, 9820, 9826, 9831–9836, 9840, 9860–9861, 9863, 9865–9867, 9869–9876, 9891, 9895–9898, 9910, 9911, 9920, 9930–9931, 9940, 9945–9946, 9948, 9963–9964	204.0, 204.1, 205.0, 207.0, 207.2, 205.1, 202.4, 204.2, 204.8, 204.9, 205.2, 205.3, 205.8, 205.9, 206.0, 206.1, 206.2, 206.8, 206.9, 203.1, 207.1, 207.8, 208.0, 208.1, 208.2, 208.8, 208.9	C91–C95, C90.1	204.0, 204.1, 205.0, 207.0, 207.2, 205.1, 202.4, 204.2, 204.8, 204.9, 205.2, 20.53, 205.8, 205.9, 206.0, 2061, 206.2, 206.8, 206.9, 203.1, 207.1, 207.8, 208.0, 208.1, 208.2, 208.8, 208.9
	Type 9811–9818, 9823, 9827, 9837 sites C42.0,.1,.4			
All other cancers	All sites C00–C80 not listed above	All sites 140–209 not listed above	All sites C00–C80 not listed above, C97	All sites 140–209 not listed above
All cancers	All invasive sites	All invasive sites	All invasive sites	All invasive sites

CNS=central nervous system; NOS=not otherwise specified

* For incidence, histology types 9590–9992 (leukemia, lymphoma and multiple myeloma), 9050–9055 (mesothelioma) and 9140 (Kaposi sarcoma) are excluded from other specific organ sites.

Note: ICD-O-3 refers to the *International Classification of Diseases for Oncology, Third Edition*.[5] ICD-10 refers to the *International Statistical Classification of Diseases and Related Health Problems*, Tenth Revision.[10] ICD-9 refers to the *International Statistical Classification of Diseases and Related Health Problems*, Ninth Revision.[6]

TABLE A2-1 Recent cancer definition changes in incidence

	New definition	Year changed	Old definition
Bladder	ICD-O-3 C67 (including in situ cancers, except for Ontario since this province does not report in situ bladder cancer)	2006	ICD-O-3, C67 (not including in situ cancers)
Colorectal	ICD-O-3 C18–C20, C26.0	2011	ICD-O-3 C18–C21, C26.0
Kidney and renal pelvis	ICD-O-3 C64–C65	2008	ICD-O-3 C64–C66, C68
Lung and bronchus	ICD-O-3 C34	2008	ICD-O-3 C33–C34 (before 2006)
			ICD-O-3 C34 (in 2006)
			ICD-O-3 C33–C34 (in 2007)
Ovary	ICD-O-3 C56	2006	ICD-O-3 C56, C57.0–C57.4

Note: Bladder, colorectal, kidney, lung and ovary cancers exclude histology types 9590–9992 (leukemia, lymphoma and multiple myeloma), 9050–9055 (mesothelioma) and 9140 (Kaposi sarcoma). ICD-O-3 refers to the *International Classification of Diseases for Oncology, Third Edition*.[5]

TABLE A2-2 Recent cancer definition changes in mortality

	New definition	Year changed	Old definition
Colorectal	ICD-10 C18–C20, C26.0	2012	ICD-10 C18–C21, C26.0
Kidney and renal pelvis	ICD-10 C64–C65	2008	ICD-10 C64–C66, C68
Leukemia	ICD-10 C91–C95, C90.1	2008	ICD-10 C91–C95
Liver	ICD-10 C22.0, C22.2–C22.7	2007	ICD-10 C22 (before 2006)
			ICD-10 C22.0, C22.2–C22.9 (in 2006)
Lung and bronchus	ICD-10 C34	2008	ICD-10 C33–C34 (before 2006)
			ICD-10 C34 (in 2006)
			ICD-10 C33–C34 (in 2007)
Multiple myeloma	ICD-10 C90.0, C90.2	2008	ICD-10 C88, C90 (before 2007)
			ICD-10 C90 (in 2007)
Ovary	ICD-10 C56	2006	ICD-10 C56, C57.0–C57.4
All other and unspecified cancers	ICD-10 C44, C46, C76–C80, C88,C96.0–C96.2, C96.7–C96.9, C97	2007	ICD-10 C44, C46, C76–C80,C96.0–C96.2, C96.7–C96.9, C97

Note: ICD-10 refers to the *International Statistical Classification of Disease and Related Health Problems*, Tenth Revision.[10]

Abbreviations

AAPC	Average annual percent change
APC	Annual percent change
ASIR	Age-standardized incidence rate
ASMR	Age-standardized mortality rate
CCR	Canadian Cancer Registry
CI	Confidence interval
CL	Confidence limits
CNS	Central nervous system
CVSD	Canadian Vital Statistics—Death database
DCO	Death certificate only
HAART	Highly active antiretroviral therapy
HIV	Human immunodeficiency virus
HPV	Human papillomavirus
HRT	Hormone replacement therapy
IARC	International Agency for Research on Cancer
ICCC-3	*International Classification of Childhood Cancer*, Third Edition
ICD-9	*International Statistical Classification of Diseases and Related Health Problems*, Ninth Revision
ICD-10	*International Statistical Classification of Diseases and Related Health Problems*, Tenth Revision
ICD-O-3	*International Classification of Diseases for Oncology*, Third Edition
NCIRS	National Cancer Incidence Reporting System
NOS	Not otherwise specified
PNC	Peripheral nervous cell tumour
PSA	Prostate-specific antigen
PTCR	Provincial and territorial cancer registries
PYLL	Potential years of life lost
RSR	Relative survival ratio
SEER	Surveillance, Epidemiology, and End Results Program

Index of tables and figures

Tables

Appendix tables

Figures

Contact us

Partner organizations

Public Health Agency of Canada (PHAC)

https://www.canada.ca/en/public-health.html (select “Chronic Diseases”)

More detailed information on the methodology used for cancer incidence and mortality projections, trends over time, and probability of developing and dying from cancer used in this publication is available from the Centre for Surveillance and Applied Research, Health Promotion and Chronic Disease Prevention, Public Health Agency of Canada. Email: ccc-ssc@phac-aspc.gc.ca.

Statistics Canada

statcan.gc.ca (search “cancer”)

More detailed information on the survival methodology used in this publication is available from the Centre for Population Health Data at Statistics Canada, National Enquiries Line (1-800-263-1136) or through Client Services at the Centre for Population Health Data (statcan.hd-ds.statcan@canada.ca or 613-951-1746).

Canadian Cancer Society

cancer.ca

For general information about cancer (such as cancer prevention, screening, diagnosis, treatment or care), contact the Canadian Cancer Society’s Cancer Information Service at 1-888-939-3333 or visit cancer.ca. For questions about this publication, email: stats@cancer.ca.

Canadian Council of Cancer Registries

Cancer incidence data are supplied to Statistics Canada by provincial and territorial cancer registries to form the Canadian Cancer Registry (CCR). The CCR is governed by the Canadian Council of Cancer Registries (CCCR), a collaboration between the 13 provincial and territorial cancer registries and the Centre for Population Health Data Statistics Canada. Information about the CCR and CCCR can be found on Statistics Canada’s Canadian Cancer Registry (CCR) website. Detailed information regarding the statistics for each province or territory is available from the relevant registry.

Vital Statistics Council for Canada

Mortality data are supplied to Statistics Canada by the provincial and territorial Vital Statistics Registrars to form the Canadian Vital Statistics—Death Database (CVSD). The Canadian Vital Statistics System is governed by the Vital Statistics Council for Canada (VSCC) since 1945. The VSCC is a collaboration between the 13 provincial and territorial Vital Statistics Registrars and the federal government represented by the Centre for Population Health Data of Statistics Canada. Detailed information on the VSCC and the CVSD can be found on Statistics Canada’s Vital Statistics—Death Database (CVSD).

Canadian Council of Cancer Registries

NEWFOUNDLAND AND LABRADOR

Janet Templeton
Director, Cancer Care Program
Eastern Health
Dr H. Bliss Murphy Cancer Centre
300 Prince Philip Drive
St John's, NL A1B 3V6
Tel: 709-777-6521
Fax: 709-753-0927
Cancercare.easternhealth.ca

PRINCE EDWARD ISLAND

Kim Vriends
Manager, PEI Cancer Registry
PEI Cancer Treatment Centre
Riverside Drive
Charlottetown, PE C1A 8T5
Tel: 902-894-2167
Fax: 902-894-2187

NOVA SCOTIA

Gordon Walsh
Manager, Cancer Registry and Analytics
Nova Scotia Cancer Care Program
1276 South Park Street
Bethune Building, Room 568
Halifax, NS B3H 2Y9
Tel: 902-473-7258
Fax: 902-425-9614
nshealth.ca/cancer-care

NEW BRUNSWICK

Dr Eshwar Kumar
Medical Director; NB Cancer Registry
Medical Officer, New Brunswick Cancer Network
Department of Health
HSBC Place, 2nd floor
520 King Street
Fredericton, NB E3B 5G8
Tel: 506-453-5521
Fax: 506-453-5522
http://www2.gnb.ca/content/gnb/en/departments/health/NewBrunswickCancerNetwork.html

QUEBEC

Christine Bertrand
Directrice du registre, de la surveillance et de la performance
Direction générale de cancérologie
Ministère de la Santé et Services sociaux
1075, Chemin Ste-Foy, 7e étage
Québec, QC G1S 2M1
Tel: 418-266-6940
Fax: 418-266-5862
http://www.msss.gouv.qc.ca/ministere/lutte-contre-le-cancer/

ONTARIO

Mary Jane King
Manager, Ontario Cancer Registry
Informatics Centre for Excellence
Cancer Care Ontario
620 University Avenue
Toronto, ON M5G 1X3
Tel: 416-217-1242
Fax: 416-971-6888
cancercare.on.ca

MANITOBA

Sheila Fukumura
Manager, Manitoba Cancer Registry
CancerCare Manitoba
675 McDermot Avenue, Room ON2114
Winnipeg, MB R3E 0V9
Tel: 204-787-2157
Fax: 204-786-0628
cancercare.mb.ca

SASKATCHEWAN

Heather Stuart-Panko
Director, Cancer Registry
Saskatchewan Cancer Agency, 2nd Floor
#200-4545 Parliament Avenue
Regina, SK S4W 0G3
Tel: 639-625-2042
Fax: 639-625-2191
saskcancer.ca

ALBERTA

Cindy Nikiforuk
Director, Alberta Cancer Registry
Cross Cancer Institute, Room 2133
11560 University Avenue
Edmonton, AB T6G 1Z2
Tel: 780-432-8781
Fax: 780-432-8659
albertahealthservices.ca

BRITISH COLUMBIA

Ryan Woods
Scientific Director, BC Cancer Registry
BC cancer
Cancer Control Research Unit
675 West 10th Avenue, Room #2-116
Vancouver, BC V5Z 1L3
Tel: 604-675-8070
Fax: 604-675-8180
bccancer.bc.ca

NUNAVUT

Selina Khatun
Epidemiologist, Department of Health
Population Health Information
Box 1000, Station 1033
Iqaluit, NU X0A 0H0
Tel: 867-975-5937

NORTHWEST TERRITORIES

Heather Hannah
Territorial Epidemiologist
Office of the Chief Public Health Officer
Department of Health and Social Services
Government of the NWT
Box 1320, 5022 49th Street
New Government Building, 5th floor
Yellowknife, NT X1A 2L9
Tel: 867-767-9066
Fax: 867-873-0442
hss.gov.nt.ca

YUKON

Marguerite Fenske
Manager Health Informatics and Information Technology
Insured Health and Hearing Services
Box 2703 (H2-F)
Whitehorse, YT Y1A 2C6
Tel: 867-393-6925
Fax: 867-667-5705
yukon.ca

STATISTICS CANADA

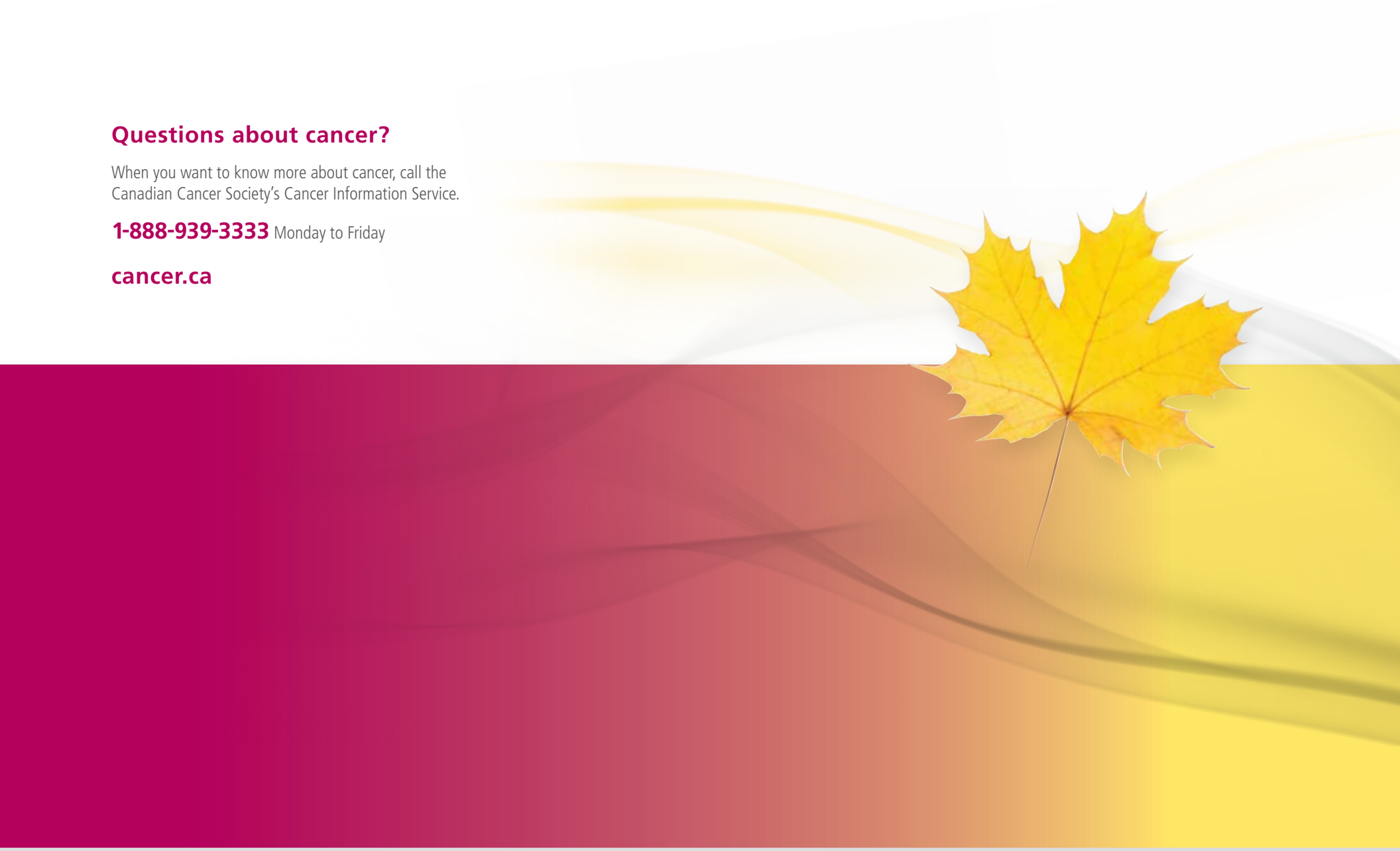
Centre for Population Health Data Client Services
RH Coats Building, 12th Floor
100 Tunney's Pasture Driveway
Ottawa, ON K1A 0T6
Tel: 613-951-1746
statcan.hd-ds.statcan@canada.ca
statcan.gc.ca

Questions about cancer?

When you want to know more about cancer, call the Canadian Cancer Society's Cancer Information Service.

1-888-939-3333 Monday to Friday

cancer.ca



Canadian Cancer Society
Société canadienne du cancer