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CANADIAN CANCER STATISTICS 2011

Featuring Colorectal Cancer

Produced By: Canadian Cancer Society, Statistics Canada, Provincial/Territorial Cancer Registries, Public Health Agency of Canada

cancer.ca

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The development of this publication over the years has benefited considerably from the comments and suggestions of readers. The Steering Committee appreciates and welcomes such comments. To be included on the distribution mailing list for next year's publication or to offer ideas on how the publication can be improved, please complete the *Evaluation and order form* at the back of the publication or e-mail stats@cancer.ca.

This publication is also available at www.cancer.ca/statistics. Additional copies may be requested from divisions of the Canadian Cancer Society or by calling the *Cancer Information Service* at 1 888 939-3333 (see *For further information*).

La version française de cette publication est disponible sur demande.

FOREWORD

Thinking back 25 years ago to the mid-1980s, readers may find it hard to realize the paucity of readily available cancer statistics in Canada at that time. The National Cancer Incidence Reporting System (NCIRS), established in 1969, was hard-pressed to produce the actual data reported from provincial cancer registries within five years of the reference year. While these highly detailed data were published by Statistics Canada in *Cancer in Canada,* the national totals lacked information from one large Canadian province. Little wonder that most Canadians in the cancer field quoted current year statistical estimates from the United States. Ironically, the US estimates were based on data from the US Surveillance, Epidemiology and End Results (SEER) Program, which at the time covered only about 10% of the US population. In contrast, Canada had excellent coverage of cancer registration for the entire population, but the available data were not being used to best advantage.

Frustration with the lack of timeliness in reporting actual data was widespread among those responsible for compiling cancer statistics in Canada. Thus, when Dr. Bob MacBeth of the National Cancer Institute of Canada/Canadian Cancer Society (NCIC/CCS) approached Statistics Canada in 1985 with the concept of developing estimates for Canadian data based on the US model, staff at Statistics Canada were keen to get involved. A Steering Committee was formed to give the project scientific and political legitimacy, and it represented an early example of partnership in cancer control, including members from the Alberta Cancer Registry, Health and Welfare Canada, Canadian Cancer Society, Fichier des tumeurs du Québec and Statistics Canada. Members enthusiastically contributed data from various sources, all with the aim of providing the best possible overview of the cancer situation in Canada. Funding for Steering Committee meetings and printing and dissemination costs was provided by the Society.

When I arrived at Statistics Canada in December 1985 on a temporary assignment as Project Manager, Disease Registries, work had already begun to develop the methodology to produce the cancer estimates. My role was to serve as managing editor for the first 10 years of the publication, and what an exciting 10 years they were for the development of cancer statistics in Canada. The first current year estimates were produced for 1986; however, by the time the estimates were reviewed, 1986 was half over, so the Steering Committee prudently recommended to postpone publication. The first issue of *Canadian Cancer Statistics,* a mere 32 pages, was published in 1987.

The publication was an instant success, with front-page coverage in leading newspapers headlining the fact that just over one in three Canadians would develop some form of cancer during their lifetime. Over the first few years, the scope of content grew to include age and sex distributions, childhood cancer, as well as a wide range of annual special topics. In 1991, the special topic of smoking and lung cancer was particularly relevant as the release of this issue coincided with a major court case in Quebec involving cigarette companies and garnered considerable attention from the national news media. By this time, *Canadian Cancer Statistics* was well established as a responsive, user-friendly and authoritative source of national statistics for Canada and had become a major vehicle for disseminating not only basic statistical information but also related information useful for cancer control.

Data sources have improved considerably over the past 25 years, largely due to the evolution of the patient-oriented Canadian Cancer Registry (CCR) from the event-oriented NCIRS. Development of the CCR required considerable cooperation and collaboration among Statistics Canada and the provincial/territorial cancer registries for more than a decade between 1987 and 1997.

FOREWORD

Canadian Cancer Statistics has continued to grow both in content and reputation, and it now comprises over 120 pages annually, with distribution in both electronic and print formats. The Steering Committee has increased in size to reflect a growing number of national stakeholders. Cancer estimates and survival rates are now produced using data from the CCR. Projection methodologies have continued to be improved, together with the incidence data, which are now available for all provinces. In addition to basic trends, considerable information is available on all aspects of cancer control, from risk factor data needed for prevention, through screening data used to monitor cancer screening programs and, in the 2010 edition, information on end-of-life care. Widely distributed and used by researchers, administrators and healthcare professionals, this publication is a key source of knowledge for cancer control purposes, including trend analysis, survival patterns, education and health services planning.

Leslie Gaudette, former member of Steering Committee

Key dates

1930s	first provincial cancer registries in BC, SK and MB
1940s	AB cancer registry set up
1950s	workshops for provincial cancer registry technical staff supported by NCIC; registries set up in Atlantic Provinces
1960s	registries established in ON and QC; some provinces set up computerized databases
1969	inception of NCIRS at Statistics Canada
1970s	Western provinces, ON and QC submit data to Statistics Canada in electronic formats
early 1980s	NCIRS redesigned
1985	site visit of the NCIRS results in recommendation to build a fully functional national cancer registry; start-up funding for development of CCR provided by NCIC/CCS
late 1980s	cancer registry directors meet 1 to 2 times per year; committees established to guide data quality, database development and death clearance
1993	publication of *The Making of the Canadian Cancer Registry 1969-1988,* which tabulated data for the first 20 years of national cancer incidence data
1994-95	first year of operation of new CCR (with data as of 1992)
1996	first internal linkage of data to detect duplicates
1997	death clearance module completed for the CCR; publication of *Cancer Incidence in Canada 1969–1993,* based on national data from a common data format
2001	publication of cancer survival rates based on CCR data

References

Band P, Gaudette LA, Hill GB, Holowaty EJ, Huchcroft SA, Johnston GM, Illing EMM, Mao Y, Semenciw RM. *The Making of the Canadian Cancer Registry: Cancer Incidence in Canada and its Regions, 1969–1988.* Ottawa, ON: Canadian Council of Cancer Registries, Health and Welfare Canada, Statistics Canada; 1993.

Ellison LF, Gibbons L, and the Canadian Cancer Survival Analysis Group. Five-year relative survival from prostate, breast, colorectal and lung cancer. *Health Reports* 2001;13(1):23–34.

Gaudette LA, Lee J. *Cancer Incidence in Canada, 1969–1993.* Ottawa, ON: Statistics Canada; 1997.

HIGHLIGHTS

1. Incidence and mortality by cancer type

- An estimated 177,800 new cases of cancer (excluding 74,100 non-melanoma skin cancers) and 75,000 deaths from cancer will occur in Canada in 2011.
- Of the newly diagnosed cases, about one-half will be lung, colorectal, prostate and breast cancers.
- Over one-quarter (27%) of all cancer deaths are attributed to lung cancer.
- Colorectal cancer has a significant impact on mortality for men and women combined, with an estimated 8,900 deaths (12% of all cancer deaths).

2. Incidence and mortality by geographic region

- Generally, both incidence and mortality rates are higher in Atlantic Canada and Quebec. They are lowest in British Columbia.
- In both men and women, lung cancer incidence rates are highest in Quebec and lowest in British Columbia.
- The highest colorectal cancer incidence rates among men and women are seen in Newfoundland and Labrador. For women, high rates are also seen in Prince Edward Island and Nova Scotia. The lowest rates for both sexes are in British Columbia.
- The prostate cancer mortality rate is highest in Saskatchewan.
- Little variation is seen in breast cancer rates across Canada.

3. Incidence and mortality by age and sex

- The risk of cancer increases with age, with 42% of new cancer cases and 59% of cancer deaths occurring among those 70 years of age and older.
- The incidence and mortality rates for males surpass those for females around age 55.
- Mortality is declining for males in most age groups and for females under 70.

4. Time trends in incidence and mortality

- Increases in the number of new cancer cases are due mainly to a growing and aging population.
- Between 1998 and 2007, thyroid cancer incidence rates rose an average of 7% per year for males and 9% for females. Liver cancer rates rose an average of 4% per year for males and just over 2% per year for females.
- Between 1998 and 2007, incidence rates declined, on average, by at least 2% per year for stomach cancer in males and for larynx cancer in both sexes.
- Between 1997 and 2006, overall mortality rates declined significantly for both sexes. The rates declined, on average, by at least 2% per year for lung, oral, prostate and larynx cancers in males; breast and cervical cancer in females; and stomach cancer and non-Hodgkin lymphoma in both sexes.

5. Incidence, mortality and survival in children and youth (0–19 years)

- Although cancer in children and youth is rare, it remains of significant public health importance.
- On average, an estimated 1,310 children and youth aged 0–19 years develop cancer each year, but due to the successful treatment of the most common cancers, the number of deaths is almost one-seventh the number of cases.
- While the cancer incidence rate in children and youth has been relatively constant since 1985, the cancer mortality rate continues to decline.
- Improving survival of childhood and youth cancers (now at 82%) has increased the need for long-term follow-up of late effects.

6. Probability of developing or dying from cancer

- Based on current incidence rates, 40% of women and 45% of men in Canada will develop cancer during their lifetimes.
- Current mortality rates indicate that 24% of women and 29% of men, or approximately one out of every four Canadians, will die from cancer.

7. Five-year relative survival

- Relative survival ratios are highest for thyroid, prostate and testicular cancers.
- Pancreatic, esophageal and lung cancers have the lowest relative survival ratios.
- Relative survival for lung cancer tends to decline with increasing age. For breast cancer, survival is significantly worse for those aged 15–39 and 80–99 at diagnosis compared to all other age groups.
- Relative survival has improved by 6% for all cancers combined between 1992 to 1994 and 2004 to 2006. Improvements were greatest for non-Hodgkin lymphoma and leukemias.

8. Prevalence

- Cancers of the breast, prostate, colon/rectum and lung that were diagnosed between 1997 and the end of 2006 were the most prevalent cancers on January 1, 2007 and together accounted for nearly 60% of 10-year prevalent cases.
- Among women, the most common 10-year prevalent cancers were breast, colorectal, body of uterus and lung.
- Among men, the most common 10-year prevalent cancers were prostate, colorectal, bladder and lung.
- As the number of Canadians diagnosed with cancer continues to grow and cancer survival increases, cancer prevalence rises. This growing burden will have healthcare resource implications as more Canadians will require ongoing medical treatment, surveillance and supportive care.

9. Special topic: Colorectal cancer

- Colorectal cancer is the second leading cause of cancer death in Canadians (8,900 estimated deaths in 2011) and the fourth most common cancer diagnosis overall (22,200 estimated new cases in 2011).

HIGHLIGHTS

- Age-standardized incidence and mortality rates are considerably higher in males compared to females.
- There is an east-west gradient in incidence across Canada, likely due to differences in risk factors (e.g., diet, physical activity and family history of the disease) as well as screening intensity.
- Screening for colorectal cancer is recommended for Canadians at average risk between the ages of 50 and 74, and organized screening programs are currently available in several provinces.
- Five-year relative survival is 63%, which has improved by almost eight percentage points between 1992 to 1994 and 2004 to 2006.

Canadian Cancer Statistics is part of an annual series that began in 1987 and has been developed by members of the Steering Committee on Cancer Statistics, which is supported by the Canadian Cancer Society. The Steering Committee is responsible for developing content, reviewing statistical information, interpreting data and writing text. The Steering Committee includes individuals from the Canadian Cancer Society, the Public Health Agency of Canada (PHAC), Statistics Canada, the Canadian Council of Cancer Registries, as well as researchers based in universities and provincial or territorial cancer agencies.

Purpose and intended audiences

The aim of this annual publication is to provide health professionals, researchers and policy-makers with detailed information regarding incidence, mortality and other measures of cancer burden for the most common types of cancer, presented by age, sex, time and province or territory. These data can help stimulate new research as well as assist decision-making and priority-setting at the individual, community, provincial/territorial and national levels. Educators, the media and members of the public who have an interest in cancer may also find value in this report.

New biennial format

Every year, this publication provides updates on cancer incidence, mortality, survival, prevalence and risk of developing or dying from cancer. Given that some of this information does not change significantly from year to year, a new biennial format was introduced for the publication in 2010 such that some information is included only every other year. This enables the Steering Committee on Cancer Statistics to explore and develop new content on specialized cancer issues beyond the usual statistics.

To make this change, the sections on Five-Year Relative Survival, Prevalence, Probability of Developing or Dying from Cancer, and Incidence, Mortality and Survival in Children and Youth were not included as part of the 2010 edition but are reported this year and will continue to appear in the publication every odd year.

Data sources (see *Appendix II* for detailed information)

The Canadian Cancer Registry (CCR), National Cancer Incidence Reporting System (NCIRS), Canadian Vital Statistics – Death Database (CVS: D) and population censuses and forecasts are the main sources of data for this publication.

- Provincial and territorial cancer registries collect clinical and demographic data on newly diagnosed cancer cases for people residing in the province or territory. These data are reported annually to Statistics Canada and added to the CCR.
- Provincial and territorial registrars of vital statistics collect demographic and cause of death information for people residing in the province or territory at the time of death. These data are reported annually to Statistics Canada and added to the CVS: D.
- Cancers included in this publication are defined according to the groupings listed in Table A10, unless otherwise noted.
- The following types of tumours are not included:
  - non-melanoma skin cancers (basal and squamous)

- benign tumours and carcinomas in situ (except for in situ carcinomas of the bladder, which are included for provinces and territories other than Ontario)

Most provincial and territorial cancer registries do not collect non-melanoma skin cancer incidence data. Canada-wide non-melanoma skin cancer estimates are based on data from three provinces and are shown only in Tables 1.1 and 1.2.

Actual and estimated data (see *Appendix I* and *II* for detailed information)

- The information provided in this publication includes both actual and estimated data.
- Actual cancer incidence data used in this publication cover the period of 1982 to 2008 (except for Quebec for which data in the CCR were available to 2007 in time for this publication).
- Actual mortality data are available up to 2006 for all provinces and territories.
- Incidence data for 2008 to 2011 and mortality data for 2007 to 2011 are estimated from long-term trends (15–20 years). Therefore, a recent change in the long-term trend may not be reflected in projected estimates.

Review and analysis

- The Chronic Disease Surveillance and Monitoring Division of the Centre for Chronic Disease Prevention and Control (CCDPC), part of the Public Health Agency of Canada (PHAC), conducted the data analysis for most of the sections. The analysts were supported by Ms. Brenda Branchard, who updated the tables and figures.
- The Health Statistics Division of Statistics Canada also provided analyses.
- Provincial and territorial cancer registries were consulted regarding the cancer incidence and mortality estimates for their own jurisdictions. The results of this consultation are noted in Tables A8 and A9.
- The French translation of this publication was reviewed by Michel Beaupré and Rabia Louchini of the Fichier des tumeurs du Québec and Jean-Marc Daigle of the Institut national de santé publique du Québec.

Special topic: Colorectal cancer

This special topic was developed by a working group that consisted of members of the Steering Committee on Cancer Statistics and other authors whose names are listed at the beginning of Section 9. The authors of the special topic would like to acknowledge Dr. Jeff Sisler of CancerCare Manitoba for his clinical input and Dr. John McLaughlin of Cancer Care Ontario for his critical review of the final draft of this section.

For a complete list of previous special topics, see *Appendix III*. Previous special topics (1988–2010) are available online at www.cancer.ca/statistics or can be obtained in hardcopy by writing to stats@cancer.ca.

Production and distribution

The Canadian Cancer Society supports the production, printing and distribution of this publication with charitable funds. Ms. Monika Dixon coordinated the production process and provided administrative support from the initial planning through to distribution.

How to access the contents of this publication

Electronic copies of this publication (English and French), all figures and some additional tables and figures not included in this publication are available on the Canadian Cancer Society's website at www.cancer.ca/statistics. This material may be used without permission. Please refer to the front of this publication for proper citation information.

For additional resources related to cancer surveillance in Canada, please refer to the section entitled *For further information*.

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In 2011, Canada will continue to see an increase in the number of individuals diagnosed with cancer. Every hour of every day, an average of 20 people will be diagnosed with some type of cancer and eight people will die from cancer.

Incidence describes the number of new cases of cancer diagnosed in a year, while mortality indicates the number of deaths attributed to cancer. Together, these statistics (outlined in Tables 1.1 and 1.2) provide a fundamental understanding of cancer burden.

An estimated 177,800 new cases of cancer and 75,000 cancer deaths are expected in Canada in 2011. More men than women will be diagnosed with a new cancer (52% of all new cases will occur in men vs. 48% in women) and will die from cancer (53% of all cancer deaths will occur in men vs. 47% in women). In addition, 74,100 new cases and 270 deaths from non-melanoma skin cancers (basal and squamous) are expected in 2011. Although non-melanoma skin cancer represents the most common cancer diagnosed among Canadians, it is reported separately because it accounts for very few deaths and most cancer registries do not routinely collect information on these cases.

In men and women combined, lung cancer is the second most common cancer (14%), and colorectal is the third most common cancer (12%). Prostate cancer remains the most common cancer diagnosed in men, with 25,500 cases expected in 2011. Breast cancer continues to be the most frequently diagnosed cancer in women, with over 23,400 new cases expected. In 2011, four cancers (breast, lung, colorectal and prostate) will account for 54% of all cancers diagnosed in Canada.

Lung cancer remains the leading cause of cancer death in both men (28%) and women (27%), as shown in Figures 1.1 and 1.2. While prostate cancer is the most common cancer diagnosed in men, it ranks third in terms of mortality, with approximately 4,100 deaths. Breast cancer, which represents 28% of cancer cases in women, ranks second in mortality at 14%. Colorectal cancer has a significant impact on mortality for men and women combined, with 8,900 deaths expected (12% of all deaths).

The projected number of new cancer cases is roughly the population of Kelowna, BC; Barrie, ON; or St. John's, NL. The projected number of cancer deaths is roughly the population of Nanaimo, BC; Peterborough, ON; or Drummondville, QC.

1. INCIDENCE AND MORTALITY BY CANCER TYPE

Table 1.1
Estimated New Cases and Age-Standardized Incidence Rates for Cancers by Sex, Canada, 2011

	New Cases			Cases per 100,000		
	Total*	M	F	Total*	M	F
All Cancers	**177,800**	**93,000**	**84,800**	**406**	**456**	**369**
Prostate	25,500	25,500	—	—	122	—
Lung	25,300	13,200	12,200	57	65	51
Breast	23,600	190	23,400	53	1	102
Colorectal†	22,200	12,500	9,700	50	61	40
Non-Hodgkin Lymphoma	7,700	4,200	3,400	18	21	15
Bladder‡	7,200	5,400	1,800	16	27	7
Thyroid	5,700	1,200	4,500	15	6	24
Melanoma	5,500	3,100	2,500	13	15	12
Kidney	5,100	3,100	1,950	12	15	8
Leukemia	5,000	3,000	2,100	12	15	9
Body of Uterus	4,700	—	4,700	—	—	20
Pancreas	4,100	2,000	2,100	9	10	8
Oral	3,600	2,400	1,200	8	11	5
Stomach	2,900	1,900	1,000	7	9	4
Brain	2,700	1,550	1,150	7	8	6
Ovary	2,600	—	2,600	—	—	11
Multiple Myeloma	2,300	1,300	1,000	5	6	4
Liver	1,950	1,500	460	4	7	2
Esophagus	1,750	1,350	410	4	6	2
Cervix	1,300	—	1,300	—	—	7
Larynx	1,150	930	210	3	4	1
Testis	970	970	—	—	6	—
Hodgkin Lymphoma	920	510	420	3	3	2
All Other Cancers	14,000	7,300	6,800	32	37	28
Non-Melanoma Skin	74,100	40,700	33,300	—	—	—

— Not applicable.
* Column totals may not sum to row totals due to rounding.
† Definition for this cancer has changed; see Table A7.
‡ Ontario does not currently report in situ bladder cases.
Note: "All Cancers" excludes the estimated new cases of non-melanoma skin cancer (basal and squamous).
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data source: Canadian Cancer Registry database at Statistics Canada

Table 1.2

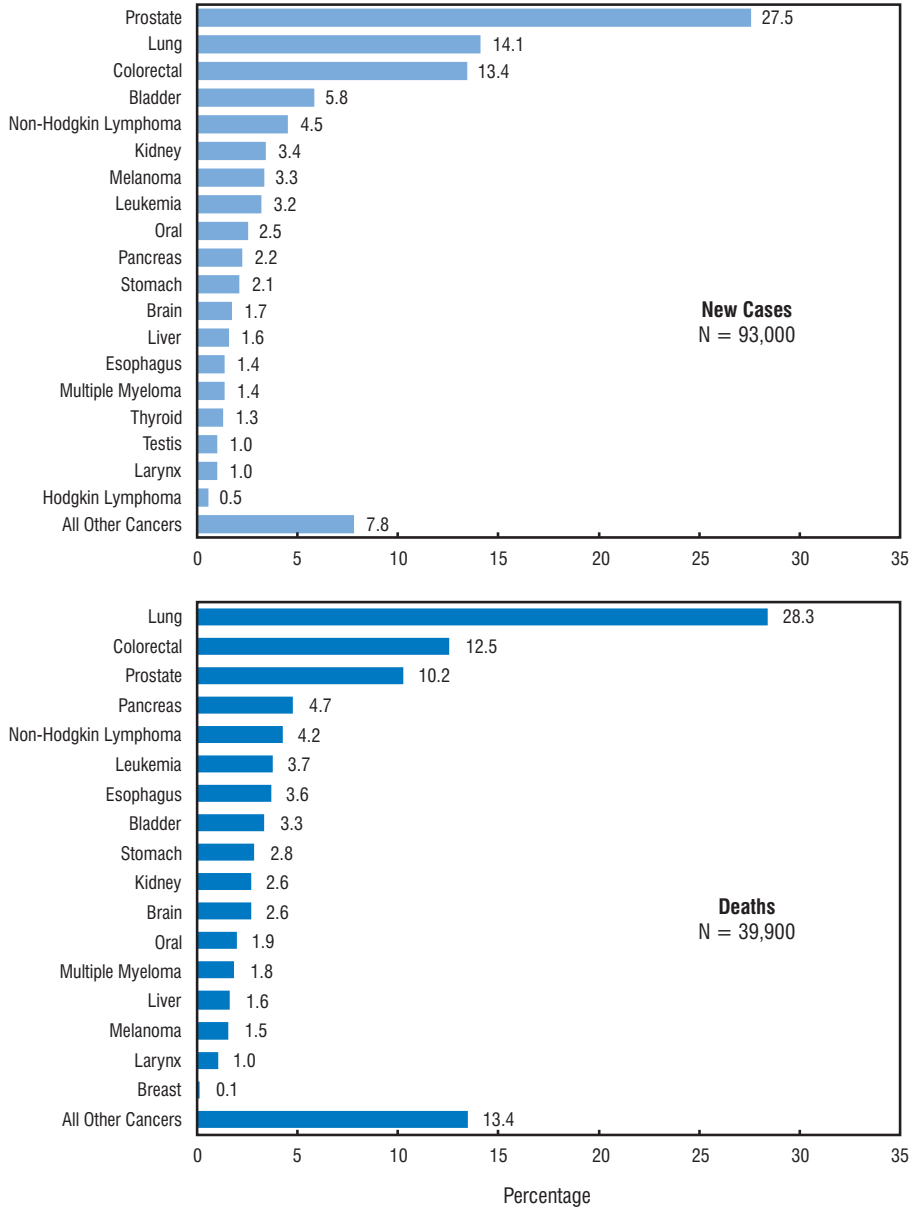
Estimated Deaths and Age-Standardized Mortality Rates for Cancers by Sex, Canada, 2011

	Deaths			Deaths per 100,000		
	Total*	M	F	Total*	M	F
All Cancers	**75,000**	**39,900**	**35,100**	**167**	**199**	**144**
Lung	20,600	11,300	9,300	46	56	39
Colorectal	8,900	5,000	3,900	20	25	15
Breast	5,100	55	5,100	11	<0.5	21
Prostate	4,100	4,100	—	—	21	—
Pancreas	3,800	1,900	1,950	9	9	8
Non-Hodgkin Lymphoma	3,000	1,700	1,350	7	8	6
Leukemia	2,500	1,450	980	6	8	4
Bladder	1,850	1,300	520	4	7	2
Esophagus	1,850	1,450	410	4	7	2
Stomach	1,800	1,150	680	4	6	3
Brain	1,800	1,050	750	4	5	3
Ovary	1,750	—	1,750	—	—	7
Kidney	1,650	1,050	580	4	5	2
Multiple Myeloma	1,350	730	640	3	4	3
Oral	1,150	760	370	3	4	2
Melanoma	950	590	360	2	3	2
Liver	810	640	170	2	3	1
Body of Uterus	750	—	750	—	—	3
Larynx	490	390	95	1	2	<0.5
Cervix	350	—	350	—	—	2
All Other Cancers	10,400	5,300	5,000	23	27	20

— Not applicable.
* Column totals may not sum to row totals due to rounding.
Note: "All Other Cancers" includes 270 deaths from non-melanoma skin cancer (basal and squamous).
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data source: Canadian Vital Statistics Death database at Statistics Canada

Figure 1.1

Percentage Distribution of Estimated New Cases and Deaths for Selected Cancers, Males, Canada, 2011



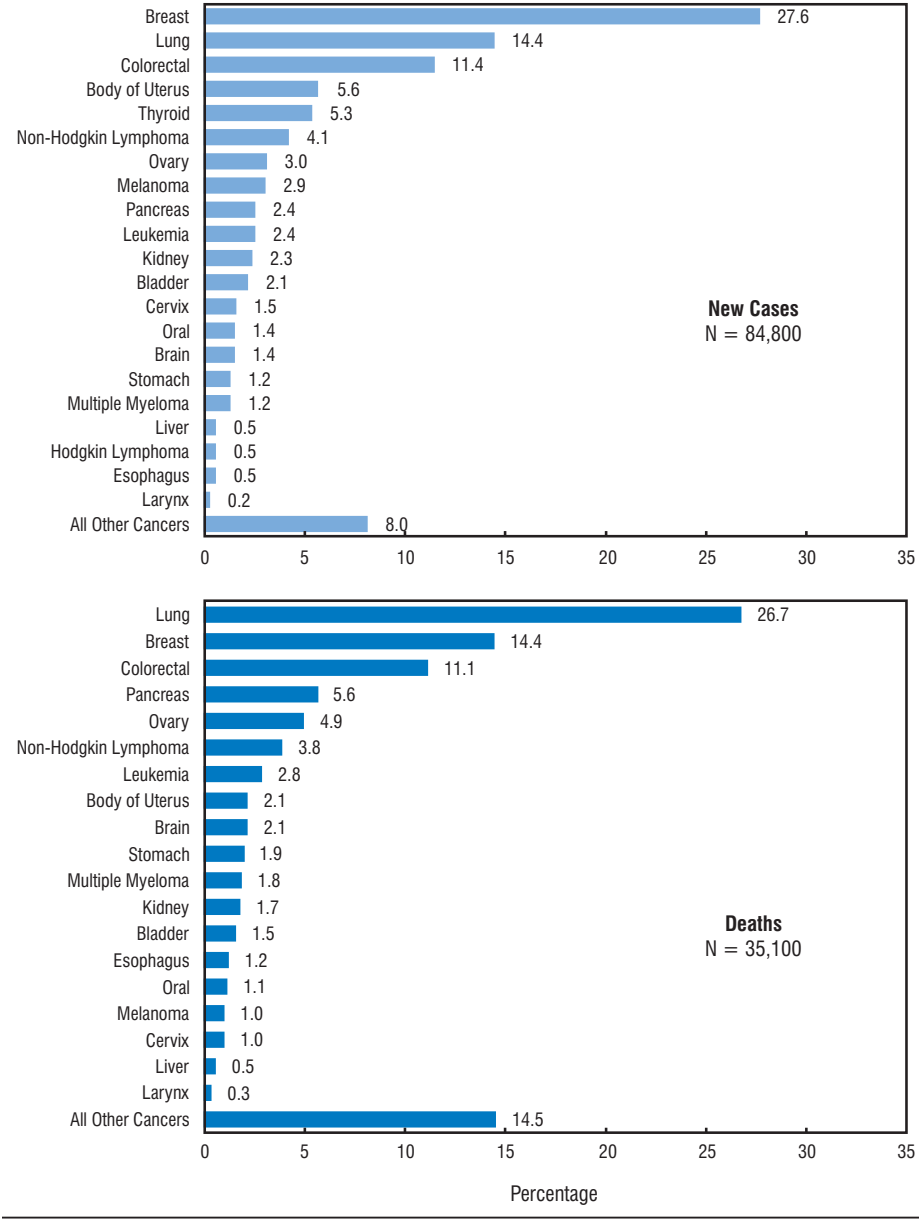
Note: New cases exclude an estimated 40,700 new cases of non-melanoma skin cancer (basal and squamous). The number of deaths for "All Other Cancers" includes about 170 deaths with underlying cause "other malignant neoplasms" of skin.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Figure 1.2

Percentage Distribution of Estimated New Cases and Deaths for Selected Cancers, Females, Canada, 2011



Note: New cases exclude an estimated 33,300 cases of non-melanoma skin cancer (basal and squamous). Deaths for "All Other Cancers" include about 100 deaths with underlying cause "other malignant neoplasms" of skin.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

2. INCIDENCE AND MORTALITY BY GEOGRAPHIC REGION

Table 2.1 presents population projections and estimates of new cases and deaths for all cancers combined, by sex and province/territory for 2011. Tables 2.2 and 2.3 present estimates of the number of new cases and the age-standardized incidence rates for selected cancers by sex and province for 2011. The corresponding estimates of the number of cancer deaths and the age-standardized mortality rates are presented in Tables 2.4 and 2.5. Tables A3 to A6 in *Appendix I* provide the most recent actual numbers and rates.

Age-standardization is used to adjust for differences in age distributions among the provinces and territories, allowing for interprovincial comparisons. The calculation of age-standardized rates, using the 1991 Canadian population as the standard, is described in the *Glossary* and in more detail in *Appendix II*.

Incidence

The estimated incidence rates for all cancers combined continue to be highest for the maritime provinces and Quebec and lowest in British Columbia (Table 2.3). Rates in Newfoundland and Labrador are underestimated because of missing data (see *Appendix II*).

Prostate cancer incidence rates continue to show large provincial differences, possibly due to variation in prostate-specific antigen (PSA) testing.

In both men and women, lung cancer incidence rates are projected to be highest in Quebec and lowest in British Columbia.

The highest colorectal cancer incidence rates among men and women are seen in Newfoundland and Labrador. For women, high rates are also seen in Prince Edward Island and Nova Scotia. The lowest rates for both sexes are in British Columbia.

Female breast cancer incidence rates appear to be fairly consistent across the country, with no discernible geographic pattern.

Mortality

For males, mortality rates for all cancers continue to be higher in Atlantic Canada and Quebec and lower in Western Canada (Table 2.5). The pattern is similar for females, although the projected rate is also high in Manitoba and overall differences across the country are smaller than those for males.

Among males, the lung cancer mortality rate is projected to be highest in Quebec and New Brunswick and lowest in British Columbia. Among females, the lung cancer mortality rate is projected to be highest in Quebec and lowest in Newfoundland and Labrador.

Colorectal cancer mortality rates are highest in Newfoundland and Labrador, twice those in British Columbia for males.

The projected mortality rate for prostate cancer continues to be highest in Saskatchewan.

Interpretation

Canada is one of the few nations in the world with population-based cancer registries that allow cancer patterns to be monitored for the entire population. The provincial/territorial and national cancer registries serve as important resources that enable geographic comparisons of rates of new cancer cases and deaths. This results in

valuable information that can be used for research and knowledge exchange, along with planning and decision-making at the national and provincial/territorial levels. These data are therefore of interest to researchers, healthcare workers, healthcare planners and policy-makers.

Interpretation of geographic differences should, however, be approached with caution since there may be a number of explanations for the variation. True differences in incidence or mortality rates among provinces and territories may be due to any one of several factors, including the following:

- variation in the prevalence of cancer risk factors (e.g., higher historic smoking rates in Quebec and Atlantic Canada as the likely cause of higher rates of lung cancer)
- variation in early detection of cancer because of different rates of participation in formal screening programs (e.g., mammographic screening for breast cancer) or other screening procedures (e.g., PSA testing for prostate cancer)
- variation in the availability of diagnostic services
- variation in treatment access and quality

However, even if the above situations apply, it cannot be assumed that they are the cause of the variation in cancer rates across Canada. Such a determination can only be made after conducting more detailed studies involving individual people. It is also important to note that for many cancers the interval between exposure to a risk factor and the occurrence of the disease is quite long, making it difficult to collect detailed information on the prevalence of past risk factors. Where true differences in cancer risk and causal associations are demonstrated in subsequent epidemiological studies, these findings can be used in planning cancer control programs that aim to reduce the burden of cancer.

Issues that should be kept in mind when interpreting interprovincial variation include the following:

- When a cancer is rare, or the population is small, the number of cases and the rates occurring annually in a given province or territory may be unreliable and vary considerably from year to year.
- While the completeness of registration of new cancer cases is generally very good across the country, there are exceptions. Death certificate information has not been available for registry purposes in Newfoundland and Labrador until very recently and was not available for this publication. This has falsely lowered the actual data (*Appendix I*) and the number of newly diagnosed cases for the current projection, mainly among those cancers with a poor prognosis, such as lung and pancreatic cancers (see *Appendix II*). The degree to which death certificate information is checked against hospital records also varies across provinces and territories, and this affects the accuracy of incidence data (e.g., year of diagnosis). In Quebec, because of the registry's dependence on hospital data, the numbers of prostate, melanoma and bladder cases have been estimated to be under-reported.[1]
- The method of projection selected by the provincial registries for 2011 estimates (either a Poisson model or a five-year moving average) varies across provinces and cancer type (see *Methods* in *Appendix II*). This may particularly affect 2011 estimates for lung cancer in women (new cases and deaths), whereby the choice of method may be related to recent trend changes that vary by province.

2. INCIDENCE AND MORTALITY BY GEOGRAPHIC REGION

- The large interprovincial differences seen in bladder cancer incidence rates are likely due to differences in reporting of in situ cases, particularly in Ontario, where such cases were not collected until recently and were not available for this publication.

There continues to be large variation in reported incidence and mortality rates across Canada.

Canada is one of the few nations in the world with a cancer registry system that allows cancer patterns to be monitored and compared across the entire population. Such comparisons can provide valuable information for research, knowledge exchange, planning and decision-making.

2. INCIDENCE AND MORTALITY BY GEOGRAPHIC REGION

Table 2.1

Estimated Population, New Cases and Deaths for All Cancers by Sex and Geographic Region, Canada, 2011

	Population (in thousands)			New Cases			Deaths		
	Total*	M	F	Total*	M	F	Total*	M	F
CANADA	**34,360**	**17,083**	**17,276**	**177,800**	**93,000**	**84,800**	**75,000**	**39,900**	**35,100**
British Columbia (BC)	4,574	2,274	2,300	22,100	11,900	10,200	9,300	4,900	4,300
Alberta (AB)	3,775	1,929	1,847	16,200	8,600	7,600	6,100	3,300	2,900
Saskatchewan (SK)	1,035	516	518	5,300	2,800	2,400	2,400	1,300	1,050
Manitoba (MB)	1,240	619	621	6,100	3,100	3,000	2,800	1,450	1,300
Ontario (ON)	13,361	6,602	6,759	66,900	34,500	32,400	27,800	14,600	13,200
Quebec (QC)†	7,921	3,938	3,983	46,400	24,000	22,500	20,100	10,800	9,300
New Brunswick (NB)	751	370	381	4,800	2,700	2,100	1,950	1,100	890
Nova Scotia (NS)	942	459	483	6,100	3,300	2,800	2,700	1,450	1,200
Prince Edward Island (PE)	143	70	73	910	500	410	350	180	170
Newfoundland and Labrador (NL)†	507	249	258	2,800	1,500	1,250	1,400	830	590
Yukon (YT)	34	17	17	120	60	60	70	40	30
Northwest Territories (NT)	44	23	21	140	85	60	60	30	30
Nunavut (NU)	33	17	16	70	35	35	45	25	20

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

† The number of cases for some cancers that were used to calculate the overall 2011 incidence estimates for this province was underestimated.

Note: The Canada and provincial totals exclude non-melanoma skin cancer (basal and squamous).

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases, and Census and Demographics Branch at Statistics Canada[2]

Table 2.2

Estimated New Cases for Selected Cancers by Sex and Province, Canada, 2011

	New Cases										
	Canada*	BC	AB	SK	MB	ON	QC†	NB	NS	PE	NL†
Males											
All Cancers	**93,000**	**11,900**	**8,600**	**2,800**	**3,100**	**34,500**	**24,000**	**2,700**	**3,300**	**500**	**1,500**
Prostate	25,500	3,400	2,500	900	710	10,600	5,100	820	910	150	430
Lung	13,200	1,450	990	360	430	4,100	4,500	430	500	75	200
Colorectal‡	12,500	1,550	1,050	400	460	4,500	3,400	320	470	60	310
Bladder§	5,400	800	530	170	210	1,350	1,850	160	210	30	80
Non-Hodgkin Lymphoma	4,200	580	400	130	160	1,650	970	110	120	15	55
Melanoma	3,100	480	310	75	95	1,350	420	90	140	20	60
Kidney	3,100	300	290	90	150	1,100	870	120	130	20	60
Leukemia	3,000	400	340	100	110	1,150	680	65	80	15	25
Oral	2,400	300	190	55	100	920	580	65	85	10	40
Pancreas	2,000	270	180	65	70	670	590	60	65	10	15
Stomach	1,900	250	170	50	75	710	490	50	60	10	50
Brain	1,550	190	150	45	45	580	420	35	45	5	35
Liver	1,500	220	150	25	40	570	420	20	25	5	15
Esophagus	1,350	190	150	35	40	490	310	40	50	5	20
Multiple Myeloma	1,300	150	110	35	40	510	350	30	40	10	15
Thyroid	1,200	85	110	15	25	600	270	35	35	5	15
Females											
All Cancers	**84,800**	**10,200**	**7,600**	**2,400**	**3,000**	**32,400**	**22,500**	**2,100**	**2,800**	**410**	**1,250**
Breast	23,400	2,800	2,100	660	810	9,000	6,200	550	720	100	370
Lung	12,200	1,500	1,050	330	470	3,900	4,000	320	410	55	140
Colorectal‡	9,700	1,150	770	290	350	3,600	2,600	230	360	55	200
Body of Uterus	4,700	600	450	150	200	1,950	1,050	100	130	20	75
Thyroid	4,500	240	390	55	90	2,500	970	120	90	5	50
Non-Hodgkin Lymphoma	3,400	440	320	100	120	1,400	800	95	120	15	60
Ovary	2,600	290	190	75	95	1,050	690	65	60	10	25
Melanoma	2,500	370	240	60	65	1,150	340	80	130	15	45
Pancreas	2,100	270	190	65	75	690	620	65	70	10	10
Leukemia	2,100	260	230	75	85	800	490	40	55	10	15
Kidney	1,950	180	180	60	80	730	520	65	90	10	30
Bladder§	1,800	260	160	60	65	450	630	50	65	10	30
Cervix	1,300	160	170	40	45	500	280	30	45	10	20
Oral	1,200	160	95	30	50	500	300	25	35	5	15
Brain	1,150	140	100	35	35	450	340	30	35	5	15
Stomach	1,000	110	90	25	30	390	280	25	25	5	25
Multiple Myeloma	1,000	110	90	25	30	420	270	25	30	5	10

* Column totals may not sum to row totals due to rounding. Canada totals include provincial and territorial estimates. Territories are not listed separately due to small numbers.

† The number of cases for some cancers that were used to calculate the overall 2011 incidence estimates for this province was underestimated.

‡ Definition for this cancer has changed; see Table A7.

§ Interprovincial variation. Ontario does not currently report in situ bladder cases.

Note: New cases for "All Cancers" exclude non-melanoma skin cancer (basal and squamous).

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Table 2.3

Estimated Age-Standardized Incidence Rates for Selected Cancers by Sex and Province, Canada, 2011

	Cases per 100,000										
	Canada*	BC	AB	SK	MB	ON	QC†	NB	NS	PE	NL†
Males											
All Cancers	**456**	**412**	**455**	**461**	**440**	**445**	**487**	**525**	**529**	**543**	**440**
Prostate	122	117	130	145	100	134	100	156	140	158	119
Lung	65	49	55	58	61	54	92	87	80	80	58
Colorectal‡	61	52	58	64	64	58	67	63	75	64	89
Bladder§	27	28	29	27	30	18	37	33	34	31	25
Non-Hodgkin Lymphoma	21	20	21	21	22	22	20	23	20	19	16
Melanoma	15	17	16	12	13	18	9	18	23	20	19
Kidney	15	10	15	15	20	14	17	23	21	22	17
Leukemia	15	14	18	17	16	15	15	14	13	20	7
Oral	11	10	9	9	13	11	11	12	13	13	12
Pancreas	10	9	10	10	10	9	12	12	10	12	4
Stomach	9	9	9	8	10	9	10	10	9	8	15
Brain	8	7	8	7	7	8	9	8	8	9	10
Liver	7	7	7	4	6	7	8	4	4	4	5
Esophagus	6	6	8	5	6	6	6	8	8	7	5
Thyroid	6	3	6	3	4	8	6	8	6	6	4
Multiple Myeloma	6	5	6	5	6	6	7	6	6	10	4
Females											
All Cancers	**369**	**324**	**368**	**356**	**369**	**370**	**393**	**377**	**396**	**396**	**332**
Breast	102	91	100	98	101	102	110	99	101	98	96
Lung	51	46	52	47	57	43	67	55	55	52	35
Colorectal‡	40	35	37	39	41	39	44	38	48	49	52
Thyroid	24	10	20	10	14	33	22	28	17	9	16
Body of Uterus	20	19	21	22	25	21	18	18	18	19	19
Non-Hodgkin Lymphoma	15	14	15	15	15	16	14	17	17	13	16
Melanoma	12	13	12	10	9	14	7	16	19	17	12
Ovary	11	9	9	11	12	12	12	12	9	9	6
Leukemia	9	9	11	11	11	9	9	8	9	9	5
Pancreas	8	8	9	8	8	7	10	11	9	8	3
Kidney	8	6	9	9	10	8	9	12	12	10	8
Cervix	7	6	9	8	7	7	6	7	10	9	7
Bladder§	7	8	8	9	8	5	11	9	9	9	8
Brain	6	5	5	5	5	6	7	6	6	5	5
Oral	5	5	5	4	6	6	5	4	5	6	4
Stomach	4	3	4	4	3	4	5	4	4	6	7
Multiple Myeloma	4	3	4	3	4	4	4	4	4	3	3

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

† The number of cases for some cancers that were used to calculate the overall 2011 incidence estimates for this province was underestimated.

‡ Definition for this cancer has changed; see Table A7.

§ Interprovincial variation. Ontario does not currently report in situ bladder cases.

Note: Rates for "All Cancers" exclude non-melanoma skin cancer (basal and squamous). Rates are age-standardized to the 1991 Canadian population.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Table 2.4

Estimated Deaths for Selected Cancers by Sex and Province, Canada, 2011

	Deaths										
	Canada*	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Males											
All Cancers	**39,900**	**4,900**	**3,300**	**1,300**	**1,450**	**14,600**	**10,800**	**1,100**	**1,450**	**180**	**830**
Lung	11,300	1,250	890	320	360	3,700	3,700	360	450	60	240
Colorectal	5,000	580	400	150	180	1,800	1,350	120	190	20	150
Prostate	4,100	530	420	210	160	1,550	840	120	140	20	85
Pancreas	1,900	270	160	60	65	670	480	55	75	10	35
Non-Hodgkin Lymphoma	1,700	270	140	50	70	630	410	45	50	5	20
Esophagus	1,450	230	130	45	60	570	270	40	55	5	20
Leukemia	1,450	200	130	55	60	600	320	35	50	10	20
Bladder	1,300	190	110	40	50	510	310	35	45	5	25
Stomach	1,150	130	75	25	35	420	330	25	35	5	35
Brain	1,050	130	100	25	35	370	300	25	35	5	20
Kidney	1,050	120	95	35	55	370	270	35	40	5	20
Oral	760	110	70	15	25	280	180	20	35	5	15
Multiple Myeloma	730	95	55	20	25	290	200	15	25	5	10
Liver	640	75	45	5	20	260	190	5	15	—	10
Melanoma	590	80	50	15	20	260	120	10	25	—	10
Females											
All Cancers	**35,100**	**4,300**	**2,900**	**1,050**	**1,300**	**13,200**	**9,300**	**890**	**1,200**	**170**	**590**
Lung	9,300	1,250	830	250	320	3,000	3,000	230	310	45	120
Breast	5,100	600	410	150	210	1,950	1,300	120	170	30	100
Colorectal	3,900	510	270	120	140	1,450	1,050	95	150	25	90
Pancreas	1,950	270	170	55	70	700	520	60	70	10	25
Ovary	1,750	240	160	55	65	700	380	45	60	5	30
Non-Hodgkin Lymphoma	1,350	170	110	45	60	510	340	35	50	5	15
Leukemia	980	130	85	35	40	400	220	25	30	5	10
Body of Uterus	750	85	70	15	30	320	180	20	25	5	10
Brain	750	95	70	25	25	260	220	15	25	5	15
Stomach	680	80	50	15	20	240	200	15	20	5	25
Multiple Myeloma	640	75	50	20	25	260	160	15	20	—	5
Kidney	580	60	50	20	25	200	160	20	20	5	15
Bladder	520	60	45	15	15	210	130	15	15	—	10
Oral	370	50	35	10	15	140	95	10	10	—	—
Melanoma	360	50	30	10	10	160	60	10	15	—	5
Cervix	350	45	45	10	15	140	60	10	20	—	10

— Fewer than three deaths.

* Column totals may not sum to row totals due to rounding. Canada totals include provincial and territorial estimates. Territories are not listed separately due to small numbers.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death database at Statistics Canada

Table 2.5

Estimated Age-Standardized Mortality Rates for Selected Cancers by Sex and Province, Canada, 2011

	Deaths per 100,000										
	Canada*	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Males											
All Cancers	**199**	**171**	**184**	**204**	**205**	**191**	**222**	**222**	**239**	**206**	**252**
Lung	56	43	49	51	51	48	75	74	73	63	72
Colorectal	25	20	23	24	26	24	28	24	30	24	45
Prostate	21	19	25	33	24	21	18	25	23	24	29
Pancreas	9	9	9	10	9	9	10	12	12	11	10
Non-Hodgkin Lymphoma	8	9	8	8	10	8	8	9	8	7	5
Leukemia	8	7	7	9	9	8	7	7	8	9	6
Esophagus	7	8	7	7	8	7	5	8	8	7	6
Bladder	7	7	6	7	7	7	7	7	8	7	9
Stomach	6	5	4	4	5	6	7	5	6	5	11
Brain	5	5	5	4	5	5	6	5	6	3	6
Kidney	5	4	5	6	7	5	5	7	7	6	7
Oral	4	4	4	3	3	4	4	4	5	4	4
Multiple Myeloma	4	3	3	3	4	4	4	3	4	4	3
Melanoma	3	3	3	2	3	3	2	2	4	—	4
Liver	3	3	2	1	3	3	4	1	2	—	2
Females											
All Cancers	**144**	**130**	**137**	**145**	**154**	**141**	**154**	**150**	**160**	**153**	**152**
Lung	39	38	41	34	38	33	50	39	42	42	31
Breast	21	18	19	21	23	21	22	20	22	27	27
Colorectal	15	15	13	15	16	15	17	15	19	23	23
Pancreas	8	8	8	7	8	7	8	10	9	6	7
Ovary	7	7	7	8	8	8	6	7	8	5	7
Non-Hodgkin Lymphoma	6	5	5	6	7	6	6	6	7	6	4
Leukemia	4	4	4	5	5	4	4	4	4	4	2
Stomach	3	2	2	2	2	3	3	2	3	4	6
Body of Uterus	3	2	3	2	3	3	3	3	3	3	3
Brain	3	3	3	4	3	3	4	3	4	6	4
Multiple Myeloma	3	2	2	2	3	3	3	3	3	—	2
Oral	2	1	2	1	2	2	2	1	1	—	—
Melanoma	2	2	1	1	1	2	1	1	2	—	2
Cervix	2	1	2	2	2	2	1	2	3	—	3
Bladder	2	2	2	2	2	2	2	2	2	—	2
Kidney	2	2	3	3	3	2	3	4	2	4	4

— Fewer than three deaths.

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

Note: Rates are age-standardized to the 1991 Canadian population.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death database at Statistics Canada

3. INCIDENCE AND MORTALITY BY AGE AND SEX

Trends by age

While cancer is primarily a disease that affects Canadians 50 years of age or older (who represent 88% of all new cases and 95% of cancer deaths), it impacts all age groups. For both sexes, the median age range is 65–69 years at cancer diagnosis and 70–74 years at cancer death. Table 3.1 shows the following estimates for 2011:

- Approximately 74,700 new cancer cases (42% of all cases) and 44,600 cancer deaths (59% of all deaths) will occur in Canadians aged 70 years or older.
- An additional 49,600 new cases (28% of all cases) and 17,600 deaths (23% of all deaths) will occur in those aged 60–69 years.
- Compared to older age groups, those aged 50–59 years will represent a smaller proportion of all new cases (18% of all cases) and deaths (12% of all deaths).

Figure 3.1 displays age-specific rates of cancer incidence (for 2007) and mortality (for 2006) by five-year age groups. Cancer incidence and mortality rates increase with age for both sexes. The incidence rate for males surpasses that for females around age 55 and a similar pattern is observed for mortality.

The age and sex distributions for the most common cancers among Canadians are presented in Table 3.2, which shows the following:

- Half of all newly diagnosed lung and colorectal cancer cases will occur among people aged 70 years or older.
- Breast cancer occurs primarily in females 50–69 years of age. Twenty-eight percent of breast cancer cases will be diagnosed among women over the age of 69, while 19% will occur in those under age 50. It is notable that although over half of the new cases of breast cancer occur between ages 50 and 69, more deaths from breast cancer will occur in females 80 years and older than any other age group, reflecting the benefits of screening and treatment in prolonging life in middle-aged women.
- Prostate cancer will be diagnosed most frequently in males aged 60–69 years, but more prostate cancer deaths will occur in males 80 years and older. This pattern likely reflects the effect of screening men for prostate cancer in their 60s and the long natural history of the disease.
- Unlike other major cancers, for which the number of deaths increases with age, deaths for lung cancer peak at age 70–79 for both males and females.

Trends by sex

Trends in age-standardized incidence and mortality rates for all cancers combined are shown in Figure 3.2.

Cancer is more common among males than females in those 19 and younger and 60 and older, but this trend reverses with a higher incidence in females between ages 20 and 59. Sex-specific cancers (breast and cervical cancer in particular) as well as lung cancer, melanoma and thyroid cancer account for the higher cancer incidence in younger females.

Breast cancer is the most common cancer in females over the age of 20. Deaths from breast cancer are more frequent than other common cancers only in women 30–39 years of age.

3. INCIDENCE AND MORTALITY BY AGE AND SEX

The overall cancer incidence rate in males over age 69 has been dropping, primarily due to a declining rate of lung cancer from decreased tobacco use.[3] The overall incidence rate in females has only recently begun to level off. Lung cancer remains the most common cause of cancer death in both sexes.

Since 1989, the mortality rate for all cancers combined has been dropping for males up to age 79 and females up to age 69. But for females, this rate begins to increase from age 70.

The risk of developing cancer increases with age. Notable declines in mortality for all cancers combined have occurred in both sexes and in most age groups.

Table 3.1

Estimated New Cases and Deaths for All Cancers by Age Group and Sex, Canada, 2011

Age Group	Population (in thousands)			New Cases			Deaths		
	Total*	M	F	Total*	M	F	Total*	M	F
All Ages	**34,360**	**17,083**	**17,276**	**177,800**	**93,000**	**84,800**	**75,000**	**39,900**	**35,100**
0–19	7,864	4,034	3,830	1,350	730	640	160	90	75
20–29	4,808	2,451	2,357	2,100	960	1,150	230	130	100
30–39	4,656	2,334	2,322	4,700	1,550	3,100	630	270	360
40–49	5,163	2,601	2,562	13,000	4,500	8,500	2,800	1,200	1,600
50–59	5,029	2,497	2,531	32,400	15,400	17,000	9,000	4,400	4,600
60–69	3,575	1,744	1,831	49,600	28,500	21,100	17,600	9,600	7,900
70–79	2,061	955	1,106	44,300	25,800	18,500	22,100	12,500	9,600
80+	1,205	469	737	30,400	15,600	14,800	22,500	11,600	10,800

* Column totals may not sum to row totals due to rounding. Canada totals include provincial and territorial estimates.

Note: New cases exclude non-melanoma skin cancer (basal and squamous).

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases, and Census and Demographics Branch at Statistics Canada[2]

Table 3.2

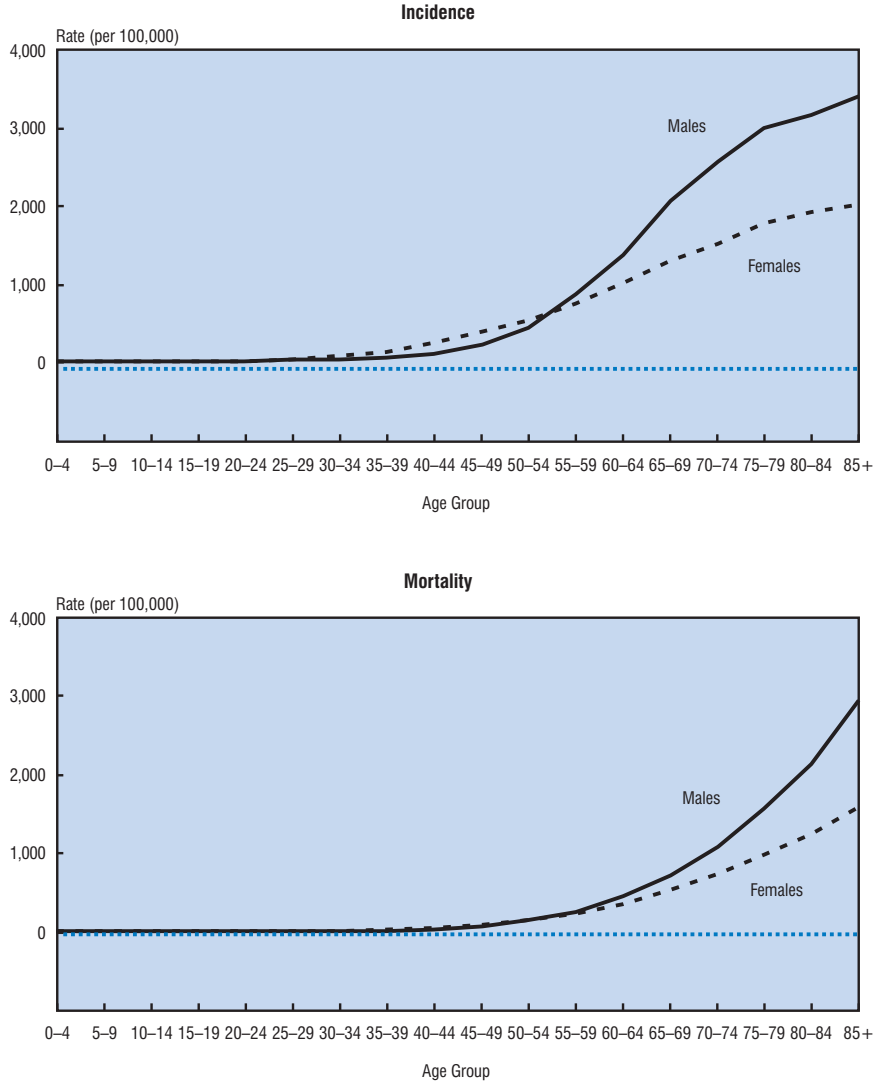
Estimated New Cases and Deaths for the Most Common Cancers by Age Group and Sex, Canada, 2011

Age Group	Lung			Colorectal			Prostate	Breast
	Total	M	F	Total	M	F	M	F
New Cases								
All Ages	**25,300**	**13,200**	**12,200**	**22,200**	**12,500**	**9,700**	**25,500**	**23,400**
0–19	10	5	5	15	10	5	—	5
20–29	20	15	10	65	40	30	—	90
30–39	85	35	50	240	120	110	5	870
40–49	960	340	620	1,000	530	490	460	3,500
50–59	3,600	1,650	2,000	3,400	2,000	1,400	4,500	6,300
60–69	7,700	4,000	3,700	6,100	3,800	2,300	10,100	6,200
70–79	8,100	4,500	3,600	6,400	3,700	2,700	7,000	3,900
80+	4,800	2,700	2,200	4,900	2,300	2,600	3,400	2,600
Deaths								
All Ages	**20,600**	**11,300**	**9,300**	**8,900**	**5,000**	**3,900**	**4,100**	**5,100**
0–19	—	—	—	5	—	—	—	—
20–29	5	—	—	15	10	5	—	5
30–39	50	20	30	50	25	25	—	95
40–49	670	250	420	270	150	120	15	390
50–59	2,600	1,200	1,350	970	580	390	120	910
60–69	5,800	3,100	2,700	1,950	1,250	700	520	1,100
70–79	6,900	4,000	2,900	2,500	1,500	1,000	1,200	1,100
80+	4,600	2,700	1,950	3,100	1,450	1,650	2,200	1,450

— Fewer than three cases or deaths.
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Figure 3.1

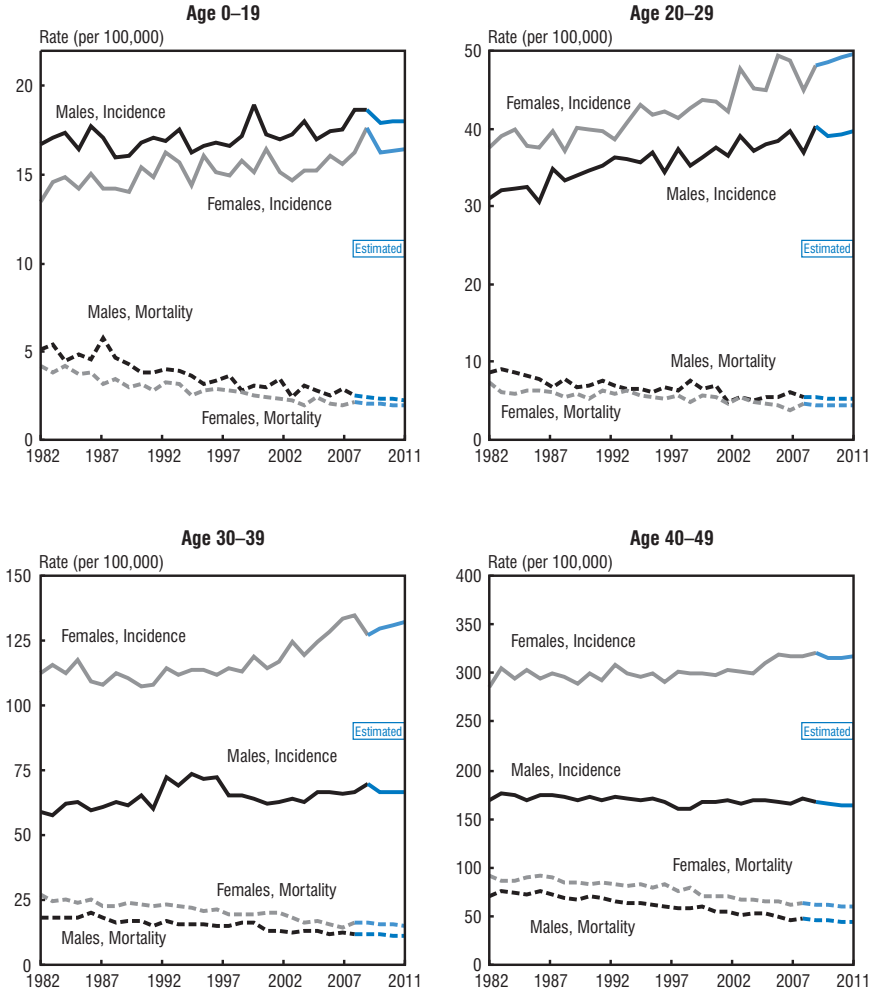
Age-Specific Incidence (2007) and Mortality (2006) Rates for All Cancers by Sex, Canada



Note: Incidence rates exclude non-melanoma skin cancer (basal and squamous).
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Figure 3.2

Age-Standardized Incidence and Mortality Rates for All Cancers by Age Group, Canada, 1982–2011



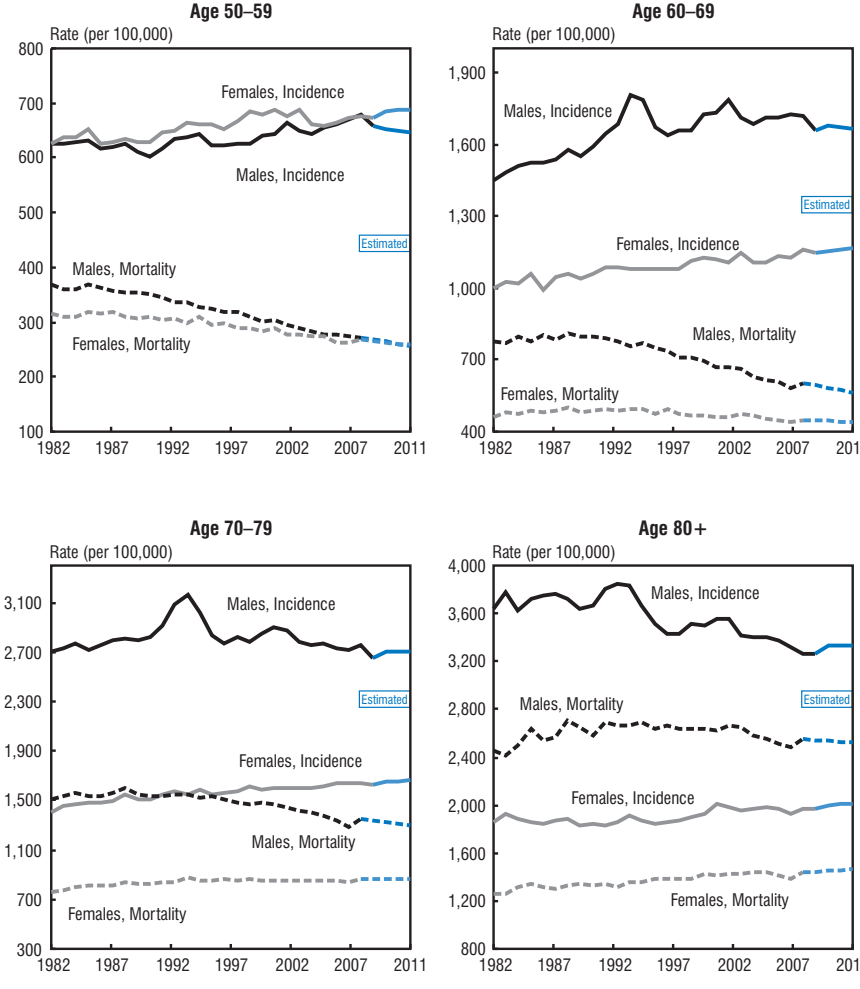
Note: The range of rate scales differs widely between the four age groups. Incidence rates exclude non-melanoma skin cancer (basal and squamous). Actual incidence data were available up to the year 2008 for all provinces except for Quebec (2007), and actual mortality data were available up to 2006.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Figure 3.2 *(continued)*

Age-Standardized Incidence and Mortality Rates for All Cancers by Age Group, Canada, 1982–2011



Note: The range of rate scales differs widely between the four age groups. Incidence rates exclude non-melanoma skin cancer (basal and squamous). Actual incidence data were available up to the year 2008 for all provinces except for Quebec (2007), and actual mortality data were available up to 2006.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

4. TIME TRENDS IN INCIDENCE AND MORTALITY

The numbers of new cases and deaths are important measures of cancer burden on the Canadian population and healthcare system. Incidence trends generally signal changes in the population or the prevalence of risk factors, or they may indicate changes in screening or diagnostic practices. Incidence trends can be directly used to predict how many new people may seek diagnosis, primary treatment, potential further treatment or palliative care in the future. Trends in mortality rates reflect changes in disease incidence, survival or both. A decreasing trend in mortality indicates progress in cancer control.

Trends in incidence and mortality are often assessed by comparing annual age-standardized rates. Age-standardization results in more meaningful comparisons of changes in cancer risk or diagnostic practices over place and time because it adjusts for variation in the age distributions and growth of populations. Unless otherwise specified, this section reports average annual percent changes over 10 years.

Trends for all cancers combined

Figure 4.1 presents the number of new cases for all cancers combined, together with the corresponding age-standardized incidence rates for 1982 to 2007, with estimates to the year 2011. Figure 4.2 presents the number of deaths and age-standardized mortality rates for 1982 to 2006, with estimates to 2011. Despite the relative stability in age-standardized rates, the number of new cancer cases continues to rise steadily as the Canadian population grows and ages. In 2011, the number of new cases is estimated to be 177,800 and the number of deaths is estimated to be 75,000.

Among males, the overall cancer incidence rate rose in the early 1990s and then declined sharply (Figure 4.1). This reflects a similar trend in the incidence of prostate cancer, the leading type of cancer in men, during the same period. Since 1993, there has been a decline in the overall cancer incidence rate in males. In contrast, the cancer mortality rate in males, after reaching a peak in 1988, has been declining slowly because of decreases in mortality rates for prostate, lung, colorectal and other cancers (Figure 4.2).

Among females, the overall cancer incidence rate has been increasing slowly since the early 1990s (Figure 4.1), while the mortality rate has remained relatively stable since 1982 (Figure 4.2).

Figures 4.3 and 4.4 show the relative contributions to the changes in the total numbers of new cases and deaths that can be attributed to changes in cancer risk or diagnostic practices, population size and aging of the population. The major contributors to the rising numbers of new cancer cases are population growth and the aging of the population:

- The lowest solid line represents the total number of new cancer cases (or deaths) that would have occurred each year if the population size and age structure had remained the same as they were in 1982, reflecting the impact of changes in risk or diagnostic practices.
- The middle line represents the number of new cases (or deaths) that would have occurred if the age structure of the population had remained the same as it was in 1982, reflecting the impact of changes in risk and population growth.

- The top line represents the number of new cases (or deaths) that actually occurred and thus reflects the combined impact of changes in risk, population growth and the aging of the population.

These figures indicate that the increase in the number of cancer cases and deaths that has occurred over the last 30 years is primarily the result of an aging population and, to a lesser extent, an increase in population size. As long as current demographic trends continue, there will be a commensurate annual increase in the number of new cases of cancer. It is noteworthy that changes in the risk of cancer or in diagnostic practices have contributed very little to the increase in new cases, especially in males, while changes in the risk of death have actually resulted in a reduction of deaths among males.

Trends for selected cancers

Trends in annual rates for selected cancers over the past 30 years are presented in Figures 4.5 to 4.8, with the data provided in Tables 4.1 to 4.4. The trends are discussed further below.

The annual percent change (APC) in cancer-specific incidence rates (1998–2007) and mortality rates (1997–2006) is listed in Table 4.5. The overall incidence rate increased significantly for females between 1998 and 2007 (0.3% per year). The overall mortality rates declined significantly between 1997 and 2006 for both sexes (-2.0% per year for males since 2001 and -0.6% per year for females). It should be noted that these short-term trends do not necessarily reflect the longer-term or earlier trends evident in Tables 4.1 to 4.4 and Figures 4.5 to 4.8. The descriptions that follow should be interpreted with this in mind.

For the cancers listed in Table 4.5, several statistically significant increases or decreases of 2% or more per year are observed:

- increases in incidence
  - liver cancer in both males (3.6%) and females (2.3%)
  - thyroid cancer in both males (6.8%) and females (8.8%)
- decreases in incidence
  - larynx cancer in both males (-3.8%) and females (-3.4%)
  - stomach cancer in males (-2.0%)
- increases in mortality
  - no cancers in either males or females
- decreases in mortality
  - in males, deaths from all cancers combined (-2.0%), lung cancer (-2.3%), oral cancer (-2.4%), stomach cancer (-3.1%), non-Hodgkin lymphoma (-3.8%), prostate cancer (-4.5%) and larynx cancer (-6.1%)
  - in females, stomach cancer (-2.2%), breast cancer (-3.1%), non-Hodgkin lymphoma (-3.1%) and cervical cancer (-3.4%)

Discussion of leading and selected cancers with significantly changing trends

Breast cancer

Breast cancer incidence rates rose from 1982 through the early 1990s, in part because of increased mammography screening. Reasons for the pattern of modest declines and increases observed since then are unclear but likely relate to factors like the continuing rise in mammography screening throughout the 1990s, along with the fluctuating patterns of hormone replacement therapy use among post-menopausal women during this time.

Female breast cancer mortality rates have been declining since the mid-1980s. The age-standardized mortality rate has fallen by more than 35% since peaking in 1986, from 32.0 to 20.7 per 100,000 (Table 4.4). The downward trend has accelerated to -3.1% since 2002. This is likely the result of a combination of the increase in mammography screening and the use of more effective adjuvant therapies following breast cancer surgery. The breast cancer mortality rate is the lowest it has been since 1950. Similar declines have also occurred in the United States, United Kingdom and Australia.[4]

Cervical cancer

Incidence and mortality rates have continued declining for cervical cancer, by -1.4% and -3.4% per year, respectively (Table 4.5). This is largely due to widespread, regular use of Papanicolaou (Pap) test screening, which detects pre-malignant and malignant lesions early so that they can be treated.

The immunization of school-aged girls with the vaccine for human papillomavirus (HPV) will further reduce incidence and mortality over the longer-term but will not eliminate cervical cancer. The continuation of Pap screening is still a necessary and important part of preventive healthcare.

Colorectal cancer

Trends for colorectal cancer incidence between 1982 and 2007 (the last year of complete data) are complex. In both sexes, incidence rose (or was relatively stable in the case of females) between 1982 and 1985, then declined to the mid-1990s (more strongly in females than in males), then rose through 2000, only to decline significantly thereafter (Figures 4.5 and 4.7). Colorectal cancer projections to 2011 are based on long-term data (1986–2007), which is the standard methodology for this publication and, therefore, may not capture effects of short-term fluctuations. They should be used with caution.

Mortality rates continue to decline in both sexes: -1.5% per year in males and -1.8% in females since 1997 (Table 4.5). This is likely the result of improvements in treatment, such as chemotherapy.

Screening for colorectal cancer can reduce both incidence (by identifying and removing precancerous polyps) and mortality. Screening has already been occurring in several provinces, which may partly account for the decline in mortality, though screening rates are low. As of 2010, all provinces have announced or have started implementing organized screening programs (Table 9.5).

Larynx cancer

Incidence rates of larynx cancer are significantly decreasing for both males (-3.8% per year) and females (-3.4% per year), while mortality rates for males only show a significant decline of -6.1% since 2001 (Table 4.5).

Cancer of the larynx is most strongly associated with smoking[3] and alcohol use.[5] Incidence and mortality rates reflect the decreasing trends in these risk factors.

Liver cancer

In males, the incidence rate of liver cancer increased by 3.6% per year and the mortality rate increased by 1.8% per year (Table 4.5). Both increases were statistically significant.

In females, the incidence rate increased by 2.3% per year (Table 4.5). There was a statistically non-significant increase in the mortality rate. For the first time since trends in liver cancer incidence and mortality were examined in this publication, in 2007, the increase in the incidence rate in women is statistically significant.

Some of the observed increase may be explained by rising immigration of people from world regions where risk factors for liver cancer, such as hepatitis B virus infections and exposure to aflatoxins, are prevalent.[6]

Other risk factors include increased rates of hepatitis C infection and alcohol abuse, which both increase the risk of liver cirrhosis and therefore liver cancer.[7]

Lung cancer

In males, incidence and mortality rates for lung cancer began to level off in the mid-1980s and have been declining ever since (Tables 4.1 and 4.2). Rates have dropped significantly, by -1.8% per year for incidence and by -2.3 % per year for mortality (Table 4.5).

In females, the incidence rate has been increasing since 1982, with a significant upward trend of 1.1% per year between 1998 and 2007. However, longer-term projections suggest that this rate is beginning to level off.

Males are projected to continue to have higher incidence and mortality rates than females in 2011 (incidence: 65 vs. 51 per 100,000; mortality: 56 vs. 39 per 100,000).

The differences between male and female lung cancer trends reflect past differences in the patterns of tobacco consumption. In males, the drop in tobacco consumption began in the mid-1960s, preceding the decline in lung cancer rates by approximately 20 years. In females, tobacco consumption began to decline in the mid-1980s.

Non-Hodgkin lymphoma

Incidence rates for non-Hodgkin lymphoma have increased modestly in males (0.8%) and stabilized in females.

The observed incidence patterns likely result from a combination of improved detection and classification of this complex set of diseases, as well as changes in risk factors. The clearest risk factor for non-Hodgkin lymphoma is immunosuppression, which can result from immune disorders, immunosuppressive therapy or infection with human immunodeficiency virus (HIV). Other factors that increase risk are poorly understood but may include occupational exposures to pesticides and organochlorines, such as phenoxy herbicides and dioxins.

4. TIME TRENDS IN INCIDENCE AND MORTALITY

Mortality rates have declined for males (-3.8% per year) and females (-3.1% per year) since 2001 and 2000, respectively (Table 4.5).

Declines in mortality may reflect recent improvements in treatment, such as immunotherapy (e.g., rituximab). As well, the introduction of anti-retroviral treatment for HIV infection in the second half of the 1990s has resulted in a decline in the proportion of the particularly aggressive forms of non-Hodgkin lymphoma attributable to HIV infection.

Oral cancer

This group of cancers includes cancers of the lip, tongue, salivary gland, mouth, nasopharynx and oropharynx.

Declines have occurred in the incidence rate in males (-1.0% per year) and mortality rates in both males and females (-2.4% per year and -1.9%, respectively; Table 4.5).

A decline in smoking, which is a major risk factor for most oral cancers in Canada, likely accounts for the downward trends in oral cancer incidence and mortality. Decreases in heavy alcohol use may also be relevant. The contributions of other risk factors, including HPV infection, diet and sun exposure (linked to lip cancer), are unclear.

Prostate cancer

The two peaks in incidence of prostate cancer that occurred in 1993 and 2001, each followed by a decline (Figure 4.5), are compatible with two waves of intensified screening activity with the PSA test for early prostate cancer detection. The first follows the introduction of PSA as a screening test. The second may be explained by the publicity around the federal minister of health's diagnosis of prostate cancer in early 2001 as a result of serial PSA tests. The first decline was followed by resumption of the earlier, more gradual increase, whereas the second decline is too recent to know whether the increasing trend will return.

Although the long-term and apparently ongoing increase in incidence may be due to more gradual changes in early detection, changes in the prevalence of risk factors might also be partly responsible. However, little is known about what these factors are for prostate cancer.

In contrast to incidence, mortality rates rose much more slowly from 1980 and started to decline in the mid-1990s. Mortality declined significantly by -4.5% per year between 1997 and 2006 (Table 4.5), which likely reflects improved treatment.

In 2009, two large randomized trials of PSA testing and its possible relation to reducing mortality in men over age 55 produced conflicting results.[8,9] Ongoing follow-up of men in these studies may help clarify the role of PSA testing in reducing deaths from prostate cancer.

Stomach cancer

Incidence rates of stomach cancer are declining in both sexes: -2.0% per year in males and -1.5% per year in females (Table 4.5). This decline may be due to changes in diet, decreases in smoking and heavy alcohol use (which can increase the impact of smoking on stomach cancer risk), and increased recognition and treatment of infection with the bacterium *Helicobacter pylori*, which is associated with stomach cancer.

Mortality rates from this cancer have also declined significantly, by -3.1% per year in males and -2.2% per year in females (Table 4.5).

Similar downward trends in incidence and mortality have been observed over a long period of time. Incidence rates of stomach cancer are now about half of what they were in 1982, and mortality rates are about two-thirds lower than in 1981.

Thyroid cancer

The incidence rate of thyroid cancer is the most rapidly increasing of all cancers (6.8% per year in males and 8.8% per year in females since 1998; Table 4.5). Similar increases have been noted in Europe and the United States.

More frequent use of diagnostic testing (ultrasound, computed tomography [CT] scan and magnetic resonance imaging) may be detecting earlier stage, asymptomatic thyroid cancers more frequently than was possible in the past.[10]

Mortality rates have remained stable, most likely because modern treatment is highly effective in the management of early thyroid cancers.

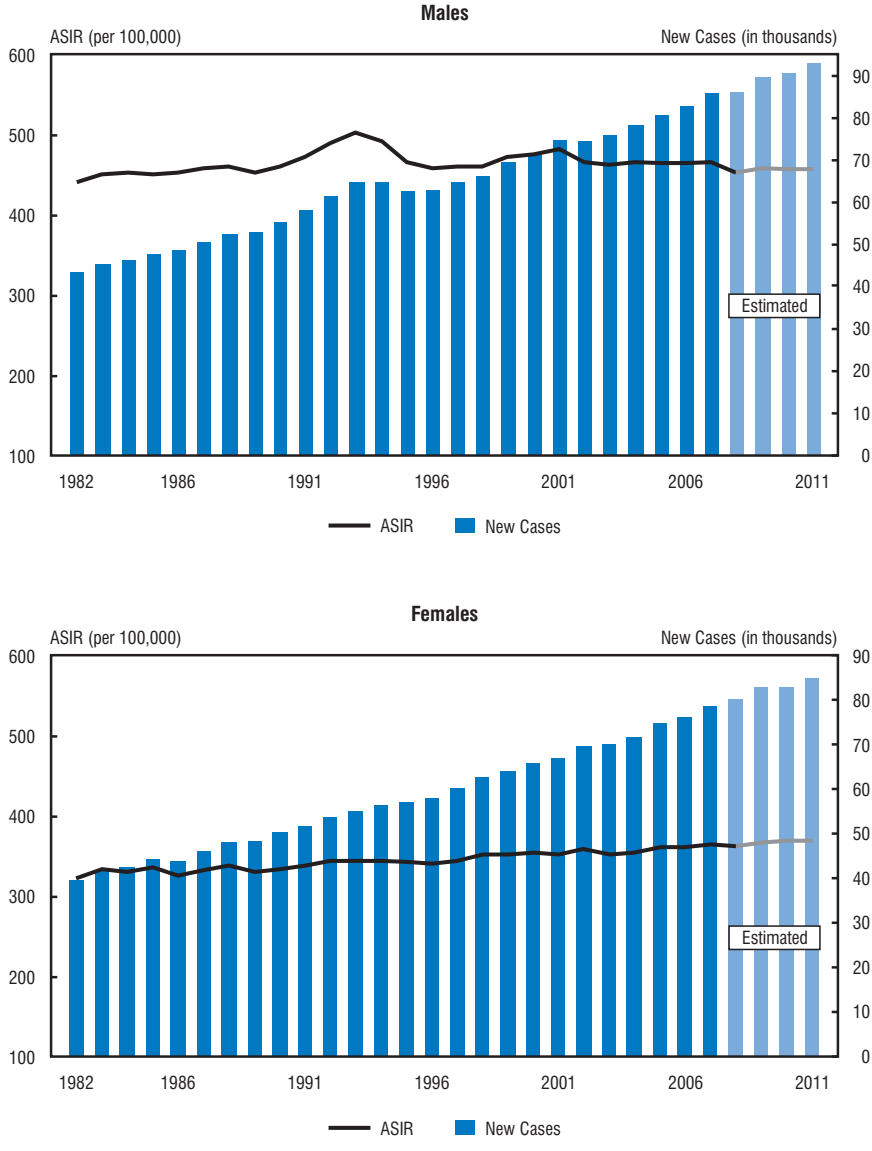
Implications

The strong declines in mortality rates for several cancers suggest that there has been important progress in cancer control, specifically due to early detection and treatment as seen in improved five-year relative survival in the most recent time period for the leading cancers (see Section 7). However, the increasing or stable trends in incidence rates for many cancers suggest a need for more primary prevention. Furthermore, Figures 4.1 and 4.2 highlight the fact that the rise in new cases of cancer will place an increasing burden on Canadian society, largely independent of the trend in rates of incidence and mortality. This vividly illustrates why cancer prevention and health promotion programs are so vital. There is a need to enhance capacity for primary prevention, early detection and treatment to further reduce overall cancer incidence and mortality.

Incidence and mortality are measures of disease burden, and their trends can inform the need for clinical services. Overall, incidence rates are stable (males) or show modest increases (females), but mortality rates are declining, suggesting better survival for some cancers. The trends call for an enhancement of primary prevention efforts; a sustained focus on screening for breast, colorectal and cervical cancers; more emphasis on early detection measures and public education about the early signs of cancer; and improved treatment options and health promotion.

Figure 4.1

New Cases and Age-Standardized Incidence Rates (ASIR) for All Cancers, Canada, 1982–2011



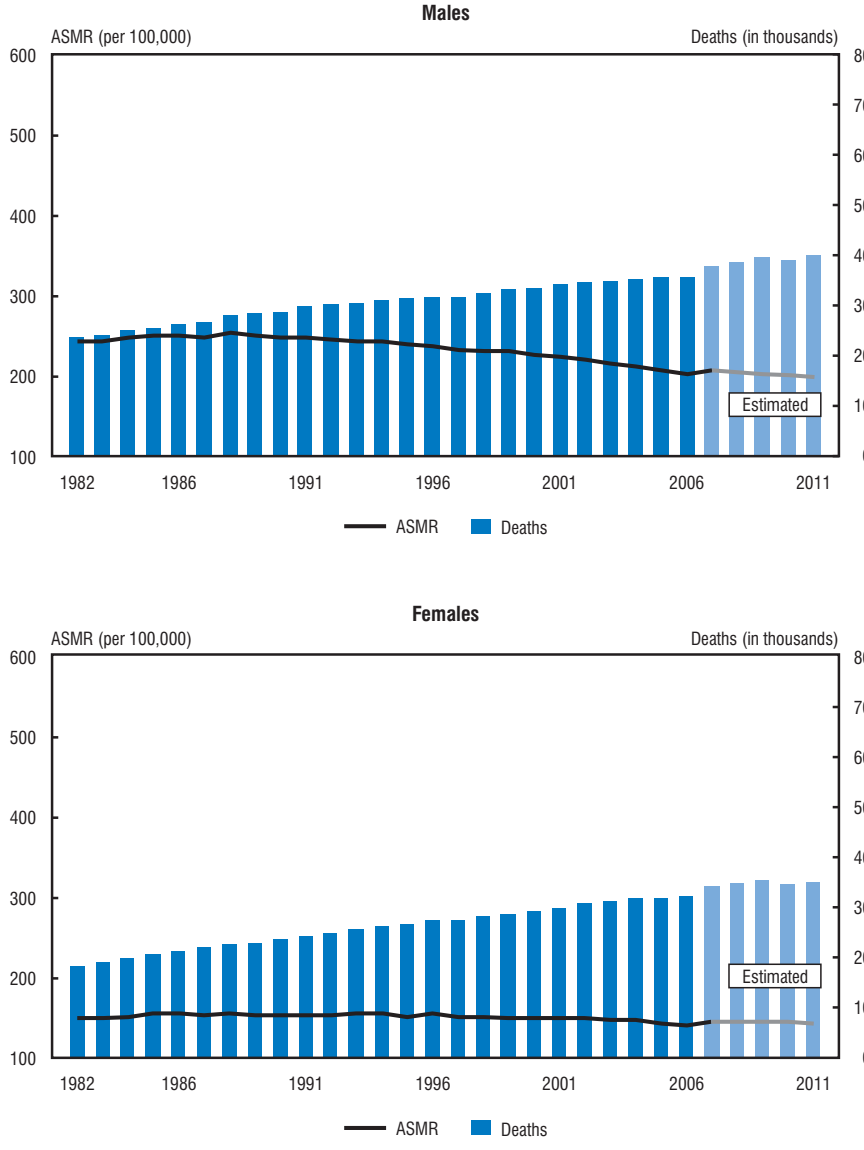
Note: All cancers exclude non-melanoma skin cancer (basal and squamous). Rates are age-standardized to the 1991 Canadian population. Actual incidence data were available to 2008 except for Quebec (2007). Please refer to *Appendix II: Methods* for further details.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Figure 4.2

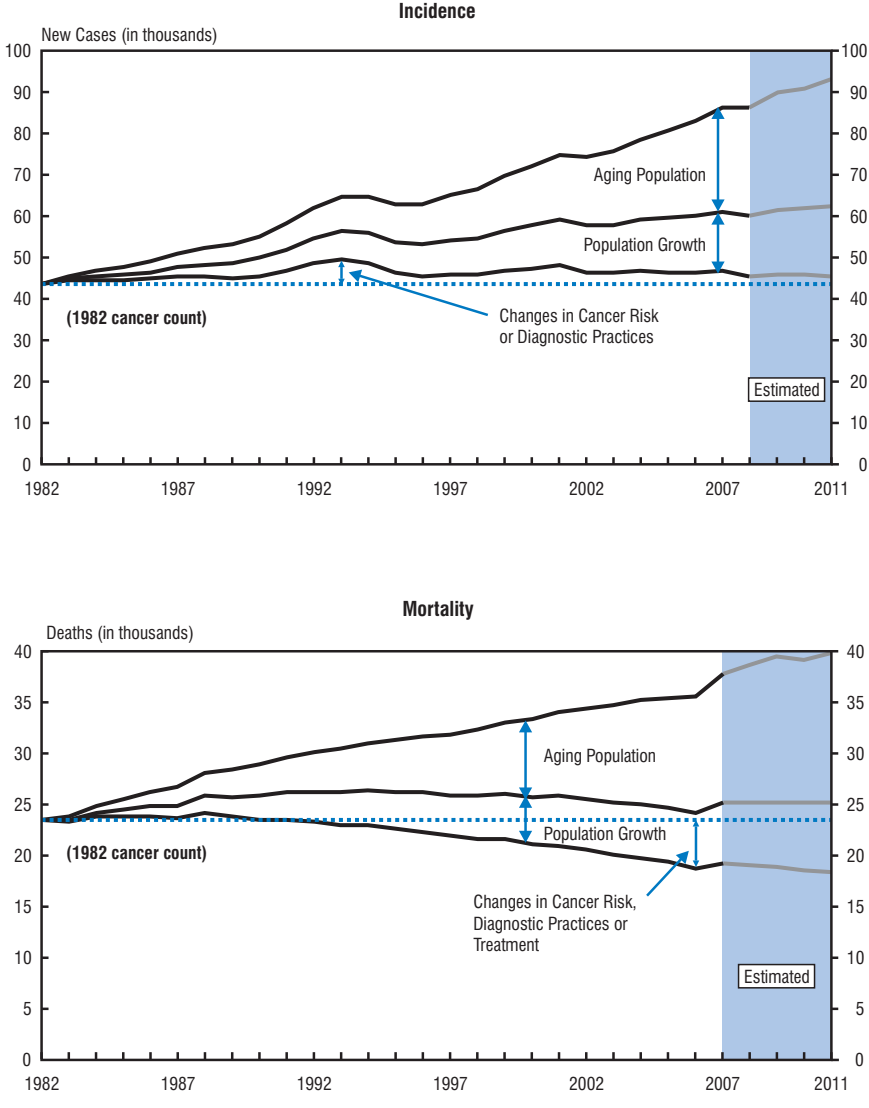
Deaths and Age-Standardized Mortality Rates (ASMR) for All Cancers, Canada, 1982–2011



Note: Rates are age-standardized to the 1991 Canadian population. Actual data were available to 2006.
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data source: Canadian Vital Statistics Death database at Statistics Canada

Figure 4.3

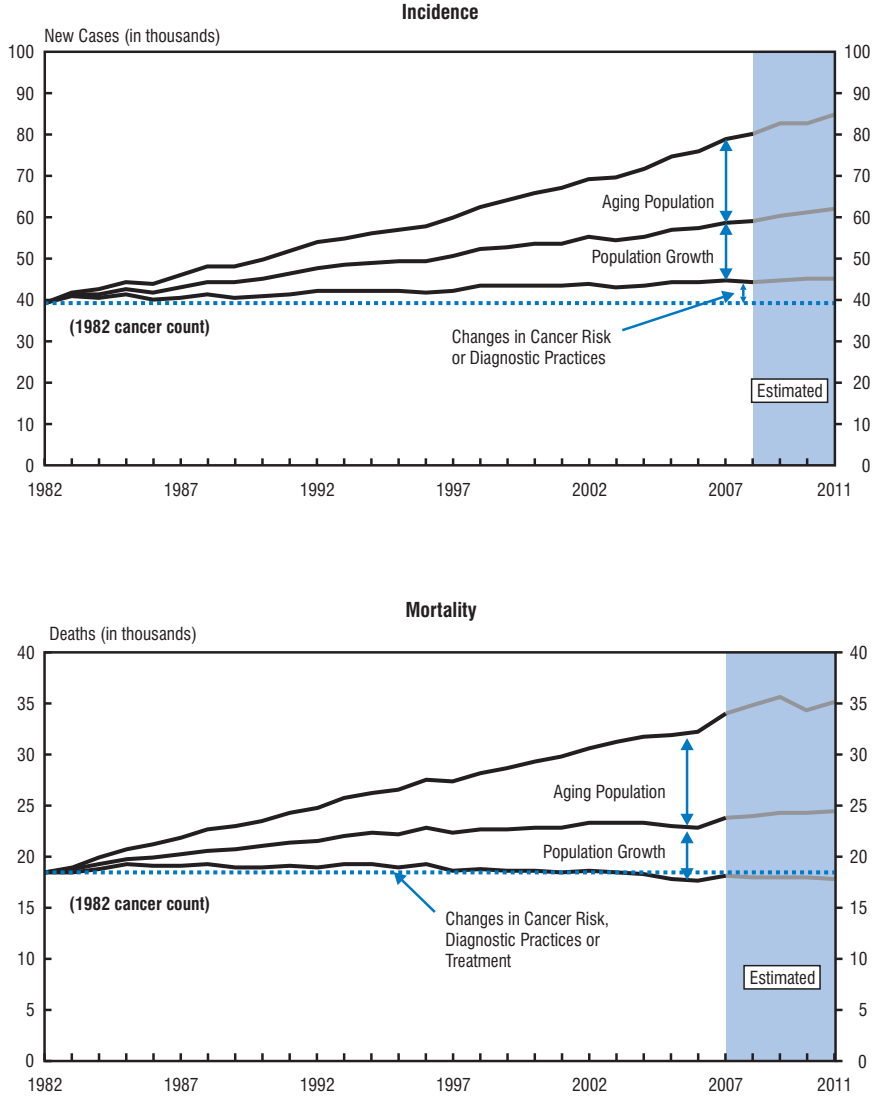
Trends in New Cases and Deaths for All Cancers and Ages, Attributed to Cancer Rate, Population Growth and Aging Population, Males, Canada, 1982–2011



Note: New cases exclude non-melanoma skin cancer (basal and squamous). Actual incidence data were available up to the year 2008 for all provinces except for Quebec (2007), and actual mortality data were available up to 2006. The range of scales differs between the figures.
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Figure 4.4

Trends in New Cases and Deaths for All Cancers and Ages, Attributed to Cancer Rate, Population Growth and Aging Population, Females, Canada, 1982–2011



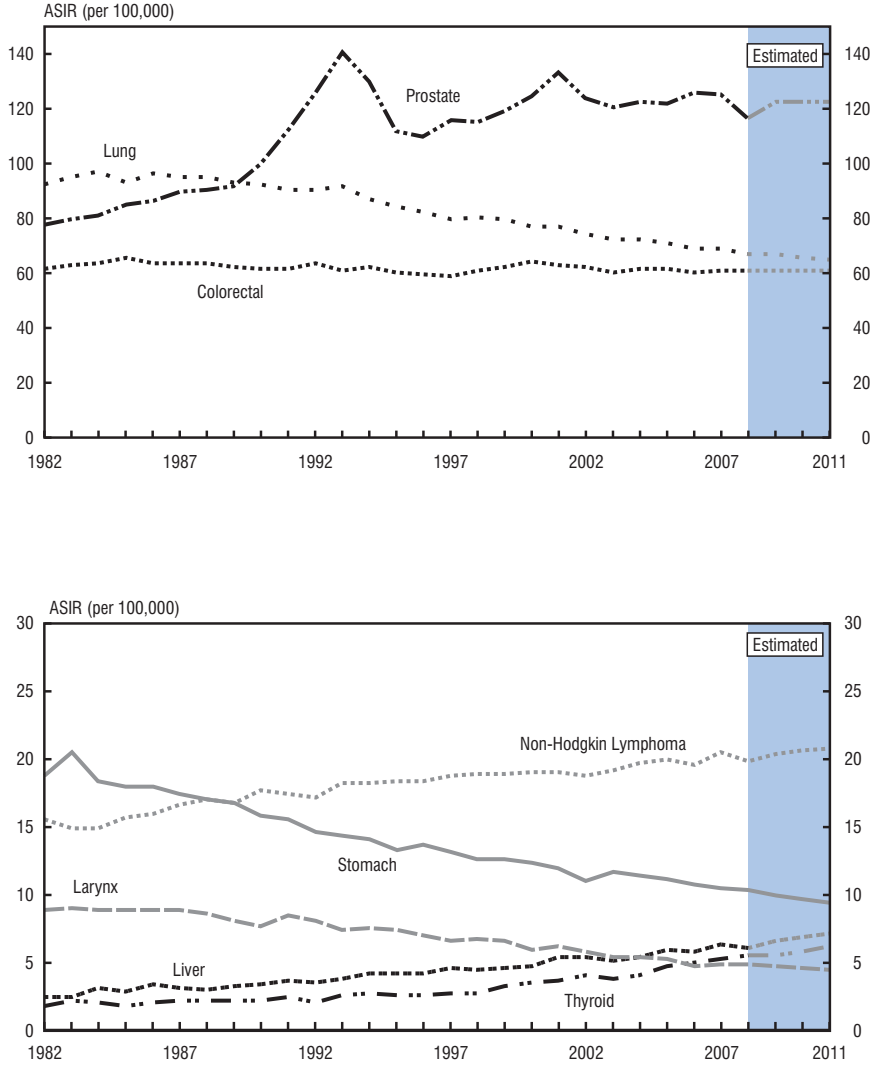
Note: New cases exclude non-melanoma skin cancer (basal and squamous). Actual incidence data were available up to the year 2008 for all provinces except for Quebec (2007), and actual mortality data were available up to 2006. The range of scales differs between the figures.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Figure 4.5

Age-Standardized Incidence Rates (ASIR) for Selected* Cancers, Males, Canada, 1982–2011



* Five most frequent cancers (both sexes combined) and cancers with a statistically significant change in incidence rate of at least 2% per year (see Table 4.5).

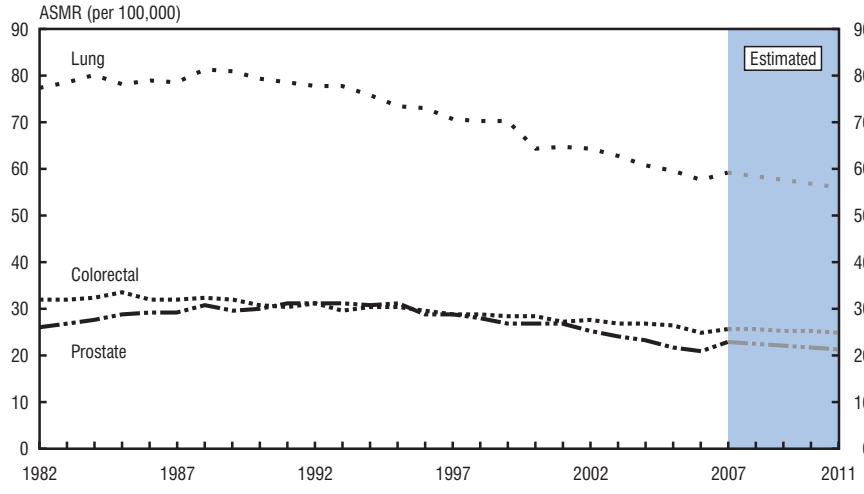
Note: Rates are age-standardized to the 1991 Canadian population. See Table 4.1 for data points. Actual data for incidence were available to 2008 except for Quebec (2007). The range of scales differs widely between the figures.

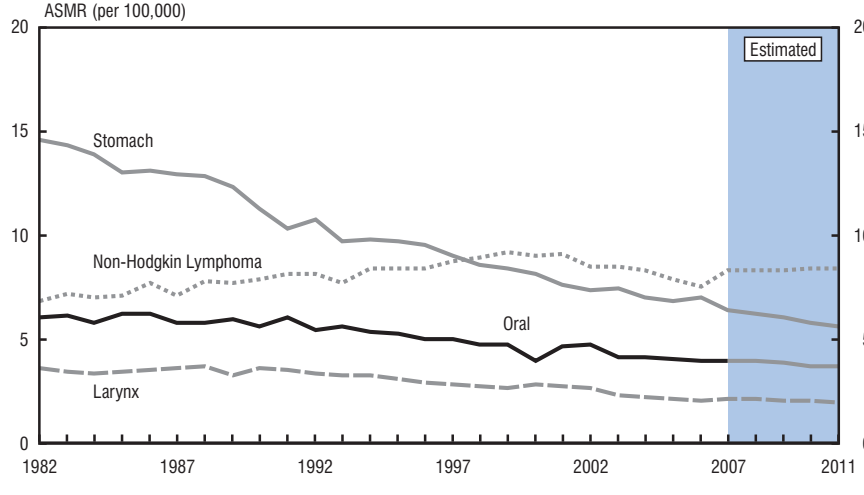
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Figure 4.6

Age-Standardized Mortality Rates (ASMR) for Selected* Cancers, Males, Canada, 1982–2011





* Five most frequent cancers (both sexes combined) and cancers with a statistically significant change in mortality rate of at least 2% per year (see Table 4.5).

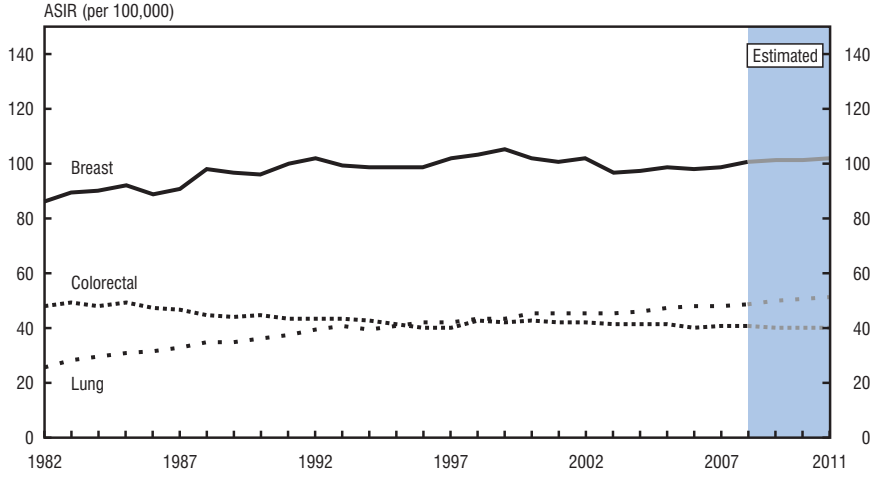
Note: Rates are age-standardized to the 1991 Canadian population. See Table 4.2 for data points. Actual data for mortality were available to 2006. The range of scales differs widely between the figures.

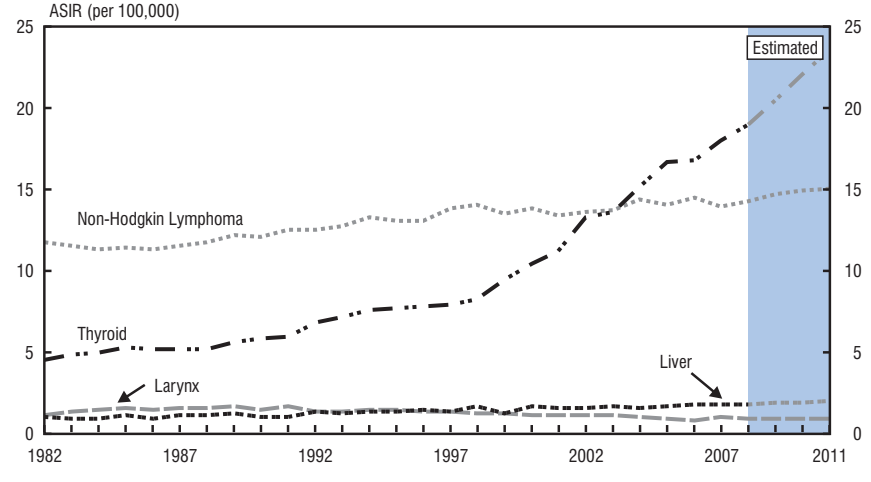
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health of Agency of Canada

Data source: Canadian Vital Statistics Death database at Statistics Canada

Figure 4.7

Age-Standardized Incidence Rates (ASIR) for Selected* Cancers, Females, Canada, 1982–2011





* Five most frequent cancers (both sexes combined) and cancers with a statistically significant change in incidence rate of at least 2% per year (see Table 4.5).

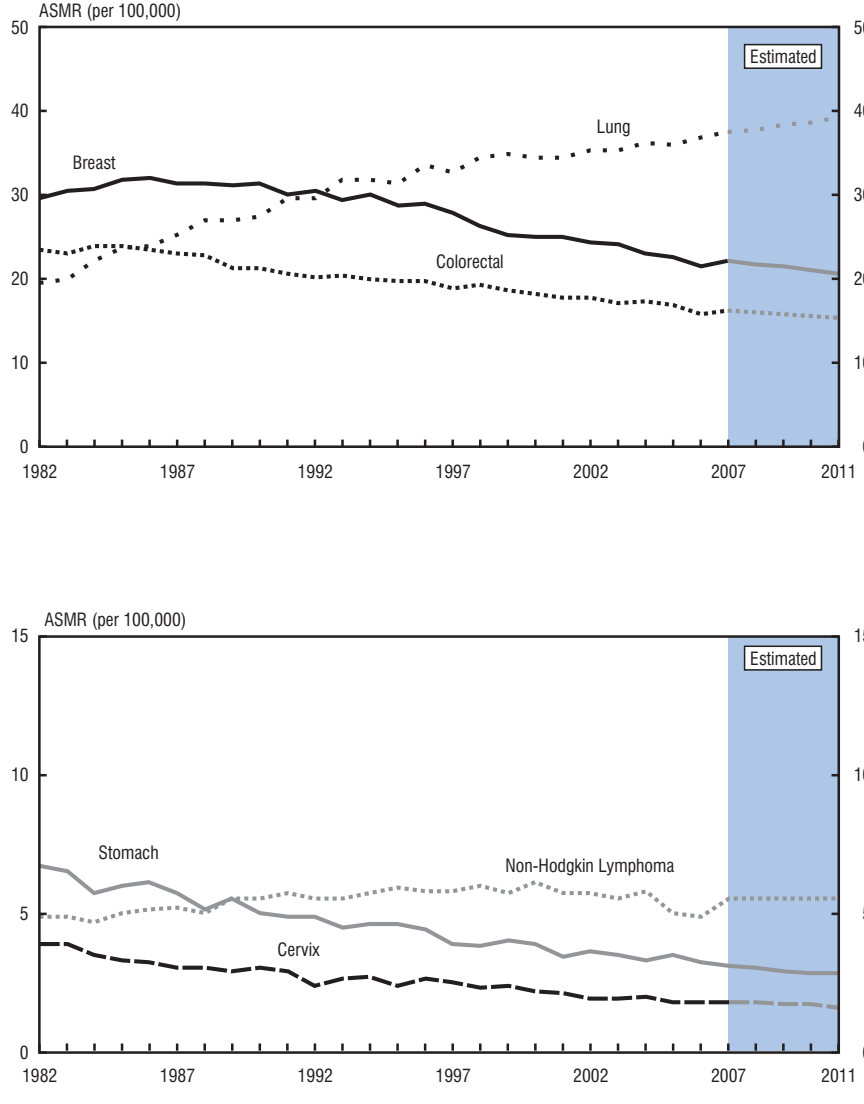
Note: Rates are age-standardized to the 1991 Canadian population. See Table 4.3 for data points. Actual data for incidence were available to 2008 except for Quebec (2007). The range of scales differs widely between the figures.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Figure 4.8

Age-Standardized Mortality Rates (ASMR) for Selected* Cancers, Females, Canada, 1982–2011



* Five most frequent cancers (both sexes combined) and cancers with a statistically significant change in mortality rate of at least 2% per year (see Table 4.5).

Note: Rates are age-standardized to the 1991 Canadian population. See Table 4.4 for data points. Actual data for mortality were available to 2006. The range of scales differs widely between the figures.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death database at Statistics Canada

4. TIME TRENDS IN INCIDENCE AND MORTALITY

Table 4.1

Age-Standardized Incidence Rates for Selected* Cancers, Males, Canada, 1982–2011

Year	Cases per 100,000								
	All Cancers	Prostate	Lung	Colorectal	Non-Hodgkin Lymphoma	Thyroid	Stomach	Liver	Larynx
1982	442.2	77.9	92.4	61.6	15.6	1.7	18.7	2.4	8.8
1983	450.6	79.7	95.0	62.9	14.9	2.1	20.5	2.4	9.0
1984	452.4	81.0	96.9	63.8	14.9	2.0	18.4	3.1	8.9
1985	452.3	85.2	93.0	65.3	15.7	1.8	18.0	2.8	8.8
1986	454.0	86.1	96.1	63.5	16.0	2.0	18.0	3.3	8.8
1987	458.5	89.5	94.8	63.4	16.6	2.2	17.4	3.1	8.8
1988	461.0	90.4	95.1	63.4	17.0	2.1	17.0	3.0	8.6
1989	453.8	91.8	93.3	62.0	16.7	2.1	16.7	3.2	8.1
1990	460.2	99.8	92.4	61.9	17.7	2.2	15.8	3.4	7.7
1991	472.4	112.5	90.5	61.8	17.4	2.4	15.6	3.6	8.4
1992	490.6	125.7	90.6	63.3	17.2	2.0	14.6	3.5	8.1
1993	503.3	140.7	91.6	61.0	18.2	2.6	14.3	3.8	7.4
1994	491.4	129.8	86.9	62.1	18.2	2.7	14.1	4.2	7.5
1995	467.2	111.8	84.7	60.5	18.3	2.6	13.3	4.2	7.4
1996	458.2	110.1	82.2	59.4	18.3	2.6	13.6	4.2	6.9
1997	461.1	115.6	79.4	59.1	18.8	2.7	13.1	4.5	6.6
1998	460.8	115.0	80.5	61.2	18.9	2.7	12.6	4.4	6.7
1999	471.9	119.5	79.5	62.2	18.9	3.2	12.6	4.6	6.6
2000	476.5	124.8	77.1	64.2	19.0	3.5	12.3	4.7	5.9
2001	482.4	133.2	77.0	63.2	19.0	3.6	11.9	5.3	6.1
2002	466.7	123.7	74.5	62.6	18.8	4.0	11.0	5.3	5.8
2003	462.3	120.4	72.4	60.4	19.1	3.7	11.7	5.1	5.4
2004	466.3	122.6	72.2	61.5	19.7	4.0	11.4	5.4	5.3
2005	464.9	121.9	71.1	61.4	20.0	4.7	11.1	5.9	5.2
2006	464.2	126.0	69.0	60.4	19.5	5.0	10.7	5.7	4.7
2007	466.4	125.2	68.9	60.7	20.5	5.2	10.5	6.3	4.8
2008†	454.2	116.2	66.7	61.2	19.8	5.5	10.3	6.0	4.8
2009‡	458.8	122.4	66.7	61.0	20.4	5.5	9.9	6.6	4.7
2010‡	457.6	122.5	65.7	61.0	20.6	5.8	9.6	6.8	4.6
2011‡	456.4	122.5	64.7	60.9	20.8	6.1	9.4	7.1	4.4

* Five most frequent cancers (both sexes combined) and cancers with a statistically significant change in incidence rate of at least 2% per year (see Table 4.5).

† Actual data were available to 2008 except for Quebec (2007).

‡ Estimated rates for all provinces/territories. These estimates are based on long-term trends and may not reflect recent changes.

Note: Rates for "All Cancers" exclude non-melanoma skin cancer (basal and squamous). Rates are age-standardized to the 1991 Canadian population.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Table 4.2

Age-Standardized Mortality Rates for Selected* Cancers, Males, Canada, 1982–2011

Year	Deaths per 100,000							
	All Cancers	Prostate	Lung	Colorectal	Non-Hodgkin Lymphoma	Oral	Stomach	Larynx
1982	243.6	26.0	77.4	31.9	6.8	6.0	14.6	3.6
1983	243.1	26.7	78.4	31.8	7.2	6.1	14.3	3.4
1984	248.1	27.5	80.2	32.5	7.0	5.8	13.9	3.3
1985	249.2	28.9	78.0	33.4	7.1	6.2	13.0	3.4
1986	249.1	29.4	78.8	32.0	7.7	6.2	13.1	3.5
1987	248.1	29.4	78.5	32.0	7.1	5.8	12.9	3.6
1988	254.7	30.7	81.2	32.4	7.8	5.8	12.8	3.7
1989	249.5	29.7	81.0	31.9	7.7	5.9	12.3	3.2
1990	246.4	30.1	79.4	30.9	7.9	5.6	11.3	3.6
1991	247.5	31.2	78.7	30.4	8.1	6.0	10.3	3.5
1992	245.2	31.1	77.6	31.2	8.1	5.4	10.7	3.3
1993	243.2	31.1	77.9	29.7	7.7	5.6	9.7	3.2
1994	242.3	30.8	75.6	30.3	8.4	5.3	9.8	3.2
1995	239.3	31.1	73.3	30.2	8.4	5.2	9.7	3.1
1996	236.6	29.0	72.9	29.5	8.4	5.0	9.5	2.9
1997	232.3	28.8	70.5	29.0	8.7	5.0	9.0	2.8
1998	230.8	28.1	70.2	29.0	8.9	4.7	8.6	2.7
1999	229.8	27.0	70.4	28.6	9.2	4.7	8.4	2.6
2000	225.8	26.9	64.4	28.5	9.0	3.9	8.1	2.8
2001	224.3	26.8	64.7	27.2	9.1	4.6	7.6	2.7
2002	220.3	25.1	64.5	27.8	8.5	4.7	7.3	2.6
2003	215.4	24.0	62.7	26.8	8.5	4.1	7.4	2.3
2004	212.1	23.4	60.6	26.8	8.3	4.1	7.0	2.2
2005	207.7	21.9	59.8	26.5	7.9	4.0	6.8	2.1
2006	201.5	20.8	57.5	25.0	7.5	3.9	7.0	2.0
2007†	207.5	22.8	59.2	25.8	8.3	3.9	6.4	2.1
2008†	205.4	22.4	58.3	25.6	8.3	3.9	6.2	2.1
2009†	203.3	22.0	57.5	25.3	8.3	3.8	6.0	2.0
2010†	201.2	21.6	56.7	25.1	8.4	3.7	5.8	2.0
2011†	199.2	21.2	55.9	24.8	8.4	3.7	5.6	1.9

* Five most frequent cancers (both sexes combined) and cancers with a statistically significant change in mortality rate of at least 2% per year (see Table 4.5).

† Actual data were available to 2006. Estimated rates for all provinces/territories. These estimates are based on long-term trends and may not reflect recent changes.

Note: Rates are age-standardized to the 1991 Canadian population.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death database at Statistics Canada

Table 4.3

Age-Standardized Incidence Rates for Selected* Cancers, Females, Canada, 1982–2011

Year	Cases per 100,000							
	All Cancers	Lung	Breast	Colorectal	Non-Hodgkin Lymphoma	Thyroid	Liver	Larynx
1982	321.3	25.8	86.0	47.9	11.7	4.5	1.0	1.1
1983	333.1	28.2	89.3	49.2	11.5	4.8	0.9	1.3
1984	329.9	29.5	90.3	47.8	11.3	4.9	0.9	1.4
1985	336.1	30.8	92.2	49.5	11.4	5.3	1.1	1.5
1986	325.5	31.5	88.6	47.1	11.3	5.2	0.9	1.4
1987	331.6	33.2	91.1	46.7	11.5	5.2	1.1	1.5
1988	336.8	34.6	97.8	45.0	11.7	5.1	1.1	1.5
1989	330.6	34.9	96.4	44.3	12.2	5.6	1.2	1.6
1990	333.6	36.3	96.0	44.5	12.1	5.8	1.0	1.4
1991	338.1	37.6	100.2	43.3	12.5	5.9	1.0	1.6
1992	343.8	39.6	101.9	43.2	12.5	6.8	1.3	1.3
1993	343.4	40.6	99.2	43.2	12.7	7.1	1.2	1.3
1994	343.8	39.8	99.0	42.5	13.3	7.6	1.3	1.4
1995	342.1	40.7	98.9	41.4	13.1	7.7	1.3	1.4
1996	340.0	42.0	98.7	40.1	13.1	7.8	1.4	1.3
1997	344.3	42.0	102.3	40.4	13.8	7.9	1.3	1.3
1998	352.1	43.6	103.4	42.8	14.0	8.2	1.6	1.2
1999	352.8	43.5	105.4	41.9	13.5	9.4	1.2	1.2
2000	354.8	45.1	101.8	42.9	13.8	10.4	1.6	1.1
2001	352.7	45.1	100.4	42.3	13.4	11.2	1.5	1.1
2002	358.6	45.7	102.3	42.1	13.6	13.3	1.5	1.1
2003	351.3	45.6	96.9	41.2	13.7	13.6	1.6	1.1
2004	354.1	46.3	97.2	41.6	14.4	15.1	1.5	1.0
2005	360.7	47.6	98.5	41.5	14.0	16.7	1.6	0.9
2006	360.7	47.9	98.3	40.3	14.5	16.8	1.8	0.8
2007	364.4	47.7	98.7	40.8	13.9	18.0	1.8	1.0
2008†	362.4	48.6	100.4	40.5	14.2	19.0	1.8	0.9
2009‡	365.7	50.0	101.2	40.3	14.7	20.5	1.9	0.9
2010‡	367.4	50.7	101.4	40.1	14.9	22.0	1.9	0.9
2011‡	369.1	51.3	101.7	40.0	15.0	23.6	2.0	0.9

* Five most frequent cancers (both sexes combined) and cancers with a statistically significant change in incidence rate of at least 2% per year (see Table 4.5).

† Actual data were available to 2008 except for Quebec (2007).

‡ Estimated rates for all provinces/territories. These estimates are based on long-term trends and may not reflect recent changes.

Note: Rates for "All Cancers" exclude non-melanoma skin cancer (basal and squamous). Rates are age-standardized to the 1991 Canadian population.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Table 4.4

Age-Standardized Mortality Rates for Selected* Cancers, Females, Canada, 1982–2011

Year	Deaths per 100,000						
	All Cancers	Lung	Breast	Colorectal	Non-Hodgkin Lymphoma	Stomach	Cervix
1982	149.3	19.5	29.7	23.5	4.9	6.7	3.9
1983	149.4	19.9	30.4	23.1	4.9	6.5	3.9
1984	151.9	22.1	30.7	23.8	4.7	5.7	3.5
1985	154.8	23.7	31.8	23.8	5.0	6.0	3.3
1986	154.4	23.9	32.0	23.5	5.1	6.1	3.2
1987	154.1	25.3	31.3	23.0	5.2	5.7	3.0
1988	155.4	26.9	31.4	22.7	5.0	5.1	3.0
1989	153.0	26.9	31.2	21.3	5.5	5.5	2.9
1990	152.9	27.5	31.3	21.3	5.5	5.0	3.0
1991	153.7	29.5	30.1	20.7	5.7	4.9	2.9
1992	153.2	29.6	30.4	20.2	5.5	4.9	2.4
1993	154.9	31.7	29.4	20.3	5.5	4.5	2.6
1994	155.2	31.9	30.0	19.9	5.7	4.6	2.7
1995	152.1	31.3	28.7	19.8	5.9	4.6	2.4
1996	155.2	33.6	28.9	19.7	5.8	4.4	2.6
1997	150.4	32.6	27.8	18.8	5.8	3.9	2.5
1998	151.3	34.5	26.4	19.3	6.0	3.8	2.3
1999	149.8	34.9	25.2	18.6	5.7	4.0	2.4
2000	149.8	34.4	25.1	18.2	6.1	3.9	2.2
2001	148.2	34.4	25.0	17.8	5.7	3.4	2.1
2002	149.2	35.2	24.4	17.7	5.7	3.6	1.9
2003	148.1	35.3	24.1	17.1	5.5	3.5	1.9
2004	147.0	36.1	23.1	17.3	5.8	3.3	2.0
2005	143.7	35.9	22.6	16.9	5.0	3.5	1.8
2006	141.6	36.8	21.5	15.8	4.9	3.2	1.8
2007†	145.4	37.4	22.2	16.3	5.5	3.1	1.8
2008†	145.0	37.8	21.8	16.1	5.5	3.0	1.8
2009†	144.6	38.3	21.4	15.8	5.5	2.9	1.7
2010†	144.2	38.7	21.1	15.6	5.5	2.8	1.7
2011†	143.7	39.2	20.7	15.4	5.5	2.8	1.6

* Five most frequent cancers (both sexes combined) and cancers with a statistically significant change in mortality rate of at least 2% per year (see Table 4.5).

† Actual data were available to 2006. Estimated rates for all provinces/territories. These estimates are based on long-term trends and may not reflect recent changes.

Note: Rates are age-standardized to the 1991 Canadian population.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death database at Statistics Canada

Table 4.5

Annual Percent Change (APC) in Age-Standardized Incidence Rates (1998–2007) and Mortality Rates (1997–2006) for Selected Cancers, Canada

	Incidence 1998–2007				Mortality 1997–2006			
	Males		Females		Males		Females	
	APC	Change-point†	APC	Change-point†	APC	Change-point†	APC	Change-point†
All Cancers	**0.1**	**2003**	**0.3****		**–2.0****	**2001**	**–0.6****	
Prostate	–0.6	2001	—		–4.5**	2001	—	
Lung	–1.8**		1.1**		–2.3**		1.0**	
Breast	—		–0.7**		—		–3.1**	2002
Colorectal	–0.8**	2000	–0.8**	2000	–1.5**		–1.8**	
Non-Hodgkin Lymphoma	0.8**		0.4		–3.8**	2001	–3.1**	2000
Bladder	–0.7*		–0.1		–1.1**		0.1	
Melanoma	1.4**		1.4**		0.5		–0.6*	
Thyroid	6.8**		8.8**		—		—	
Leukemia	0.6		1.1**		–0.9*		–1.0*	
Kidney	2.4	2003	1.8**		–0.7		–0.4	
Body of Uterus	—		0.7*		—		–0.7	
Pancreas	–0.3		0.5		–0.4		0.1	
Oral	–1.0*		0.2		–2.4**		–1.9*	
Stomach	–2.0**		–1.5**		–3.1**		–2.2**	
Brain	–0.5		–0.8		–1.0**		–1.4**	
Ovary	—		–0.2		—		–0.5	
Multiple Myeloma	0.4		0.0		–1.6*		–0.4	
Liver	3.6**		2.3*		1.8*		1.6	
Esophagus	0.6		–0.7		-0.2		–1.5*	
Cervix	—		–1.4**		—		–3.4**	
Larynx	–3.8**		–3.4**		–6.1**	2001	–2.6	
Hodgkin Lymphoma	0.4		0.9		—		—	
Testis	1.5*		—		—		—	

— Not applicable or small number of deaths.

* Significant, $p<0.05$.

** Significant, $p<0.01$.

† Changepoint indicates the baseline year, if the slope of the trend changed after 1998 for incidence or 1997 for mortality. Changepoints were fit to rates from 1986 to 2007 for incidence and 1986 to 2006 for mortality.

Note: Annual Percent Change is calculated assuming a log linear model; "All Cancers" incidence rates include cancers not found in the table but exclude non-melanoma skin cancer (basal and squamous). When there is no changepoint in the most recent 10 years, the APC was obtained by running a separate changepoint analysis on the most recent 10 years. If there is a changepoint, the APC was taken from the last segment. See *Appendix II: Data sources and methods* for further details.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

5. INCIDENCE, MORTALITY AND SURVIVAL IN CHILDREN AND YOUTH (0–19 YEARS)

Cancer is a rare occurrence among Canadian children. Between 2003 and 2007, there were 6,550 children and youth aged 0–19 years (on average 1,310 a year) diagnosed with cancer in Canada, and between 2002 and 2006, 962 died from their disease (Table 5.1). Although childhood and youth cancers account for just 1% of all cancers diagnosed in Canada, they are of significant public health importance. Cancer in children and youth creates a disproportionate impact on health, economic and social welfare systems, as well as placing a tremendous burden on the family of the child or adolescent affected by cancer. An estimated two-thirds of childhood cancer survivors have at least one chronic or late-occurring effect from their cancer therapy, and up to one-third of these late effects are considered major, serious or life-threatening.[11] As more children and youth survive a cancer diagnosis, the need for long-term monitoring and follow-up care will continue to grow.

Incidence

- There has been little change in the age-standardized incidence rate for all childhood and youth cancers combined since 1985 (Figure 5.1).
- Between 2003 and 2007, the most commonly diagnosed childhood cancer was leukemia (Table 5.1), which accounted for 26% of all newly diagnosed cases. Lymphomas and cancers of the central nervous system (CNS) were the next most common cancers at 17% and 16%, respectively.
  - Lymphoid leukemias accounted for nearly 73% of the 1,716 cases of leukemia, while 16% were acute myeloid leukemia.
  - Among the 1,100 diagnosed lymphoma cases, 55% were Hodgkin lymphomas, 8% were Burkitt lymphomas and 24% were other non-Hodgkin lymphomas.
  - Of the 1,039 CNS cancers, astrocytomas accounted for 44%, intracranial and intraspinal embryonal tumours represented 20% and ependymoma was responsible for 10%.

Mortality

- For all childhood and youth cancers combined, the age-standardized mortality rate has declined substantially, from a high of 41.2 per 1,000,000 in 1985 to 23.0 per 1,000,000 in 2007 (Figure 5.1).
- Approximately 65% of the deaths caused by childhood and youth cancers from 2002 to 2006 were leukemias (28%), CNS cancers (27%) or malignant bone cancers (11%).

Survival

Observed survival proportions (OSPs) were derived for 2002 to 2006 using period analysis (see *Appendix II*).

- For all cancers combined among this age group (0–19 years), the five-year OSP was estimated to be 82%.
- Among specific diagnostic groups, the highest five-year OSPs were observed for retinoblastoma, at 96%, followed by other malignant epithelial tumours, lymphomas and germ cell tumours, which ranged from 89% to 93% (Table 5.1). The lowest five-year OSPs were seen in malignant bone tumours (68%), soft tissue (71%) and CNS cancers (71%).

5. INCIDENCE, MORTALITY AND SURVIVAL IN CHILDREN AND YOUTH (0–19 YEARS)

- Five-year OSPs varied considerably within certain diagnostic groups (Table 5.1):
  - Survival of those diagnosed with acute myeloid leukemia (67%) was considerably less than for those diagnosed with a lymphoid leukemia (89%).
  - The outlook for those diagnosed with Hodgkin lymphoma (94%) was better than those diagnosed with non-Hodgkin lymphoma (82%).
  - For CNS cancers, the prognosis for astrocytoma (81%) was found to be higher than for intracranial and intraspinal embryonal tumours (58%).

Although cancer in children and youth is rare, it remains of significant public health importance.

Table 5.1

New Cases and Deaths, Average Annual Age-Standardized Incidence Rates (ASIR) and Mortality Rates (ASMR), and Estimated Five-Year Observed Survival Proportions (OSP) and 95% Confidence Intervals (CI) by Diagnostic Group, in Children and Youth (0–19 Years), Canada (Excluding Quebec*)

Diagnostic Group	New Cases (2003–2007)	ASIR (per 1,000,000 per year)	Deaths (2002–2006)	ASMR (per 1,000,000 per year)	5-Year OSP (2002–2006) (95% CI)
Total† (5 years)	**6,550**	**167.3**	**962**	**24.2**	**82 (81–83)**
Average Per Year	**1,310**		**192**		
I. Leukemia	**1,716**	**45.9**	**267**	**6.7**	**84 (82–86)**
a. Lymphoid	1,257	34.0	124	3.1	89 (87–91)
b. Acute Myeloid	269	6.9	67	1.7	67 (61–73)
II. Lymphoma	**1,100**	**26.4**	**61**	**1.5**	**89 (87–91)**
a. Hodgkin Lymphoma	607	14.1	12	0.3	94 (92–96)
b. Non-Hodgkin Lymphoma	259	6.4	18	0.5	82 (76–86)
c. Burkitt Lymphoma	88	2.2	8	0.2	84 (75–90)
III. Central Nervous System	**1,039**	**27.0**	**258**	**6.6**	**71 (68–74)**
a. Ependymoma	99	2.6	21	0.6	70 (59–79)
b. Astrocytoma	460	11.8	56	1.4	81 (76–84)
c. Intracranial & Intraspinal Embryonal	211	5.6	80	2.1	58 (51–65)
XI. Other Malignant Epithelial	**659**	**15.4**	**25**	**0.6**	**93 (90–95)**
b. Thyroid	314	7.3	1	0.0	99 (97–100)
d. Malignant Melanoma	139	3.3	5	0.1	95 (90–98)
X. Germ Cell and Other Gonadal	**412**	**9.8**	**20**	**0.5**	**89 (85–92)**
c. Gonadal Germ Cell Tumours	266	6.2	3	0.1	93 (88–95)
IX. Soft Tissue	**405**	**10.2**	**89**	**2.2**	**71 (66–76)**
a. Rhabdomyosarcoma	153	4.0	49	1.2	68 (59–75)
VIII. Malignant Bone	**368**	**8.8**	**103**	**2.4**	**68 (63–74)**
a. Osteosarcoma	189	4.5	45	1.1	69 (60–76)
c. Ewing's Sarcoma	136	3.3	54	1.3	62 (51–70)
IV. Neuroblastoma & Other PNC	**309**	**8.9**	**71**	**1.9**	**75 (69–80)**
a. Neuroblastoma	302	8.7	71	1.9	75 (69–80)
VI. Renal Tumours	**248**	**7.0**	**24**	**0.6**	**85 (79–89)**
a. Nephroblastoma	220	6.3	18	0.5	87 (82–92)
XII. Other and Unspecified Cancers	**122**	**3.1**	**23**	**0.6**	**90 (82–95)**
V. Retinoblastoma	**86**	**2.5**	**5**	**0.1**	**96 (89–99)**
VII. Hepatic Tumours	**78**	**2.2**	**16**	**0.4**	**74 (62–83)**

* Data from Quebec were excluded from survival calculations, in part, because the method for ascertaining the date of cancer diagnosis differs from the method used by other provinces/territories and because of issues in correctly ascertaining the vital status of cases.

† Total of new cases includes 8 malignant cases that were unclassifiable.

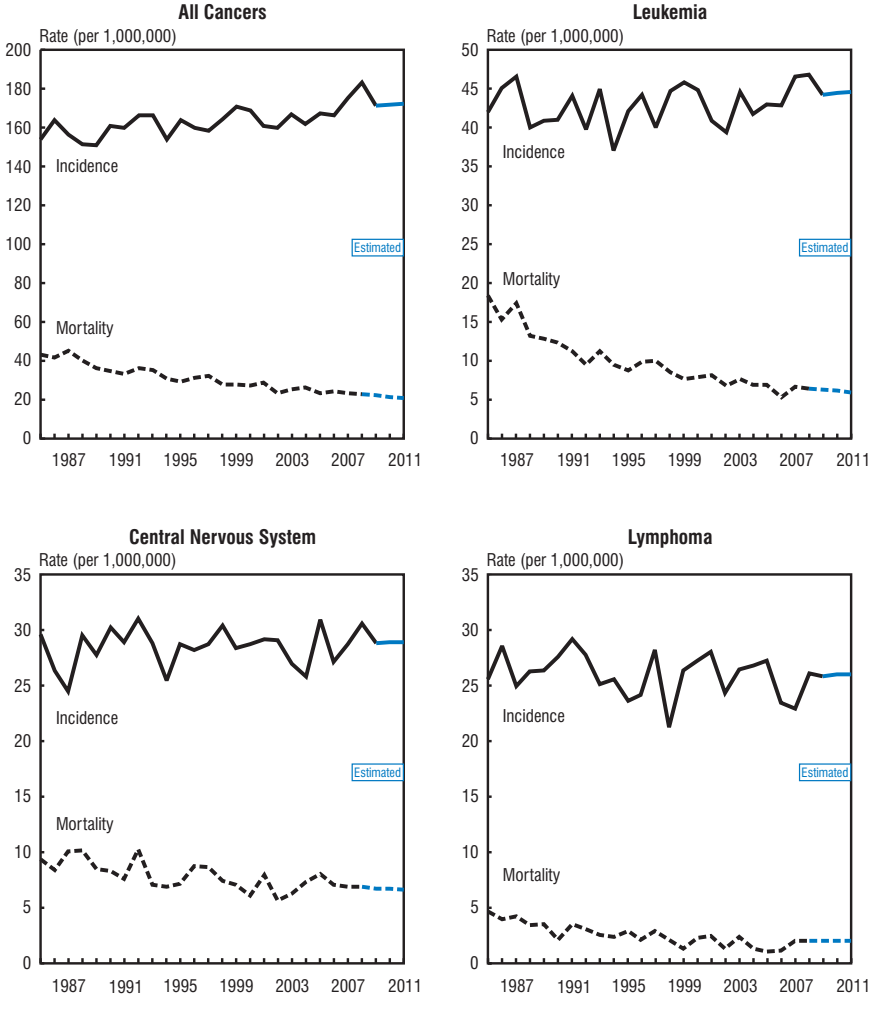
Note: Rates are age-standardized to the 1991 Canadian population and are expressed per million per year due to disease rarity. Cases were classified according to the *International Classification of Childhood Cancer, Third Edition*.[12] Diagnostic groups are listed according to disease occurrence. Only selected subgroups within each diagnostic group are listed. PNC denotes peripheral nervous cell tumours.

Analysis by: Health Statistics Division, Statistics Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Figure 5.1

Age-Standardized Incidence and Mortality Rates for the Most Common Cancers in Children and Youth (0–19 Years), Canada, 1985–2011



Note: The range of the rate scales differs widely among the figures. Incidence rates exclude non-melanoma skin cancer (basal and squamous). Actual incidence data were available up to the year 2008 for all provinces except for Quebec (2007), and actual mortality data were available up to 2006.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

6. PROBABILITY OF DEVELOPING OR DYING FROM CANCER

The chance of developing a specific type of cancer is a reflection of the population prevalence of risk factors and life expectancy, while the probability of dying from it depends on the incidence and survival of that cancer. Table 6.1 presents the probability of Canadians developing the more common cancers within specific 10-year age groups, as well as the lifetime probability of developing or dying from one of these cancers. Data for the lifetime probability of developing or dying from cancer are presented as both a percentage and a ratio.

- Men have a 45% lifetime probability (or one in 2.2 chance) of developing cancer. This means that nearly one in two men is expected to develop cancer during his lifetime.
- Similarly, women have a 40% probability (or one in 2.5 chance) of developing cancer in their lifetime.
- One in 3.5 men and one in 4.2 women, or approximately one in four Canadians, is expected to die of cancer.

Cancer-specific probabilities

- One in seven men is expected to be diagnosed with prostate cancer in his lifetime, and one in 28 is expected to die from it.
- For men, the likelihood of developing lung cancer is one in 11, and the likelihood of dying from the disease is one in approximately 13, which makes it the cancer with the greatest lifetime probability of death for men.
- Based on current estimates, one in 13 men is expected to develop colorectal cancer in his lifetime, and one in 28 is expected to die from the disease.
- One in nine women is expected to develop breast cancer in her lifetime, and 1 in 29 is expected to die from it.
- For women, the likelihood of developing lung cancer is one in 15, and the likelihood of dying from the disease is one in 17, which makes it the cancer with the greatest lifetime probability of death for women.
- Based on current estimates, one in 16 women is expected to develop colorectal cancer in her lifetime, and one in 32 is expected to die from it.

Age-specific probabilities

The probability of developing cancer within the next 10 years gives a useful indication of short-term cancer risk.

- Table 6.1 shows how steeply the risk of developing prostate cancer rises with age. A man has a low probability of being diagnosed with prostate cancer before age 50. However, a 70-year-old man has a 6.2% (one in 16) chance of being diagnosed with prostate cancer by age 80. This percentage represents the highest risk, for either men or women, of developing a specific cancer in any decade of life.
- For men, the increasing probability of developing cancer with each decade of life is greatest for prostate, lung, colorectal and, to a lesser extent, bladder cancer. For most of these cancers, the greatest increase occurs from their 50s to their 60s.
- For women, the increasing probability of developing cancer with each decade of life is greatest for breast, lung and colorectal cancer. Similar to men, for most of these cancers, the greatest increase occurs from their 50s to their 60s.

Table 6.1
Lifetime Probability of Developing or Dying from Cancer and the Probability of Developing Cancer by Age, Canada

	Lifetime Probability of Developing Cancer		Lifetime Probability of Dying from Cancer		Probability (%) of Developing Cancer in Next 10 Years by Age					
	%	One in:	%	One in:	30–39	40–49	50–59	60–69	70–79	80–89
Males										
All Cancers*	**45.3**	**2.2**	**28.9**	**3.5**	**0.7**	**1.7**	**6.2**	**15.2**	**21.4**	**20.7**
Prostate	14.2	7.0	3.6	27.8	—	0.2	1.8	5.7	6.2	4.8
Lung	8.7	11.4	8.0	12.5	—	0.2	0.8	2.4	4.1	4.0
Colorectal	7.5	13.3	3.6	27.7	0.1	0.2	0.8	2.0	3.4	3.3
Bladder	3.6	27.9	1.1	90.0	—	0.1	0.3	0.8	1.6	1.8
Non-Hodgkin Lymphoma	2.2	45.3	1.0	97.0	0.1	0.1	0.3	0.6	0.9	0.8
Leukemia	1.8	56.9	1.0	95.7	—	0.1	0.2	0.4	0.6	0.8
Kidney	1.7	59.0	0.7	141.0	—	0.1	0.3	0.5	0.6	0.5
Melanoma	1.5	66.5	0.4	243.0	0.1	0.1	0.2	0.4	0.5	0.6
Stomach	1.4	72.1	1.0	101.4	—	—	0.1	0.3	0.6	0.7
Oral	1.3	74.5	0.5	195.6	—	0.1	0.3	0.4	0.5	0.4
Pancreas	1.3	78.9	1.3	74.1	—	—	0.1	0.3	0.5	0.6
Multiple Myeloma	0.8	124.8	0.5	206.2	—	—	0.1	0.2	0.3	0.4
Brain	0.8	125.9	0.6	165.9	—	0.1	0.1	0.2	0.2	0.2
Esophagus	0.7	134.7	0.9	115.9	—	—	0.1	0.2	0.3	0.3
Liver	0.7	147.8	0.4	262.1	—	—	0.1	0.2	0.3	0.2
Larynx	0.6	178.8	0.3	377.0	—	—	0.1	0.2	0.2	0.2
Thyroid	0.4	223.4	0.1	1937.2	0.1	0.1	0.1	0.1	0.1	—

— Value less than 0.05.

* "All Cancers" excludes in situ bladder cancer and non-melanoma skin cancer (basal and squamous) for the probability of developing cancer.

Note: The probability of developing cancer is calculated based on age- and sex-specific cancer incidence and mortality rates for Canada in 2006 and on life tables based on 2004–2006 all-cause mortality rates. The probability of dying from cancer represents the proportion of Canadians dying from cancer in a cohort subjected to the mortality conditions prevailing in the population at large in 2006. See *Appendix II: Data sources and methods* for further details.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Approximately one in two Canadians will develop cancer and one in four will die of the disease, with the risk being slightly greater among men than women.

Table 6.1 *(continued)*

Lifetime Probability of Developing or Dying from Cancer and the Probability of Developing Cancer by Age, Canada

	Lifetime Probability of Developing Cancer		Lifetime Probability of Dying from Cancer		Probability (%) of Developing Cancer in Next 10 Years by Age					
	%	One in:	%	One in:	30–39	40–49	50–59	60–69	70–79	80–89
Females										
All Cancers*	**40.4**	**2.5**	**24.1**	**4.2**	**1.3**	**3.2**	**6.3**	**10.5**	**14.3**	**14.2**
Breast	11.3	8.9	3.4	29.2	0.4	1.3	2.2	3.1	3.1	2.6
Lung	6.7	14.9	5.7	17.4	—	0.2	0.8	1.9	2.7	2.0
Colorectal	6.4	15.7	3.1	32.3	0.1	0.2	0.6	1.3	2.3	2.7
Body of Uterus	2.5	40.4	0.5	183.8	—	0.1	0.6	0.8	0.7	0.5
Non-Hodgkin Lymphoma	1.9	51.5	0.9	111.5	0.1	0.1	0.2	0.5	0.7	0.7
Ovary	1.5	68.7	1.1	91.9	—	0.1	0.2	0.3	0.4	0.4
Thyroid	1.4	70.8	0.1	1374.4	0.2	0.3	0.3	0.2	0.2	0.1
Pancreas	1.3	74.1	1.4	69.9	—	—	0.1	0.2	0.5	0.6
Leukemia	1.3	75.4	0.8	125.4	—	0.1	0.1	0.2	0.4	0.5
Bladder	1.2	83.3	0.5	220.7	—	—	0.1	0.2	0.4	0.5
Melanoma	1.2	84.6	0.2	463.9	0.1	0.1	0.2	0.2	0.3	0.3
Kidney	1.1	92.4	0.4	231.3	—	0.1	0.2	0.2	0.4	0.3
Stomach	0.8	131.2	0.6	172.7	—	—	0.1	0.1	0.3	0.3
Oral	0.7	142.6	0.2	417.1	—	—	0.1	0.2	0.2	0.2
Cervix	0.7	153.4	0.2	444.7	0.1	0.1	0.1	0.1	0.1	0.1
Multiple Myeloma	0.6	157.1	0.4	230.3	—	—	0.1	0.1	0.2	0.3
Brain	0.6	158.3	0.4	224.6	—	—	0.1	0.1	0.2	0.1

— Value less than 0.05.

* "All Cancers" excludes in situ bladder cancer and non-melanoma skin cancer (basal and squamous) for the probability of developing cancer.

Note: The probability of developing cancer is calculated based on age- and sex-specific cancer incidence and mortality rates for Canada in 2006 and on life tables based on 2004–2006 all-cause mortality rates. The probability of dying from cancer represents the proportion of Canadians dying from cancer in a cohort subjected to the mortality conditions prevailing in the population at large in 2006. See *Appendix II: Data sources and methods* for further details.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

7. FIVE-YEAR RELATIVE SURVIVAL

Population-based survival estimates provide a measure of disease severity: the average person diagnosed with a cancer with a poor five-year relative survival ratio (RSR), such as lung cancer, has a small probability of living until the fifth anniversary of his or her diagnosis. Examined across cancer types and geographic regions, survival estimates can be used to establish priority areas for improving prognosis.[13] Examined over time, and in conjunction with incidence and mortality trends, they represent an important indicator of progress in cancer control.[14]

Determinants of survival

The prognosis of a person with cancer may be influenced by several factors:

- host factors such as age, sex, co-morbid conditions, socio-economic status and lifestyle factors
- tumour-related factors such as stage of disease and histological subtype
- system factors related to cancer control such as the availability and quality of early detection, diagnostic and treatment services

The stage of disease at diagnosis is a very important prognostic indicator, but it is not yet routinely available for analysis in all cancer registry datasets. Significant activities are underway in most provincial/territorial cancer registries to expand the collection of stage data.

Interpretation of the relative survival ratio (see *Glossary* for details)

The RSR is the preferred measure for assessing population-based cancer survival. It is defined as the ratio of the observed survival for a group of persons diagnosed with cancer to the survival expected for people in the same general population.[15] A five-year RSR of 80% for a particular cancer means that people with that cancer have an 80% likelihood of living for five years (or more) after diagnosis compared to their counterparts in the general population.

While a population-based survival estimate is a useful "average" indicator of survival[16] the following should be kept in mind:

- It is based on the experiences of a group of people with a heterogeneous mix of disease characteristics and therefore does not necessarily reflect a specific person's chances of surviving for a given time (e.g., five years) after diagnosis.
- The confidence intervals around survival estimates do not represent the range of possible prognoses for individual patients, but rather statistical variation.

Estimated five-year relative survival (2004–2006)

Predicted five-year RSRs for the 2004 to 2006 period are shown in Table 7.1. The data are presented for selected cancers in descending order of survival for both sexes combined.

- all cancers combined
  - The five-year relative survival for all cancers combined is 62%.
  - The five-year observed survival (i.e., the proportion of patients actually alive five years after their diagnosis) is 54% (data not shown).
- by cancer type

- RSRs are highest for thyroid (98%), prostate (96%) and testicular cancers (95%).
- RSRs are lowest for pancreatic (6%), esophageal (13%) and lung cancers (16%).

- by sex
  - For most of the cancers examined, relative survival is higher among women or was similar between the sexes.
  - The largest differences in survival between the sexes—all in favour of females—are for breast cancer (8.6% percentage points), melanoma (6.5%) and lung cancer (5.3%).
  - The largest survival difference in favour of males is for larynx cancer (3.5%).

Estimated five-year relative survival by province

Provincial, age-standardized, five-year RSRs for prostate, breast, colorectal and lung cancers (i.e., the most commonly diagnosed cancer types) are provided in Table 7.2. Survival ratios for Newfoundland and Labrador are not shown as they are artefactually high. Due to the relatively small number of cases from Prince Edward Island, RSR estimates for this province are less precise than for other provinces. Territorial estimates are not presented because there were too few cases to calculate reliable age-standardized estimates.

- The highest RSRs for prostate cancer are in New Brunswick (99%) and Ontario (98%); the lowest are in Saskatchewan (91%), Manitoba (92%) and Alberta (92%).
- There is little provincial variation for breast cancer.
- The RSR for colorectal cancer ranged from 65% in Ontario to 59% in Alberta. See Table 9.7 for information on colorectal cancer survival over time by province.
- The RSR for lung cancer ranged from 18% in Manitoba to 14% in several provinces.

There are a number of possible explanations for the variation between provinces, including the following:

- differential patterns of use and diffusion of screening and early detection tests
- varying patterns of diagnosis
- availability of and access to specialized cancer treatments
- differences in population attributes

Without data on stage of disease at diagnosis and treatment details, it is difficult to assess which of these factors might be important.

Estimated five-year relative survival by age at diagnosis

Age-specific, five-year RSRs for prostate, breast, colorectal and lung cancers are provided in Table 7.3.

- The best prognosis for breast cancer (89%) is among those diagnosed between the ages of 40 and 79; lower relative survival is seen for those diagnosed at both younger (84%) and older ages (79%).

7. FIVE-YEAR RELATIVE SURVIVAL

- Survival for prostate cancer is consistently high (>95%) among men aged 40–79, peaking at 99% for those diagnosed between the ages 60 and 69; survival is lowest for those 80–99 (83%).
- For lung cancer, the RSR decreases with increasing age, from 38% among those 15–39 years at diagnosis to 9% among those aged 80–99 at diagnosis.
- Survival for colorectal cancer is consistent across age groups up to the age of 70 (66% for ages 15–69) and then gradually declines. See Table 9.8 for information on age-specific colorectal cancer survival by subsite.

Relative survival is generally poorer among those diagnosed with cancer at an older age because of the following reasons:

- They may receive less therapy due to the presence of other diseases or conditions that reduce the body's ability to tolerate and respond to cancer treatments (referred to as co-morbidity).
- They may receive less aggressive treatment independent of co-morbidity.[17,18]

Estimated five-year relative survival, 2004–2006 versus 1992–1994

Figure 7.1 compares the age-standardized, five-year RSRs estimated for selected cancers from 2004 to 2006 with those for 1992 to 1994.

- The RSR has risen by 6% for all cancers combined (expressed as the absolute difference in relative survival between the two time periods) and has increased for most cancers.
- The largest increases in relative survival were among those diagnosed with non-Hodgkin lymphoma (almost 13%) and leukemias (10%).
- Prostate and colorectal cancer RSRs increased by 9% and almost 8%, respectively. See Table 9.9 for information on changes over time in colorectal cancer survival by subsite.
- For cancers of the bladder, body of uterus and pancreas, little change in relative survival (less than approximately 1 percentage point) is seen.

Additional information

Please see Ellison and Wilkins (2010)[19] for additional information regarding predicted survival estimates for the period from 2004 to 2006. Actual five-year survival data are available for an extensive list of cancers from 1992 onward on the Statistics Canada website.[20]

Examination of survival estimates can help identify priorities for systemic change to improve survival. It is critical to continue to expand collection of data on stage of disease for all newly diagnosed cancer cases in order to enhance interpretation of survival differences.

Table 7.1

Estimated Five-Year Relative Survival Ratios and 95% Confidence Intervals (CI) for Selected Cancers by Sex, Canada (Excluding Quebec*), 2004–2006

	Relative Survival Ratio (%) (95% CI)		
	Both Sexes	Males	Females
All Cancers	**62 (62–62)**	**62 (61–62)**	**63 (63–63)**
Thyroid	98 (97–98)	94 (93–96)	99 (98–99)
Prostate	—	96 (96–97)	—
Testis	—	95 (94–96)	—
Melanoma	90 (89–90)	86 (85–88)	93 (92–94)
Breast	88 (87–88)	79 (73–85)	88 (87–88)
Hodgkin Lymphoma	85 (83–87)	83 (81–86)	87 (84–89)
Body of Uterus	—	—	85 (85–86)
Bladder†	75 (74–77)	76 (74–78)	73 (71–76)
Cervix	—	—	75 (73–76)
Kidney	67 (66–68)	67 (65–68)	67 (66–69)
Larynx	64 (62–66)	65 (62–67)	61 (56–66)
Oral	63 (61–64)	61 (59–62)	66 (64–68)
Colorectal	63 (63–64)	63 (62–63)	64 (63–65)
Non-Hodgkin Lymphoma	63 (62–64)	61 (60–62)	65 (63–66)
Leukemia	55 (54–56)	55 (54–57)	54 (53–56)
Ovary	—	—	42 (41–44)
Multiple Myeloma	37 (35–38)	37 (35–39)	36 (34–38)
Stomach	24 (23–25)	24 (22–25)	25 (23–27)
Brain	23 (21–24)	21 (20–23)	25 (23–27)
Liver	18 (16–19)	18 (16–20)	17 (14–20)
Lung	16 (15–16)	13 (13–14)	19 (18–19)
Esophagus	13 (12–15)	13 (11–14)	15 (13–18)
Pancreas	6 (6–7)	6 (5–7)	7 (6–8)

— Not applicable.

* Data from Quebec were excluded, in part, because the method for ascertaining the date of cancer diagnosis differs from the method used by other provinces/territories and because of issues in correctly ascertaining the vital status of cases.

† Excludes data from Ontario, which does not currently report in situ bladder cases.

Note: "Body of Uterus" does not include "uterus not otherwise stated" and "Brain" does not include "other nervous system" cancers.

Analysis by: Health Statistics Division, Statistics Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Table 7.2

Estimated Age-Standardized Five-Year Relative Survival Ratios and 95% Confidence Intervals (CI) for the Most Common Cancers by Province, Canada (Excluding Quebec), 2004–2006

	Relative Survival Ratio (%) (95% CI)			
	Prostate	Breast	Colorectal	Lung
Canada*	**95 (95–96)**	**88 (87–88)**	**63 (63–64)**	**16 (16–16)**
BC	94 (93–95)	88 (87–89)	62 (61–63)	14 (13–15)
AB	92 (90–93)	88 (86–89)	59 (58–61)	14 (13–15)
SK	91 (89–92)	86 (84–87)	61 (58–63)	15 (13–16)
MB	92 (89–93)	85 (83–87)	60 (58–62)	18 (17–20)
ON	98 (97–98)	88 (88–89)	65 (65–66)	17 (17–18)
NB	99 (96–101)	87 (85–89)	63 (60–66)	16 (14–18)
NS	96 (94–98)	85 (84–87)	61 (59–63)	14 (12–15)
PE	96 (90–101)	83 (78–87)	61 (55–67)	14 (11–19)

* Data from Quebec were excluded, in part, because the method for ascertaining the date of cancer diagnosis differs from the method used by other provinces/territories and because of issues in correctly ascertaining the vital status of cases. Survival ratios for Newfoundland and Labrador are not shown as they are artefactually high.

Analysis by: Health Statistics Division, Statistics Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Table 7.3

Estimated Five-Year Relative Survival Ratios and 95% Confidence Intervals (CI) for the Most Common Cancers by Age Group, Canada (Excluding Quebec*), 2004–2006

	Relative Survival Ratio (%) (95% CI)					
	Age Group					
	20–39	40–49	50–59	60–69	70–79	80–99
Prostate	—	95 (93–96)	97 (96–98)	99 (99–100)	97 (96–98)	83 (81–85)
Breast	84 (82–85)	89 (89–90)	89 (89–90)	90 (89–91)	87 (86–88)	79 (77–81)
Colorectal	67 (64–71)	66 (64–68)	66 (65–67)	67 (66–68)	63 (62–64)	57 (55–59)
Lung	38 (32–43)	23 (21–24)	19 (18–20)	18 (17–18)	14 (13–15)	9 (8–10)

— Estimate unavailable due to small number of cases.

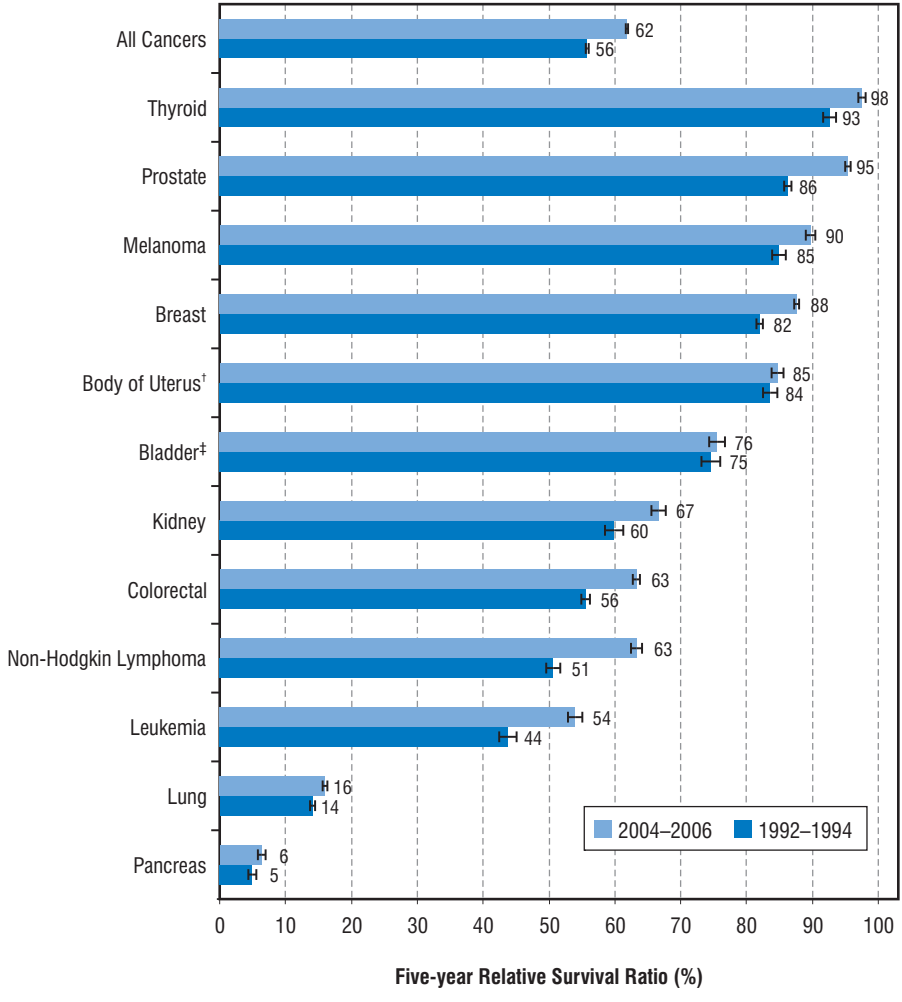
* Data from Quebec were excluded, in part, because the method for ascertaining the date of cancer diagnosis differs from the method used by other provinces/territories and because of issues in correctly ascertaining the vital status of cases.

Analysis by: Health Statistics Division, Statistics Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Figure 7.1

Estimated Age-Standardized Five-Year Relative Survival Ratios and 95% Confidence Intervals for Selected Cancers, Canada (Excluding Quebec*), 2004–2006 versus 1992–1994



* Data from Quebec were excluded, in part, because its method for ascertaining the date of cancer diagnosis differs from the method used by other provinces/territories and because of issues in correctly ascertaining the vital status of cases.

† Body of uterus does not include "uterus not otherwise stated".

‡ Excludes data from Ontario, which does not report in situ bladder cases.

Analysis by: Health Statistics Division, Statistics Canada

Data source: Canadian Cancer Registry database at Statistics Canada

8. PREVALENCE

Prevalence is influenced by both the incidence and survival of cancer. Prevalence is a useful indicator of cancer burden, at both the personal and healthcare system levels. Categorizing cancer prevalence estimates according to time since diagnosis is a useful means of providing more precise indications of healthcare needs.[21] More specifically, different healthcare services are required by people diagnosed either two or fewer, two to five or five to 10 years ago.[21,22] Cases diagnosed within 10 years represent the major demand for cancer care services.

There are two types of prevalence:

- tumour-based prevalence: The cancer prevalence is defined as the number of previously diagnosed cases of cancer in a given population, among people alive on a specified date (index date). It estimates the number of primary cancers diagnosed among individuals living with cancer on a specified date.
- person-based prevalence: The unit of interest is the number of people previously diagnosed with cancer. It estimates the number of individuals living with cancer on a specified date.

Since the person-based approach counts the number of individuals with cancer rather than the number of diagnosed tumours, it can underestimate the true burden of cancer on the Canadian healthcare system, individuals and their families. For this reason, the estimates of prevalence presented here predominantly focus on tumour-based prevalence.

Prevalence can be examined over various durations of time. For example, total prevalence refers to prevalent cases diagnosed at any previous time, while limited duration prevalence refers to prevalent cases diagnosed within a specified number of years. The latter is considered here as prevalent cases diagnosed within a span of 10 or fewer years.

Tumour-based prevalence

Among persons alive on January 1, 2007 in Canada, a total of 776,313 primary cancer cases had been diagnosed in the previous 10 years (Table 8.1).

- by cancer type
  - Nearly 40% of 10-year prevalent cases were either breast (20%) or prostate (19%), followed by colorectal cancer (13%), lung cancer (5%), bladder cancer (5%), non-Hodgkin lymphoma (4%) and melanoma (4%).
  - Despite the higher incidence of lung cancer during the period of study,[23] the number of 10-year prevalent colorectal cancer cases was 2.5 times greater, which reflects the poor prognosis for those diagnosed with lung cancer.
- by sex
  - Among men, the most common 10-year prevalent cancers were prostate (39%), colorectal (14%), bladder (7%) and lung (5%). Together, these cancers accounted for 65% of all prevalent cases in men.
  - Among women, the most common 10-year prevalent cancers were breast (39%), colorectal (12%), body of uterus (7%) and lung (5%). Together, these cancers accounted for 63% of all prevalent cases in women.
- by age
  - Five-year prevalence proportions (per 100,000) peaked in the 80- to 84-year age group in both males (8,957) and females (5,145). In older ages, they dipped to approximately the level at ages 70–74 (Figure 8.1).

- The five-year prevalence proportion in females exceeded that in males until just under age of 60, at which point the proportions crossed over and prevalence increased much more rapidly in males than in females.

- by duration
  - The relative contribution of both breast and prostate cancer decreased when shorter prevalence periods were considered (Table 8.1 and Figure 8.2).
  - The opposite pattern was observed for lung cancer; the relative contribution increased with decreasing prevalence duration (6% for 5-year; 8% for 2-year).
  - Of the estimated 776,313 10-year prevalent cancer cases on January 1, 2007, 234,490 had been diagnosed within the past two years (2005–2006). These individuals were likely at a stage of their disease requiring primary treatment or were recovering from its effects.
  - Another 248,826 prevalent cases were in the third to fifth year after diagnosis (diagnosed in 2002–2004)—a period that typically requires close clinical follow-up for recurrence and supportive care.

Person-based prevalence

Table 8.2 presents the 10-year person-based prevalence for the most common cancers for those who were alive on January 1, 2007:

- 748,897 persons (approximately one in 44 or 2.3% of the Canadian population) had been diagnosed with one or more primary invasive cancers in the previous 10 years.
- One in every 108 females had been diagnosed with breast cancer in the previous 10 years.
- One in every 108 males had been diagnosed with prostate cancer in the previous 10 years.

Implications

The number of newly diagnosed cancer cases in Canada continues to rise,[23] while survival from cancer is also increasing.[19,20] The combined result is an increase in the number of people currently living with or having a history of cancer. Although many individuals who survive cancer continue to live productive and rewarding lives, the cancer experience is difficult and presents many physical, emotional and spiritual challenges. These challenges may persist beyond the point of physical recovery from the cancer itself, often requiring extensive use of rehabilitation and supportive care resources. The growing demand and increased complexity of survivors' health needs must be considered in the planning and development of interdisciplinary health services.

A large number of Canadians live with the effects of cancer, require repeat active treatment and have a continuing need for cancer care resources and support services.

8. PREVALENCE

Table 8.1

Tumour-Based Prevalence for Selected Cancers by Duration and Sex, Canada, January 1, 2007

	2-year (diagnosed since 2005)			5-year (diagnosed since 2002)			10-year (diagnosed since 1997)		
	Total	Males	Females	Total	Males	Females	Total	Males	Females
All Cancers	**234,490**	**119,854**	**114,636**	**483,316**	**243,885**	**239,431**	**776,313**	**383,781**	**392,532**
Prostate	41,423	41,423	—	91,656	91,656	—	150,135	150,135	—
Lung	19,359	9,854	9,505	29,903	14,803	15,100	39,884	19,721	20,163
Breast	38,896	278	38,618	88,227	631	87,596	153,777	989	152,788
Colorectal	31,361	17,200	14,161	64,061	34,683	29,378	99,819	53,153	46,666
Non-Hodgkin Lymphoma	10,088	5,377	4,711	20,812	11,016	9,796	32,633	16,984	15,649
Bladder	10,900	8,200	2,700	23,040	17,315	5,725	37,216	27,731	9,485
Melanoma	8,450	4,381	4,069	18,524	9,519	9,005	31,687	15,832	15,855
Thyroid	7,438	1,622	5,816	15,983	3,367	12,616	24,861	5,299	19,562
Leukemia	6,309	3,678	2,631	12,923	7,522	5,401	19,666	11,337	8,329
Kidney	6,737	4,165	2,572	13,997	8,468	5,529	22,475	13,479	8,996
Body of Uterus	7,390	—	7,390	16,392	—	16,392	28,229	—	28,229
Pancreas	2,110	1,020	1,090	2,809	1,345	1,464	3,452	1,647	1,805
Oral	5,451	3,637	1,814	11,177	7,414	3,763	18,116	11,998	6,118
Stomach	2,981	1,890	1,091	5,019	3,163	1,856	7,134	4,396	2,738
Brain	2,389	1,370	1,019	4,096	2,306	1,790	6,214	3,466	2,748
Ovary	3,557	—	3,557	6,724	—	6,724	10,012	—	10,012
Multiple Myeloma	2,854	1,595	1,259	5,092	2,804	2,288	6,645	3,643	3,002
Liver	1,264	925	339	1,940	1,443	497	2,490	1,839	651
Esophagus	1,285	944	341	1,880	1,377	503	2,419	1,759	660
Cervix	2,297	—	2,297	5,251	—	5,251	9,806	—	9,806
Larynx	1,769	1,469	300	3,840	3,171	669	6,462	5,304	1,158
Hodgkin Lymphoma	1,618	900	718	3,873	2,124	1,749	7,021	3,874	3,147
Testis	1,647	1,647	—	3,930	3,930	—	7,409	7,409	—

— Not applicable.
Analysis by: Health Statistics Division, Statistics Canada
Data source: Canadian Cancer Registry database at Statistics Canada

Table 8.2

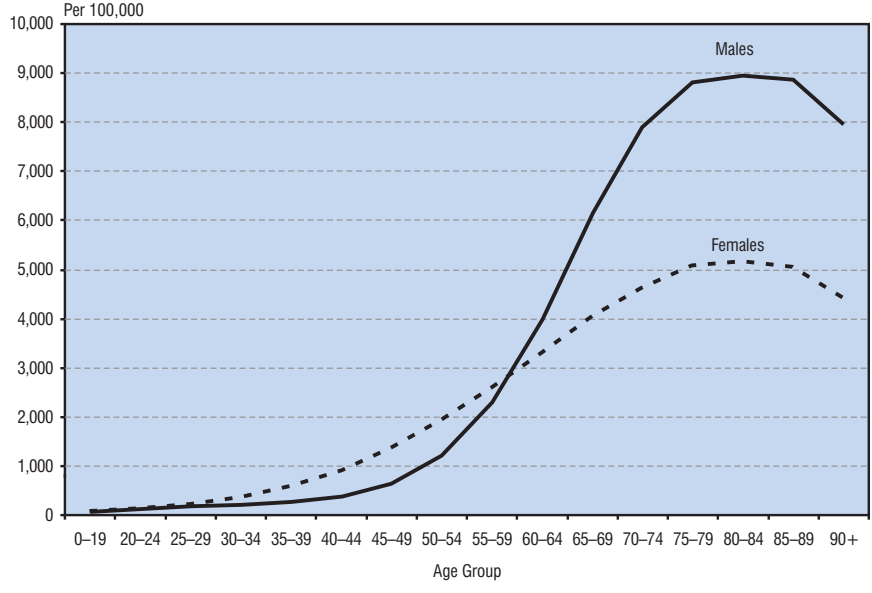
Ten-Year Person-Based Prevalence for the Most Common Cancers by Sex, Canada, January 1, 2007

	Number of Persons			Percentage of Canadian Population			One in:		
	Both	Males	Females	Both	Males	Females	Both	Males	Females
All Cancers	**748,897**	**368,193**	**380,704**	**2.3**	**2.3**	**2.3**	**44**	**44**	**43**
Female Breast	—	—	152,733	—	—	0.9	—	—	108
Prostate	—	150,130	—	—	0.9	—	—	108	—
Colorectal	98,874	52,590	46,284	0.3	0.3	0.3	331	309	357
Lung	39,731	19,655	20,076	0.1	0.1	0.1	824	826	823

— Not applicable.
Analysis by: Health Statistics Division, Statistics Canada
Data source: Canadian Cancer Registry database at Statistics Canada

Figure 8.1

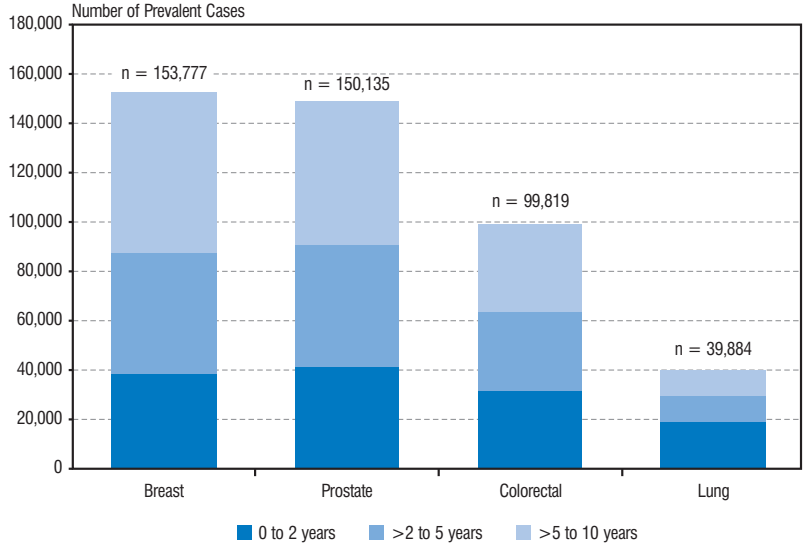
Age-Specific Five-Year Tumour-Based Prevalence Proportions for All Cancers by Sex, Canada, January 1, 2007



Analysis by: Health Statistics Division, Statistics Canada
Data source: Canadian Cancer Registry database at Statistics Canada

Figure 8.2

Tumour-based Prevalence for the Most Common Cancers by Duration, Canada, January 1, 2007



Note: n=total number of prevalent cases for each cancer type.
In the legend, 0 to 2 years refers to those diagnosed in 2005 and 2006; >2 to 5 years refers to those diagnosed between 2002 and 2004; >5 to 10 years refers to those diagnosed between 1997 and 2001.
Analysis by: Health Statistics Division, Statistics Canada
Data Source: Canadian Cancer Registry database at Statistics Canada

Special Topic: Colorectal Cancer

Led by members of the Steering Committee on Cancer Statistics with contributions from:

Ms. Gina Lockwood, Canadian Partnership Against Cancer

Dr. Geoff Porter, Dalhousie University

Dr. Donna Turner, CancerCare Manitoba

Actor and comedian Neil Crone is a colorectal cancer survivor. Neil says, "How we think about this world and each other and especially ourselves determines the quality of life we will enjoy. When I was diagnosed with cancer we decided, wisely I think, not to battle the disease, but to embrace life. Not to push cancer out, but to let wellness in. I think it's a good philosophy. I'm still here."

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9. SPECIAL TOPIC: COLORECTAL CANCER

Colorectal cancer summary statistics

Incidence (estimates for 2011)	Males	Females
Number of cases:	12,500	9,700
Age-standardized rate (per 100,000)*	61	40
% of all cancers:	13	11
Mortality (estimates for 2011)		
Number of deaths:	5,000	3,900
Age-standardized rate (per 100,000)*	25	15
% of all cancer deaths:	13	11
Relative survival		
Five-year relative survival (2004–2006)	63%	64%
Prevalence		
10-year person-based prevalence (as of Jan 1, 2007)	52,590	46,284

* Age-standardized to 1991 Canadian population.

Introduction

In Canada, approximately 22,200 people will develop colorectal cancer in 2011 and 8,900 will die of the disease, making this cancer the second most common cause of cancer death in Canadians. It is expected that one in 14 Canadians will be diagnosed with colorectal cancer during their lifetime. As of January 1, 2007, it is estimated that nearly 99,000 Canadians had been diagnosed with this cancer in the previous 10 years (see Table 8.2). The five-year relative survival following a diagnosis of colorectal cancer is 63%. The high burden, combined with the recent establishment of several organized screening programs for this cancer across the country, makes colorectal cancer an important and timely topic.

The location of colorectal cancer follows the anatomy of the colon and rectum. For reasons related to theoretical effectiveness of detection by screening tools, colorectal cancers have been sub-classified as follows: Right-sided colon cancers (sometimes referred to as "proximal") include those in the cecum, ascending colon, transverse colon and splenic flexure (Figure 9.1). Left-sided colon cancers (sometimes referred to as "distal") include those in the descending colon and sigmoid colon, while rectal cancers include tumours in the rectosigmoid junction and rectum. Cancer of the appendix is rare and is included within the "Other and not otherwise specified colon" category because screening tests for colorectal cancer do not detect this cancer. Sigmoidoscopy, due to its limited reach, can only detect left-sided colon cancers. Anal cancer (<1% of all cancers) is excluded because it represents a biologically different disease.

The vast majority of colorectal cancers are adenocarcinomas. A clear progression from abnormal epithelium (inner lining of bowel wall) to polyp to cancer has been established in colorectal cancer.[24]

Age and sex differences in incidence and mortality rates

Similar to most other cancers, colorectal cancer incidence and mortality rates rise steeply after age 50 (Figure 9.2).

- About 95% of new cases and deaths occur after the age of 50 (see Table 3.2), supporting this as the age for screening initiation in individuals at average risk of the disease.
- Age-specific incidence and mortality rates in Canada are generally higher in males than in females; the gap is greatest in the 55–74 age range, where rates for males are about 60% higher (for both incidence and mortality) than for females.

International and interprovincial differences in incidence and mortality rates

Colorectal cancer incidence varies considerably around the world, with the highest age-standardized rates found in Canada, the United States, Australia and Europe, and much lower rates in Asia, Africa and South America.[25] This is likely due in part to differences in diet and physical activity. In some populations that traditionally had low rates of colorectal cancer, such as Japan, incidence has risen dramatically in recent decades along with rapid "westernization" of the diet.[26,27]

- Interprovincial/territorial differences are likely due to variation in risk factors, including genetics. For example, recent research found that indicators of familial risk (e.g., selected genes associated with increased risk of colorectal cancer) are significantly more common among colorectal cancer diagnoses in Newfoundland and Labrador than in Ontario.[28]
- Among the provinces, there is an east-west gradient, with highest rates generally in the Atlantic Provinces (especially Newfoundland and Labrador) and lowest rates in British Columbia and Alberta. The range of rates is striking and is considerably greater than for any other major cancer, with the highest mortality rate nearly double the lowest.
- Both incidence and mortality rates are high in the territories (Nunavut, Northwest Territories and Yukon combined; Figure 9.3), although the 95% confidence intervals of rate estimates are wide due to small numbers of cases (i.e., fewer than 200 new cases per year in these regions for both sexes combined).

Trends in incidence by sex and province/territory

Age-standardized incidence rates are considerably higher in males compared to females (Figure 9.4). The gap widened between 1983 and 2007, with the rate falling by nearly 20% in females and only slightly among males. The higher incidence rate in males is likely due to differences in both biology and risk factors for colorectal cancer. Despite the decline in incidence rates, the number of new cases in both males and females combined has increased substantially from about 12,500 in 1983 to about 20,600 in 2007. This upward trend in new cases is due to population growth and aging.

A focus on the most recent 10 years of available data (1998–2007) and average annual percent changes shows the following:

- Incidence rates have dropped significantly in males and females combined, declining -0.7% per year since 2000 (Table 9.1).

- Prior to 2000, incidence rates were increasing slightly for a few years, which followed a long, slow decline (see Table 4.1). A spike in rates between 1997 and 2001 has been hypothesized as being related to the implementation of folic acid fortification of certain foods during the mid-1990s as a public health prevention measure for neural tube defects.[29] A temporally similar spike in the colorectal cancer rate was observed in the United States, where a nationwide folic acid fortification also occurred.
- Recent trends differed across provinces (Table 9.1), with statistically significant declines among males in British Columbia, Alberta, Manitoba and Quebec (since 2000), and among females in Ontario (since 1999) and New Brunswick.
- Incidence rates increased significantly among males in Newfoundland and Labrador (by 2.1% per year). While a similar rate of increase is noted for females in this province (1.9% per year), it is not statistically significant.
- Decreasing trends are noted in the Canadian territories, but the trends are not statistically significant.
- Variation in trends across provinces may reflect changes over time in either screening or in the prevalence of risk factors for colorectal cancer.

Trends in mortality by sex and province/territory

Age-standardized mortality rates for colorectal cancer are higher in males compared to females (Figure 9.4) and are declining much more quickly than incidence rates (Table 9.1).

- Mortality rates declined by -1.5% per year in males and -1.9% in females in the period 1997 to 2006. As a result, the increase in the number of colorectal cancer deaths is much slower than the rise in new cases.
- There is much less variation in annual percent changes for mortality rates compared to incidence rates across the country. Mortality rates declined in at least one sex in every province, although not always significantly so. Moreover, nowhere was there a statistically significant increase.
- The declines in mortality are likely due to improved treatments, coupled with more intense screening.

Trends in incidence by sex and subsite

When examined by sex and anatomical subsite (i.e., right colon, left colon and rectum), recent trends show distinct patterns (Figure 9.5):

- males
  - Cancer of the rectum was the most common, and the incidence rate decreased significantly between 1983 and 1997 and between 2001 and 2007 (Table 9.2).
  - The rate for cancer of the right colon increased steadily between 1983 and 2007 (0.3% per year).
  - Cancer of the left colon is least common, and the incidence rate declined by -0.4% per year between 1983 and 2007.
  - Cancers in the “Other and not otherwise specified colon” category followed the pattern of rectal cancer, with declines between 1983 and 1996 and between 2000

and 2007. The change may be in part due to improved quality of data, leading to better classification of subsite by cancer registrars.

- females
  - Cancer of the right colon was the most common; no statistically significant trends were detected.
  - The rectal cancer incidence rate declined during 1983 to 1995 and then stabilized.
  - The rate for left colon cancer declined from 1983 to 1997 (-2.2% per year) and then stabilized.
  - The incidence rate for the "Other and not otherwise specified colon" category of cancers declined by -1.7% per year between 1983 and 2007.

Differences in subsite patterns by sex likely reflect differences between males and females in both biology and risk factors, and perhaps their interaction. Differences in trends by subsite and sex are likely due in part to differential changes in the prevalence of various risk and protective factors as well as screening uptake. Physiological characteristics vary along the colon and rectum, as do molecular mechanisms of carcinogenesis and genetic effects.[30] Risk factors may also have varying impacts. Screening tests are better suited to identifying tumours in the left colon and rectum because polyps are more likely to occur in these regions and because they are more accessible to sigmoidoscopy and colonoscopy.

Stage data

Canadian registries have not historically collected stage data, which is an important determinant of survival. The Canadian Cancer Registry identified the Collaborative Stage System as the standard for collection of stage data in Canadian registries, effective for the 2004 diagnosis year. Since that time, provincial/territorial registries have been gradually moving toward the complete population-based staging of all newly diagnosed cancers, but a comprehensive, complete national dataset is not yet available for analysis. The data presented in Figure 9.6 are from a study carried out in June 2010 by the Nova Scotia Cancer Registry in collaboration with registries from Prince Edward Island and Manitoba. Together, these provinces represent approximately 7% of the total Canadian population. The purpose of the study was to examine the quality of stage data collection in a selected group of Canadian provinces that had multi-year population level data available.

Stage group distributions for colon and rectal cancers show that approximately 48% and 47%, respectively, of cases were diagnosed at stages I and II (early stages), although more rectal cases (25.6%) are diagnosed at stage I. The distributions reported were compared to data from the SEER 17 file for the 2004 to 2007 period and were very similar by stage group. Data from the United States show that the five-year relative survival ratio for early stage colorectal cancer is approximately 90%, whereas at its latest stages, when the cancer has spread, survival is less than 12%.[31]

It should be noted that this is an early analysis of emerging population-based stage data for Canada. Further examination will be needed, including data from more provinces to develop a thorough understanding of how these data can contribute to improved cancer control.

9. SPECIAL TOPIC: COLORECTAL CANCER

Risk factors

The risk of colorectal cancer is known to be affected by a mix of factors (Table 9.3), including diet, body size, physical activity and family history of the disease.[32,33] In addition to these factors, use of hormone replacement therapy (HRT) appears to have a protective effect; this may at least partially explain the lower incidence in females compared to males, which is particularly marked in the 50–74 age group. Furthermore, there is growing evidence that a prior diagnosis of diabetes increases risk. As with many cancers, known modifiable risk factors explain only a fraction of colorectal cancer incidence.[34-38]

Based on current knowledge, the best opportunities for reducing colorectal cancer risk are eating a healthy diet and being physically active in order to maintain a healthy body weight. Moreover, avoiding smoking and minimizing alcohol consumption can help reduce risk for colorectal cancer. Regular participation in colorectal screening programs will also reduce the mortality from colorectal cancer and may help reduce incidence as well.

Screening

The goal of cancer screening is to detect cancer at an early stage for those people with no symptoms of disease. Early detection offers the best chance of effective treatment and therefore reduces the likelihood of death. For colorectal cancer, there is strong evidence that screening using a fecal occult blood test (FOBT) reduces mortality.[39-41] This test can detect traces of blood in the feces, which may indicate a tumour. Because there are other reasons blood might be present, a positive test should be followed by a colonoscopy, which visualizes the interior of the colon and rectum. If a growth is seen, it can be removed during the colonoscopy and examined by a pathologist to determine if it is cancerous. There is some evidence that screening can also lower incidence by finding precancerous polyps, which are then removed before they develop into cancer.[42]

In Canada, guidelines for colorectal cancer screening recommend an FOBT every two years for people aged 50–74 who are at average risk for the disease (Table 9.4). It is estimated that if 80% of Canadians within this age range had a biennial FOBT with appropriate follow-up through organized screening, alongside any opportunistic testing that occurs outside of organized programs, 10,000 to 15,000 colorectal cancer deaths could be avoided over the next 10 years.[42]

The National Colorectal Cancer Screening Network was launched by the Canadian Partnership Against Cancer in late 2007 to support the development of evidence-based screening programs and policy. As of fall 2010, several organized colorectal cancer screening programs were established across Canada, with 8 provinces currently running full or pilot programs and 2 provinces having announced intentions for a program (Table 9.5). Each program follows the recommendations for colorectal cancer screening set out in the population-based guidelines developed in 2002.[43] All programs are using some variation of the FOBT as the entry test—either the guaiac fecal occult blood test (gFOBT) or the fecal immunochemical test (FIT).

The first national data on the testing profile in 2008 for colorectal cancer shows that 32% (range 16–46%) of Canadians aged 50–74 reported having either an FOBT in the past two years or a sigmoidoscopy/colonoscopy in the past five years for *non-symptomatic* reasons (Figure 9.7).

- The lowest rate of testing was reported in Quebec, and the highest rates were seen in Manitoba (47%) and Ontario (45%), which were the first two provinces to actively launch full screening programs in 2007 and 2008, respectively.
- Men and women are almost equally likely to be screened for colorectal cancer.
- Canadians are more likely to be screened as they get older and report higher levels of income and education.
- Overall rates of colorectal cancer screening in Canada lag behind those in the United States.[44] However, these rates are comparable to the early Canadian mammography rates in 1990 when those screening programs were just being launched[45] and are likely to improve with time.

The Colon Cancer Screening in Canada Survey,[46] which interviewed Canadians regarding their understanding and attitudes about getting screened for colorectal cancer, identified the following:

- The majority of Canadians aged 50–74 (81%) are aware that screening tests exist for colorectal cancer and recognize the benefits of screening.
- 60% of respondents did not understand that screening is a "health" behaviour that doesn't require symptoms in order to be performed.
- A minority of respondents were familiar with the FOBT; respondents were most aware of colonoscopy.

The strongest determinant of getting screened for colorectal cancer is a discussion between individuals and their doctors. For Canadians aged 50–74 who have discussed colorectal cancer with their doctors, the majority (71.7%) are up-to-date in their colorectal cancer screening, compared to (32.6%) of those who say they have not had this discussion with their doctor.

Diagnosis and treatment

Most colorectal cancer patients present with symptoms such as bleeding, obstruction or abdominal pain, although increasing numbers of cases are identified through screening. The diagnosis of colorectal cancer is commonly made using colonoscopy or sigmoidoscopy, which enables doctors to identify the exact location of the tumour and perform a biopsy. A barium enema and computed tomography (CT) scanning may also be used. Following diagnosis, staging tests such as CT scans are frequently performed.

The treatment of stage I, II and III colorectal carcinoma typically involves surgery:

- For some stage II and for stage III colon cancer, chemotherapy after surgery is frequently used (Table 9.6).
- For stage II and stage III rectal cancer, a combination of chemotherapy and radiation is often provided, preferably before surgery.
- Stage IV colorectal cancer, where there is spread to sites away from the primary tumour, is typically treated with palliative chemotherapy with surgery and/or radiation used predominately for symptoms. A small proportion of people with stage IV colorectal cancer can have long-term survival with aggressive surgery and chemotherapy.[47]

9. SPECIAL TOPIC: COLORECTAL CANCER

Survival

Compared to other cancers, colorectal cancer has moderate prognosis or "survivability" as demonstrated by a five-year relative survival ratio of 63%, which is better than some cancers, such as lung (16%) and pancreas (6%) but lower than other cancers, such as prostate (96%) and breast (88%) cancer (see Table 7.1). Nonetheless, colorectal cancer survival has improved considerably, rising by 7.7 percentage points between 1992 to 1994 and 2004 to 2006 (Table 9.7). These improvements in survival may be attributed to a number of factors, including detection of cancer at earlier stages due to increased screening and the public's knowledge of (and response to) symptoms, as well as improvements in treatment. Furthermore, individuals who survive the first year are very likely to do well—the relative survival for an additional five years is estimated at 74% for males and 78% for females (Figure 9.8).

Canada has among the best colorectal cancer survival in the world,[48] slightly lower than that of the United States but better than most European countries, including the United Kingdom and Scandinavia. Survival varies somewhat across Canada, with the highest five-year relative survival ratios in Ontario (65%) and the lowest in Alberta (59%; Table 9.7). Still, there is evidence that survival has improved in almost every jurisdiction since the early 1990s, with more improvements expected as colorectal screening programs are implemented nationwide. While the point estimate for Prince Edward Island for 2004 to 2006 was the same as that calculated for 1992 to 1994, the lack of precision in the relative survival ratios for this province should be noted.

Colorectal cancer survival estimates are similar for men and women as well as across most age groups except the oldest (Table 9.8). This is perhaps due to co-morbidities in the elderly that preclude aggressive treatment. Survival is affected by where the cancer arises; cancers occurring in the left colon have slightly better survival than those in the right colon or the rectum, while cancers in "Other and not otherwise specified colon" have substantially worse survival. Right colon cancer may present at a later stage because there may be fewer early symptoms. Rectal cancer may have a poorer prognosis due to the fact that there is a different blood supply predisposing to early metastases, and the tighter anatomic location may preclude complete removal of microscopic disease. Nevertheless, survival has improved over time regardless of the particular anatomic location (Table 9.9).

Survival statistics may be influenced by higher prevalence of screening in the population. As a result, survival for colorectal cancer is expected to improve in the near future as screening uptake increases. As more complete stage data becomes available across Canada, it will become possible to assess whether the improvements in survival are due more to changes in treatment, screening or both. Additionally, evidence is mounting for the implementation of standard follow-up protocols that are associated with improved outcomes due to detection and treatment of cancer recurrence.[49-51] The expected improvements in survival, combined with the relatively high numbers of new cases diagnosed annually, will lead to an increasing number of survivors. As of January 1, 2007, there were an estimated 98,874 Canadians (52,590 males and 46,284 females) living with colorectal cancer who had been diagnosed within the previous 10 years (see Table 8.2). As shown in Figure 9.9, 85–89 year olds who are survivors of colorectal cancer represent the highest proportion of prevalent cases of all age groups (1,623 and 1,204 per 100,000 in males and females, respectively).

Follow-up care

Colorectal cancer is the only malignancy for which more intensive follow-up testing after treatment of early stage disease has been demonstrated to have a positive impact on overall survival. Meta-analyses estimate this benefit at 7–10%, which compares favourably with the benefits of adjuvant chemotherapy.[49-51] Carcinoembryonic antigen (CEA) testing, liver imaging and colonoscopy are the key tests contributing to this improvement, which is likely achieved in part by the detection of surgically resectable metastases and local recurrences.

Research shows that compliance with follow-up testing falls well below clinical practice guidelines, particularly for CEA testing.[52-55] One critical aspect of survivorship care is ensuring that communication systems are in place to ensure that patients, their families and their healthcare providers are clear about the schedule for follow-up testing and the importance of staying on track. Written follow-up care plans that are provided to patients and their primary care providers as they move forward after treatment are an emerging standard of care in the cancer system and will help with this and many other challenges that patients and their providers face.[56]

Conclusion

Colorectal cancer is the second leading cancer cause of death in Canadians, the fourth most common cancer diagnosis overall and demonstrates only fair to good prognosis. Treatment advances have led to important reductions in mortality and improvements in survival. However, further reductions in the burden of colorectal cancer will require the following:

- continued emphasis on screening, which provides an important opportunity to reduce mortality and likely incidence
  - More specifically, there is a need to maximize recruitment, participation and retention in screening programs as well as enhance their quality.
  - Although Canadians appear to be generally aware of colorectal cancer screening since they recognize that screening tests exist and realize the value of being screened, there is a lack of knowledge about fecal occult blood testing and a belief that screening is linked to symptoms.
- more research into the modifiable risk factors for colorectal cancer and effective prevention
- continued dissemination of optimal therapies and development and testing of new therapeutic regimens
- ongoing efforts to ensure consistent and standardized follow-up management

The burden of colorectal cancer will be reduced as the impact of recently initiated screening programs take effect, public awareness of screening and risk factors for colorectal cancer increases, and new therapies and patient care are enhanced.

Table 9.1

Annual Percent Change (APC) in Age-Standardized Incidence and Mortality Rates for Colorectal Cancer by Geographic Region and Sex, Canada

	Incidence (1998–2007)						Mortality (1997–2006)					
	Total		Males		Females		Total		Males		Females	
	APC	Change-point*	APC	Change-point*	APC	Change-point*	APC	Change-point*	APC	Change-point*	APC	Change-point*
Canada	**–0.7†**	**2000**	**–0.8†**	**2000**	**–0.8‡**	**2000**	**–1.6†**		**–1.5†**		**–1.9†**	
BC	–0.6		–0.9‡		–0.5		–1.0‡		–1.1		–1.0	
AB	–0.2		–0.6‡		0.3		–1.1		–1.3		–0.8	
SK	0.8		0.7		0.7		–1.5†		–1.7		–1.5	
MB	–1.2‡		–1.5†		–0.8		–1.9		–1.5		–2.2	
ON	–0.8‡	2000	–0.4		–1.0†	1999	–1.7†		–1.7†		–1.9†	
QC	–0.9‡	2000	–1.3†	2000	–0.4		–1.8†	1996	–2.0†	1998	–2.1†	
NB	–0.8		0.1		–2.0†		–3.0†		–2.1‡		–4.4†	
NS	–0.2		–0.2		–0.4		–0.9		0.7		–2.8†	
PE	–1.5		–1.0		–2.2		–1.5		–4.6‡		1.5	
NL	2.0†		2.1†		1.9		0.4		2.5		–2.0	
YT+NT+NU	–1.8		–2.1		–1.7		2.4		6.4		–4.2	

* Changepoint indicates the baseline year, if the slope of the trend changed after 1998 for incidence or 1997 for mortality. Changepoints were fit to rates from 1986 to 2007 for incidence and 1986 to 2006 for mortality.

† Significant, $p<0.01$.

‡ Significant, $p<0.05$.

Note: Annual Percent Change is calculated assuming a log linear model. See *Appendix II: Data sources and methods* for further details.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Table 9.2

Annual Percent Change (APC) in Age-Standardized Incidence Rates for Colorectal Cancer by Subsite and Sex, Canada

	Incidence (1983–2007)			
	Males		Females	
	APC	Period	APC	Period
Right colon	0.3*	1983–2007	–1.2	1983–1989
Right colon	—	—	0.2	1989–2007
Left colon	–0.4*	1983–2007	–2.2*	1983–1997
Left colon	—	—	–0.4	1997–2007
Other and not otherwise specified colon	–2.4*	1983–1996	–1.7*	1983–2007
Other and not otherwise specified colon	2.0	1996–2000	—	—
Other and not otherwise specified colon	–4.2*	2000–2007	—	—
Rectum	–0.5*	1983–1997	–1.5*	1983–1995
Rectum	2.4	1997–2001	0.4	1995–2007
Rectum	–0.9*	2001–2007	—	—

— Not applicable.

* Significant, $p<0.05$.

Note: Annual Percent Change is calculated assuming a log linear model. See *Appendix II: Data sources and methods* for further details.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Table 9.3
Factors Modifying the Risk of Colorectal Cancer[32,33]

Modifiable Risk Factors	Non-Modifiable Risk Factors
Diet high in red meat	Age over 50
Processed meat	Polyps
Alcohol	Family history*
Obesity	Genetic conditions like familial adenomatous polyposis or Lynch syndrome
Physical inactivity	Inflammatory bowel disease (ulcerative colitis or Crohn's disease)
Smoking	Ethnic background – people of Ashkenazi (Eastern European Jewish) descent

* Family history of colorectal cancer in a first-degree relative (parent, sibling or child) may be the result of heredity, presence of similar risk factors or both.

Table 9.4
Screening Guidelines for Canadians at Average Risk for Colorectal Cancer

Canadian Task Force on Preventive Health Care, 2001[57]

- Good evidence to support annual or biennial fecal occult blood test (FOBT).
- Fair evidence to include flexible sigmoidoscopy in the periodic health examination of patients aged 50 years or older.
- Insufficient evidence to include or exclude colonoscopy as an initial screening test.

National Committee on Colorectal Cancer Screening, 2002[43]

- Recommends biennial (at minimum) FOBT for average-risk people aged 50 to 74.
- Recommends follow-up of positive FOBT by colonoscopy.
- Recommends screening occur in organized provincial programs, with ongoing evaluation.

Table 9.5
Profile of Currently Active* Provincial Organized Colorectal Cancer Screening Programs

Province	Program Name	Launch Date	Stage of Population-Based Program Implementation	Entry Test	Website
BC	Colon Check	January 2009	Pilot	FIT	www.bccancer.ca/coloncheck
AB	Alberta Colorectal Cancer Screening Program (ACRCSP)	March 2007	Phased-in	gFOBT	www.screeningforlife.ca/colorectal
SK	Screening Program for Colorectal Cancer	September 2009	Phased-in	FIT	www.saskcancer.ca (click on the "Screening" drop down menu)
MB	ColonCheck Manitoba	April 2007	Province wide	gFOBT	www.coloncheckmb.ca
ON	Colon Cancer Check	April 2008	Province wide	gFOBT	www.cancercare.on.ca/pcs/screening/coloscreening
QC	Programme québécois de dépistage du cancer colorectal (Quebec Colorectal Cancer Screening Program)	November 2010	Pilot	FIT	www.msss.gouv.qc.ca/cancer
NS	Colon Cancer Prevention Program	March 2009	Phased-in	FIT	www.cancercare.ns.ca/coloncancerprevention
PE	PEI Colorectal Cancer Screening Program	Pilot 1: May 2009 Pilot 2: April 2010	Pilot	gFOBT	http://getscreenedpei.ca/more-info/colon-cancer

* As of November 2010. The intentions for a program were announced in November 2009 in New Brunswick and in March 2010 in Newfoundland and Labrador.
Note: gFOBT = guaiac fecal occult blood test; FIT = fecal immunochemical test.

Table 9.6
Clinical Practice Guideline Summary for Management of Colon and Rectal Cancers

Stage	Recommendation	Guideline Number
Colon Cancer		
I	Standard treatment is surgical resection alone	No guideline
II	Adjuvant chemotherapy not routinely recommended Patients at high risk of recurrence (presentation associated with bowel obstruction, tumour abscess or perforation, or if tumour demonstrates aneuploidy on histology) may be considered for adjuvant chemotherapy similar to Stage III	CPG#2-1
III	Adjuvant therapy is recommended within eight weeks of surgery; 5-fluorouracil-based regimens with oxaliplatin are administered over 6 months	CPG#2-2
IV	Combination chemotherapy with a 5-fluorouracil-containing regimen, may include targeted therapy (e.g., VEGFR, EGFR inhibitor)	CPG#2-15, 2-16,2-16B
Rectal Cancer		
II,III	Both chemotherapy and radiotherapy reduce local recurrence in resectable rectal cancer; Options include either preoperative chemoradiotherapy followed by postoperative chemotherapy, or surgery followed by postoperative radiation and chemotherapy	CPG#2-3,2-13
IV	Systemic therapy as for colon cancer	CPG#2-15, 2-16,2-16B

Note: EGFR = endothelial growth factor receptor; VEGFR = vascular endothelial growth factor receptor.
Source: Cancer Care Ontario. Program in Evidence-Based Care, Gastrointestinal Cancer Disease Site Group.

Table 9.7

Estimated Age-Standardized Five-Year Relative Survival Ratios and 95% Confidence Intervals (CI) for Colorectal Cancer by Province, Canada (Excluding Quebec), 2004–2006 versus 1992–1994

	Relative Survival Ratio (%) (95% CI)	
	2004–2006	1992–1994
Canada*	**63 (63–64)**	**56 (55–56)**
BC	62 (61–63)	56 (55–58)
AB	59 (58–61)	55 (53–57)
SK	61 (58–63)	55 (52–58)
MB	60 (58–62)	58 (56–61)
ON	65 (65–66)	55 (54–56)
NB	63 (60–66)	56 (53–59)
NS	61 (59–63)	55 (52–57)
PE	61 (55–67)	61 (53–68)

* Data from Quebec were excluded, in part, because the method for ascertaining the date of cancer diagnosis differs from the method used by other provinces/territories and because of issues in correctly ascertaining the vital status of cases. Survival ratios for Newfoundland and Labrador are not shown as they are artefactually high.

Analysis by: Health Statistics Division, Statistics Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Table 9.8

Estimated Five-Year Relative Survival Ratios and 95% Confidence Intervals (CI) for Colorectal Cancer by Subsite, Sex and Age Group, Canada (Excluding Quebec*), 2004–2006

	Relative Survival Ratio (%) (95% CI)			
	Right Colon	Left Colon	Other and Not Otherwise Specified Colon	Rectum
Sex				
Both sexes	63 (62-64)	66 (65-68)	55 (53-57)	64 (63-65)
Males	62 (61-63)	66 (64-67)	57 (55-59)	63 (61-64)
Females	64 (63-65)	67 (66-69)	53 (50-55)	65 (63-66)
Age Group				
15-39	65 (57-71)	71 (63-77)	74 (66-81)	63 (57-69)
40-49	62 (58-66)	69 (65-73)	59 (53-65)	68 (65-70)
50-59	63 (60-65)	69 (67-72)	62 (58-66)	68 (66-70)
60-69	64 (62-66)	70 (68-72)	61 (58-64)	68 (66-70)
70-79	64 (62-65)	66 (64-68)	59 (55-62)	62 (60-64)
80-99	63 (61-66)	58 (54-62)	40 (36-44)	54 (51-57)
15-49	63 (59-66)	70 (66-73)	64 (59-68)	67 (64-69)
50-74	64 (63-65)	70 (68-71)	61 (59-63)	67 (66-68)
75-99	63 (61-65)	60 (57-62)	46 (43-49)	56 (54-58)

* Data from Quebec were excluded, in part, because the method for ascertaining the date of cancer diagnosis differs from the method used by other provinces/territories and because of issues in correctly ascertaining the vital status of cases.

Analysis by: Health Statistics Division, Statistics Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Table 9.9

Estimated Age-Standardized Five-Year Relative Survival Ratios and 95% Confidence Intervals (CI) for Colorectal Cancer by Subsite, Canada (Excluding Quebec*), 2004–2006 versus 1992–1994

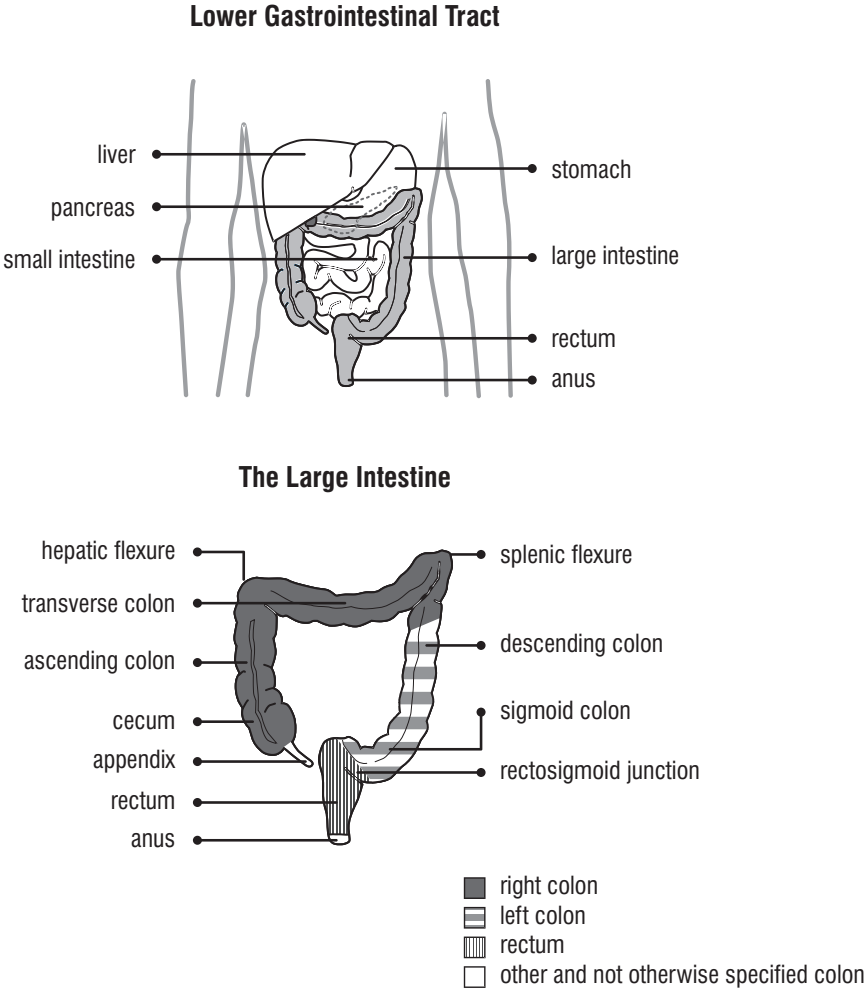
	Relative Survival Ratio (%) (95% CI)	
	2004–2006	1992–1994
Right colon	63 (62-64)	57 (55-58)
Left colon	66 (65-67)	60 (58-61)
Other and not otherwise specified colon	56 (54-57)	46 (45-48)
Rectum	63 (62-64)	54 (53-55)

* Data from Quebec were excluded, in part, because the method for ascertaining the date of cancer diagnosis differs from the method used by other provinces/territories and because of issues in correctly ascertaining the vital status of cases.

Analysis by: Health Statistics Division, Statistics Canada

Data source: Canadian Cancer Registry database at Statistics Canada

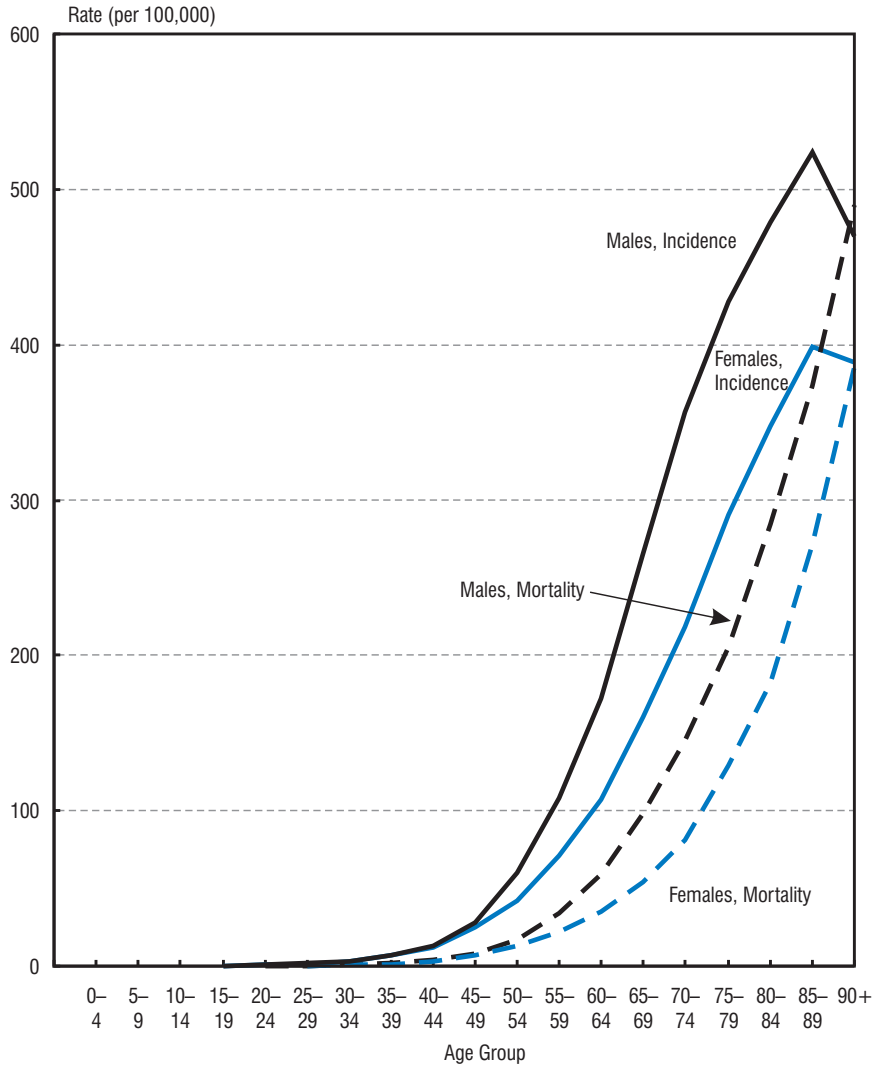
Figure 9.1
Anatomy of the Colon and Rectum



Note: Anus is excluded from the definition of colorectal cancer used in this special topic section.

Figure 9.2

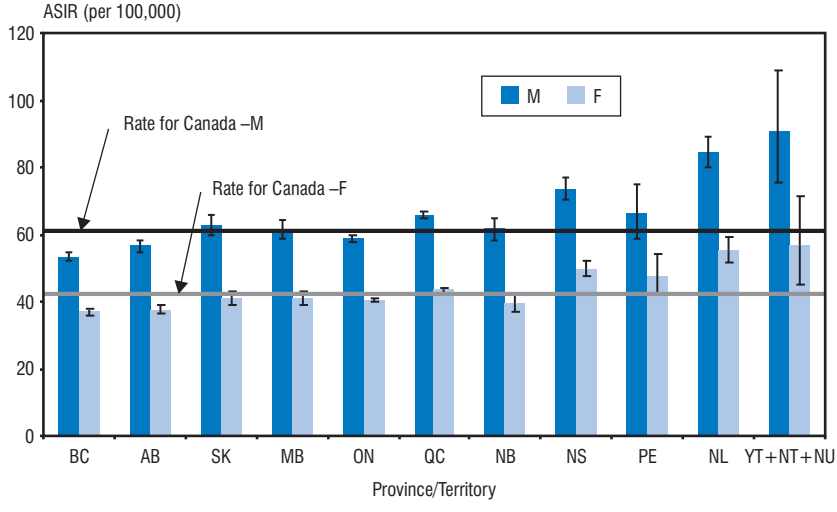
Age-Specific Incidence Rates (2003–2007) and Mortality Rates (2003–2006) for Colorectal Cancer, by Sex, Canada

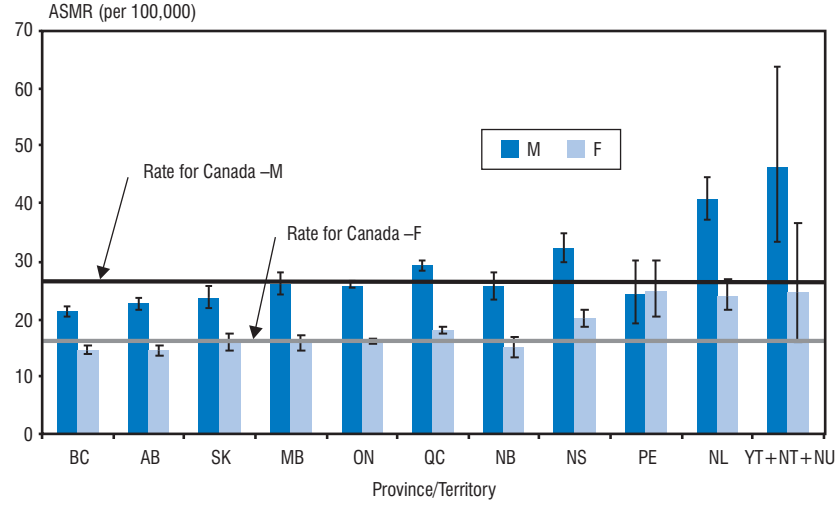


Note: The number of cases from death certificates only for Quebec in 2007 are estimated.
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Figure 9.3

Age-Standardized Incidence Rates (ASIR, 2003–2007), Mortality Rates (ASMR, 2003–2006) and 95% Confidence Intervals for Colorectal Cancer by Geographic Region and Sex, Canada

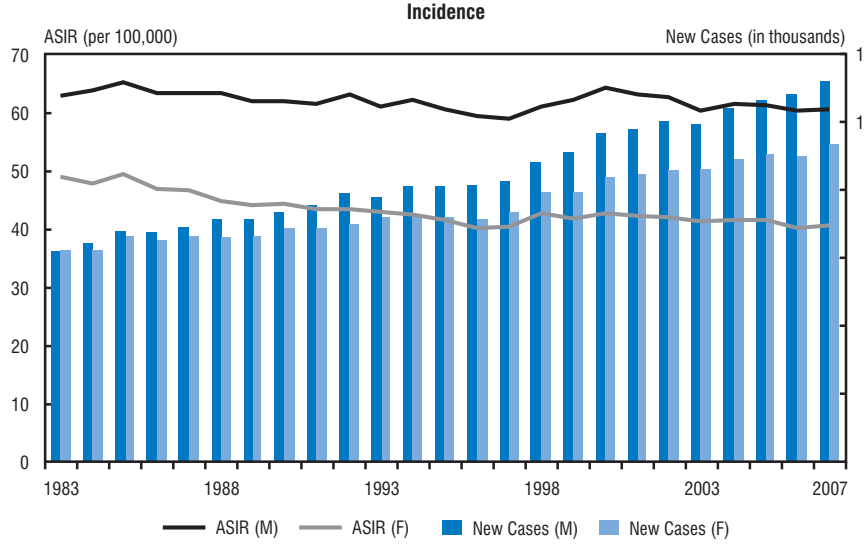


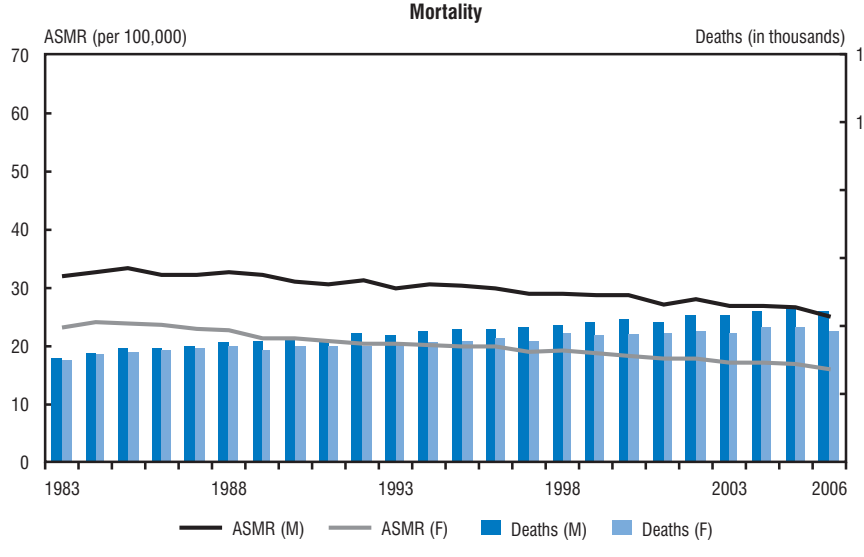


Note: Rates are age-standardized to the 1991 Canadian population. The number of cases from death certificate only for Quebec in 2007 are estimated.
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Figure 9.4

New Cases and Age-Standardized Incidence Rates (ASIR, 1983–2007), and Deaths and Age-Standardized Mortality Rates (ASMR, 1983–2006) for Colorectal Cancer by Sex, Canada

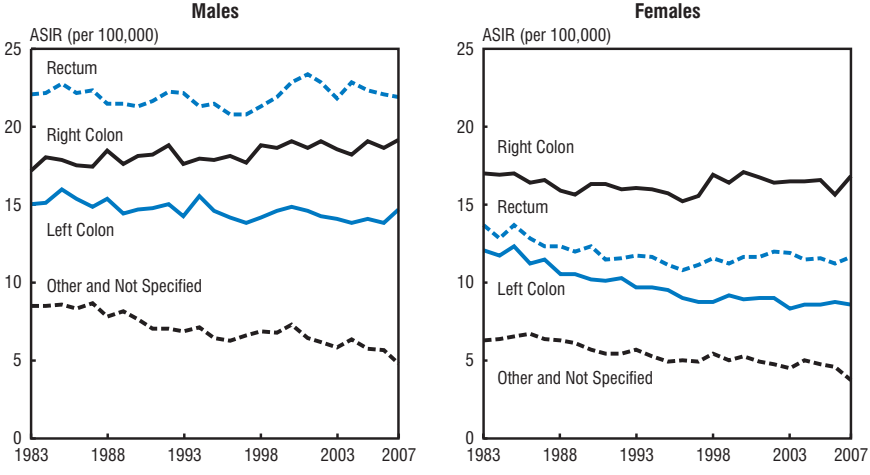




Note: Rates are age-standardized to the 1991 Canadian population. The number of cases from death certificate only for Quebec in 2007 are estimated.
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data sources: Canadian Cancer Registry and Canadian Vital Statistics Death databases at Statistics Canada

Figure 9.5

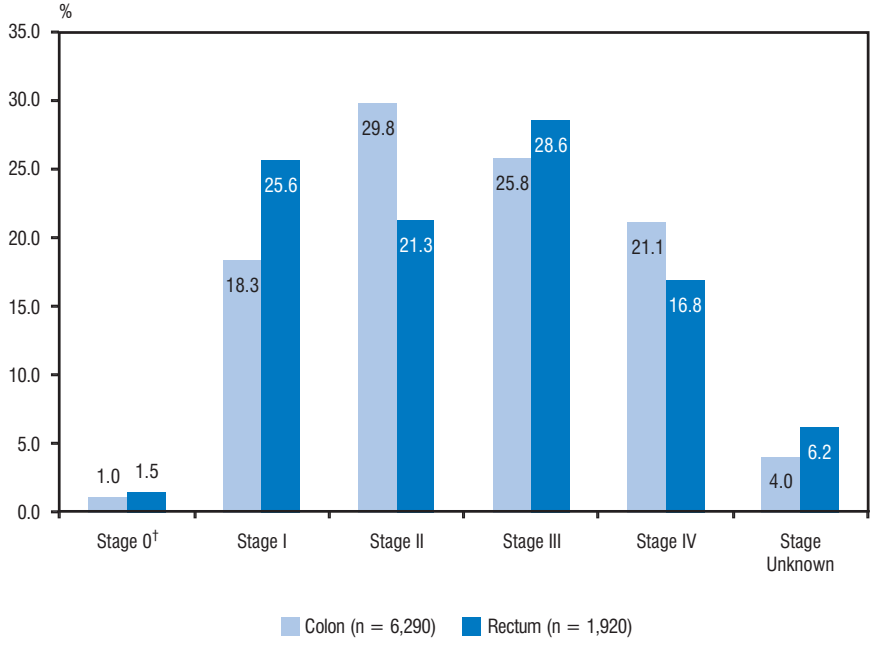
Age-Standardized Incidence Rates (ASIR) for Colorectal Cancer by Subsite and Sex, Canada, 1983–2007



Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data sources: Canadian Cancer Registry database at Statistics Canada

Figure 9.6

Stage Distribution* of Invasive Colon and Rectal Cancers Diagnosed 2004–2008, Nova Scotia, Manitoba and Prince Edward Island



* Collaborative Stage Derived TNM (Tumor Node Metastasis) Best Stage Groups were used.

† According to the 6th edition of the *American Joint Committee on Cancer* staging handbook, the definition of in situ carcinoma includes cancer cells confined within lamina propria (intramucosal) with no extension through the muscularis mucosae into the submucosa. However, these cases are assigned a behavior code 3 (invasive). Based on the *Collaborative Staging Manual and Coding Instructions v 01.04.00*, they are assigned with stage 0 but are considered invasive cases.

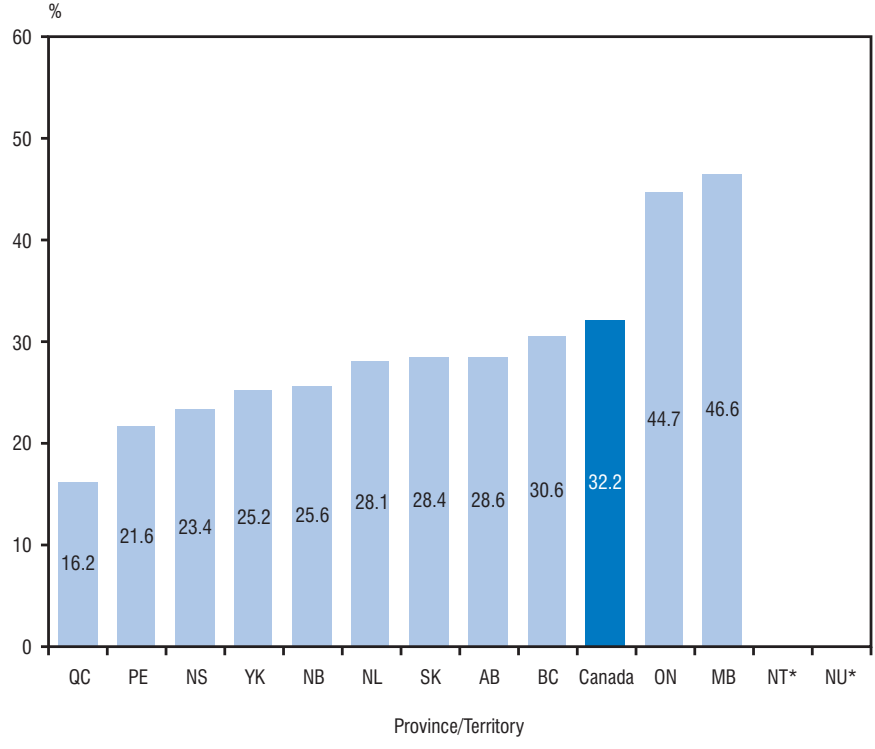
Note: 97 cases were excluded from the analysis including sarcoma, lymphoma, and carcinoid histologies; PEI's stage data are from 2005 to 2008. Data for analysis was supplied directly by the participating cancer registries and may not agree with incidence counts presented elsewhere in this publication.

Analysis by: Surveillance & Epidemiology Unit, Cancer Care Nova Scotia

Data source: Study dataset supplied by participating provincial cancer registries

Figure 9.7

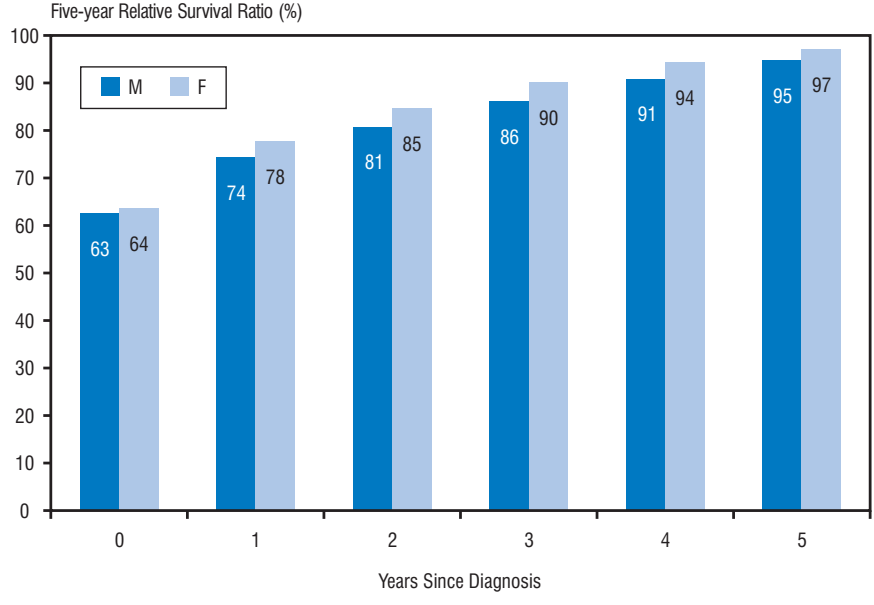
Individuals Aged 50–74 Reporting Screening by a Fecal Occult Blood Test in the Past Two Years and/or Sigmoidoscopy or Colonoscopy in the Past Five Years by Geographic Region, Canada, 2008



* Estimate unavailable due to small number of cases.
Data source: *Canadian Community Health Survey*, 2008

Figure 9.8

Estimated Colorectal Cancer Conditional Five-Year Relative Survival Ratios, Canada (Excluding Quebec*), 2004–2006

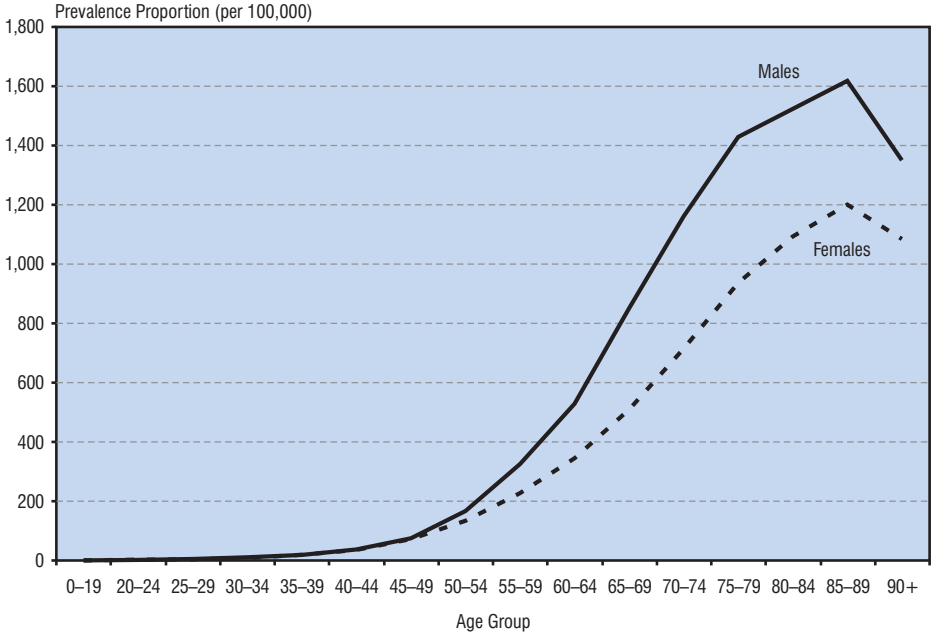


* Data from Quebec were excluded, in part, because the method for ascertaining the date of cancer diagnosis differs from the method used by other provinces/territories and because of issues in correctly ascertaining the vital status of cases.

Data Source: Ellison et al., Health Reports (in press)[58]

Figure 9.9

Age-Specific Five-Year Tumour-Based Prevalence Proportions for Colorectal Cancer by Sex, Canada, January 1, 2007



Analysis by: Health Statistics Division, Statistics Canada
Data source: Canadian Cancer Registry database at Statistics Canada

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

The focus of this publication is current year estimates obtained by analyzing actual data and making short-term projections using statistical techniques (see *Appendix II*). The tables in this appendix provide a summary of actual incidence and mortality statistics based on the most recently available data at the start of the analysis for this publication. Table A1 lists the actual number of new cases (2007) that occurred in Canada and specifies the ICD-O-3 codes used to define each diagnostic group. Table A2 lists the actual number of deaths (2006) and specifies the ICD-10 codes used to define each diagnostic group. Given the reliability of these actual counts, it is possible to examine the frequency of additional cancer types, and Tables A1 and A2 list a larger number of cancer types than the previous tables. Tables A3 to A6 list actual incidence and mortality counts and the age-standardized incidence and mortality rates for selected cancers by province and territory.

In addition to the explanations and discussion provided earlier in the publication, several other points are helpful to note. As noted in Tables A3 to A6, because of the small populations of the territories, only five-year averages (2004–2008) are provided for incidence and (2002–2006) for mortality. Furthermore, the data sources are mostly dynamic files that are routinely updated as new data become available.

- The most up-to-date information on cancer incidence is available from the following websites:
  - Statistics Canada: www.statcan.gc.ca/bsolc/olc-cel/olc-cel?catno=82-231-XWE&lang=eng
  - Public Health Agency of Canada, Chronic Disease Infobase Cubes: www.infobase.phac-aspc.gc.ca
- The most up-to-date information on causes of death—including cancer mortality—is available from Statistics Canada: www.statcan.gc.ca/bsolc/olc-cel/olc-cel?catno=84-208-x&lang=eng
- The most up-to-date data for individual provinces and territories can be obtained by contacting the provincial or territorial cancer registries (see *For further information*).

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

Table A1

Actual Data for New Cases of Cancer, Canada, 2007

Cancer	ICD-O-3 Site/Type*	Total	Males	Females
All Cancers	**All Invasive Sites**	**164,711**	**86,010**	**78,701**
Oral (Buccal Cavity and Pharynx)	**C00–C14**	**3,675**	**2,497**	**1,178**
Lip	C00	337	253	84
Tongue	C01–C02	935	646	290
Salivary Gland	C07–C08	423	233	191
Mouth	C03–C06	712	401	311
Nasopharynx	C11	256	181	75
Oropharynx	C10	163	115	48
Other and Unspecified	C09,C12–C14	848	669	179
Digestive Organs	**C15–C26,C48**	**34,059**	**19,078**	**14,981**
Esophagus	C15	1,586	1,201	385
Stomach	C16	3,060	1,943	1,117
Small Intestine	C17	613	342	271
Large Intestine	C18,C26.0	13,859	7,115	6,743
Rectum	C19–C20	6,743	4,135	2,608
Anus	C21	556	231	325
Liver	C22.0	1,586	1,202	384
Gallbladder	C23	461	152	309
Pancreas	C25	3,977	1,979	1,998
Other and Unspecified	C22.1,C24,C26.8–.9,C48	1,619	778	840
Respiratory System	**C30–C34,C38.1–.9,C39**	**24,663**	**13,780**	**10,882**
Larynx	C32	1,114	906	208
Lung	C34	23,196	12,663	10,533
Other and Unspecified	C30–31,C33,C38.1–.9,C39	353	211	142
Bone	**C40–C41**	**354**	**200**	**154**
Soft Tissue (including Heart)	**C38.0,C47,C49**	**1,119**	**619**	**501**
Skin (Melanoma)	**C44 Type 8720–8790**	**4,831**	**2,557**	**2,274**
Breast	**C50**	**21,278**	**164**	**21,114**
Genital Organs	**C51–C63**	**33,457**	**24,295**	**9,162**
Cervix	C53	1,401	—	1,401
Body of Uterus	C54	4,365	—	4,365
Uterus, Part Unspecified	C55	147	—	147
Ovary	C56	2,451	—	2,451
Prostate	C61	23,275	23,275	—
Testis	C62	832	832	—
Other and Unspecified	C51–52,C57,C58,C60,C63	986	187	798
Urinary Organs	**C64–C68**	**12,006**	**8,124**	**3,882**
Bladder	C67	6,754	4,944	1,810
Kidney	C64–C65	4,804	2,865	1,939
Other Urinary	C66,C68	448	315	133
Eye	**C69**	**289**	**162**	**127**
Brain and Central Nervous System	**C70–C72**	**2,581**	**1,464**	**1,117**
Endocrine Glands	**C37,C73–C75**	**4,482**	**1,076**	**3,406**
Thyroid	C73	4,202	950	3,252
Other Endocrine	C37,C74–C75	280	126	154
Hodgkin Lymphoma*	**Type 9650–9667**	**916**	**501**	**415**
Non-Hodgkin Lymphoma*	**See Table A10**	**6,787**	**3,772**	**3,014**
Multiple Myeloma*	**Type 9731,9732,9734**	**1,991**	**1,073**	**918**
Leukemia*	**See Table A10**	**4,822**	**2,774**	**2,048**
Mesothelioma*	**Type 9050–9055**	**514**	**419**	**95**
All Other and Unspecified Cancers	**See Table A10**	**6,885**	**3,456**	**3,430**

— Not applicable.

* Histology types 9590–9989 (leukemia, lymphoma and multiple myeloma) and 9050–9055 (mesothelioma) are excluded from other specific organ sites.

Note: ICD-O-3 refers to the *International Classification of Diseases for Oncology, Third Edition*.[59] Numbers are for invasive cancers and in situ bladder cancers (except for Ontario) but exclude non-melanoma skin cancer (basal and squamous). The numbers of cases from death certificate only for Quebec in 2007 are estimated.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Cancer Registry database at Statistics Canada

Table A2

Actual Data for Cancer Deaths, Canada, 2006

Cancer	ICD-10	Total	Males	Females
All Cancers	**C00–C97**	**67,807**	**35,624**	**32,183**
Oral (Buccal Cavity and Pharynx)	**C00–C14**	**1,022**	**708**	**314**
Lip	C00	16	12	4
Tongue	C01–C02	251	169	82
Salivary Gland	C07–C08	86	61	25
Mouth	C03–C06	183	100	83
Nasopharynx	C11	99	72	27
Oropharynx	C10	86	57	29
Other and Unspecified	C09,C12–C14	301	237	64
Digestive Organs	**C15–C25,C26.0,C26.8–.9,C48**	**18,132**	**10,121**	**8,011**
Esophagus	C15	1,560	1,182	378
Stomach	C16	1,976	1,239	737
Small Intestine	C17	179	103	76
Large Intestine	C18,C26.0	6,523	3,393	3,130
Rectum	C19–C20	1,729	1,035	694
Anus	C21	64	33	31
Liver	C22.0,C22.2–.7	733	544	189
Gallbladder	C23	252	71	181
Pancreas	C25	3,612	1,756	1,856
Other and Unspecified	C22.1,C22.9,C24,C26.8–.9,C48	1,568	798	770
Respiratory System	**C30–C34,C38.1–.9,C39**	**18,766**	**10,635**	**8,131**
Larynx	C32	420	352	68
Lung	C34	18,216	10,203	8,013
Other and Unspecified	C30–31,C33,C38.1–.9,C39	130	80	50
Bone	**C40–C41**	**136**	**75**	**61**
Soft Tissue (including Heart)	**C38.0,C47,C49**	**396**	**220**	**176**
Skin (Melanoma)	**C43**	**878**	**562**	**316**
Breast	**C50**	**4,897**	**55**	**4,842**
Genital Organs	**C51–C63**	**6,536**	**3,633**	**2,903**
Cervix	C53	375	—	375
Body of Uterus	C54	376	—	376
Uterus, Part Unspecified	C55	348	—	348
Ovary	C56	1,569	—	1,569
Prostate	C61	3,564	3,564	—
Testis	C62	33	33	—
Other and Unspecified	C51–52,C57,C58,C60,C63	271	36	235
Urinary Organs	**C64–C68**	**3,281**	**2,178**	**1,103**
Bladder	C67	1,729	1,208	521
Kidney	C64–C65	1,460	913	547
Other Urinary	C66,C68	92	57	35
Eye	**C69**	**42**	**21**	**21**
Brain and Central Nervous System	**C70–C72**	**1,658**	**966**	**692**
Endocrine Glands	**C37,C73–C75**	**270**	**123**	**147**
Thyroid	C73	160	66	94
Other Endocrine	C37,C74–C75	110	57	53
Hodgkin Lymphoma	**C81**	**127**	**74**	**53**
Non-Hodgkin Lymphoma	**C82–C85,C96.3**	**2,478**	**1,327**	**1,151**
Multiple Myeloma	**C90.0,C90.2**	**1,154**	**599**	**555**
Leukemia	**C91–C95,C90.1**	**2,295**	**1,289**	**1,006**
Mesothelioma	**C45**	**399**	**337**	**62**
All Other and Unspecified Cancers	**See Table A10**	**5,340**	**2,701**	**2,639**

— Not applicable.

Note: ICD-10 refers to the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision.*[60]

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death database at Statistics Canada

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

Table A3

Actual Data for New Cases for the Most Common Cancers by Sex and Geographic Region, Canada, Most Recent Year*

	New Cases													
	Canada[†]	BC	AB	SK	MB	ON	QC[‡]	NB	NS	PE	NL[‡]	YT	NT	NU
Males														
All Cancers	**86,000**	**11,000**	**7,600**	**2,700**	**2,800**	**32,700**	**21,400**	**2,500**	**2,800**	**430**	**1,450**	**50**	**60**	**30**
Prostate	23,300	3,100	2,200	740	560	9700	4,300	820	730	120	430	10	15	—
Lung	12,700	1,400	890	340	410	4,100	4,100	400	430	75	200	5	10	10
Colorectal[§]	11,300	1,400	960	380	450	4,100	2,900	300	440	50	280	10	10	10
Bladder[§]	4,900	780	490	190	200	1,400	1,650	150	180	30	75	5	—	—
Non-Hodgkin Lymphoma	3,800	460	360	120	140	1,500	850	90	100	15	60	—	5	—
Kidney	2,900	270	230	90	120	1,050	730	95	120	25	55	—	—	—
Leukemia	2,800	340	290	110	110	1,150	610	55	70	15	25	—	—	—
Melanoma	2,600	430	240	75	80	1,150	350	75	120	15	45	—	—	—
Oral	2,500	350	190	65	100	1,000	600	65	75	15	45	—	5	—
Pancreas	2,000	240	170	70	60	720	540	50	60	10	20	—	—	—
Stomach	1,950	260	170	70	85	690	470	45	65	10	55	—	—	—
Brain	1,450	180	150	40	40	580	390	30	45	5	25	—	—	—
Liver	1,200	180	90	20	35	470	330	15	30	5	15	—	—	—
Esophagus	1,200	180	120	40	35	470	280	35	40	10	20	—	—	—
Multiple Myeloma	1,050	130	95	30	30	410	270	35	45	—	10	—	—	—
Thyroid	950	90	95	20	30	470	200	35	30	—	10	—	—	—
Females														
All Cancers	**78,700**	**9,600**	**6,600**	**2,300**	**2,800**	**30,400**	**20,500**	**1,900**	**2,600**	**380**	**1,200**	**50**	**50**	**25**
Breast	21,100	2,700	1,800	620	760	8,200	5,400	500	710	100	300	15	15	5
Lung	10,500	1,250	850	330	400	3,600	3,100	310	400	45	130	5	5	5
Colorectal[§]	9,400	1,150	690	290	350	3,500	2,500	230	360	50	210	5	10	5
Body of Uterus	4,500	580	400	160	190	1,800	1,100	100	110	20	80	5	—	—
Thyroid	3,300	220	290	40	100	1,650	740	85	85	10	50	—	—	—
Non-Hodgkin Lymphoma	3,000	400	280	90	110	1,200	710	85	110	10	55	—	—	—
Ovary	2,500	280	190	90	85	1,000	640	55	55	10	25	—	—	—
Melanoma	2,300	400	210	55	80	1,100	270	80	110	15	35	—	—	—
Leukemia	2,000	230	190	70	80	890	440	50	40	5	15	—	—	—
Pancreas	2,000	230	160	75	85	730	560	50	60	10	20	—	—	—
Kidney	1,950	150	160	60	70	740	490	60	80	10	35	—	—	—
Bladder[§]	1,800	240	140	60	60	480	640	50	60	5	35	—	—	—
Cervix	1,400	150	140	55	50	570	300	35	45	10	25	—	—	—
Oral	1,200	160	80	20	45	510	270	20	35	10	10	—	—	—
Brain	1,100	120	90	35	35	460	300	25	45	—	10	—	—	—
Stomach	1,100	120	80	30	30	410	300	20	35	5	35	—	—	—
Multiple Myeloma	920	110	85	25	20	390	220	20	25	5	10	—	—	—

— Fewer than three cases per year.

* 2007 for Canada, Ontario, Quebec, Newfoundland and Labrador; 2008 for British Columbia, Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island; 2004–2008 average for Yukon, Northwest Territories, Nunavut. The numbers of cases from death certificate only for Quebec in 2007 are estimated.

† Canada totals include provincial and territorial estimates.

‡ The number of cases for some cancers that were used to calculate the overall 2011 estimates for this province was underestimated.

§ Definitions for these cancers have changed; see Table A7. Ontario does not report in situ bladder cases. If Ontario in situ cases were included, it is estimated that the total number of Ontario bladder cases would be 2,100 among men and 800 among women.

Note: "All Cancers" excludes the estimated new cases of non-melanoma skin cancer (basal and squamous).
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data source: Canadian Cancer Registry database at Statistics Canada

Table A4

Actual Age-Standardized Incidence Rates for the Most Common Cancers by Sex and Geographic Region, Canada, Most Recent Year*

	Cases per 100,000													
	Canada[†]	BC	AB	SK	MB	ON	QC[‡]	NB	NS	PE	NL[‡]	YT	NT	NU
Males														
All Cancers	**466**	**409**	**440**	**451**	**419**	**467**	**479**	**534**	**483**	**498**	**466**	**366**	**433**	**435**
Prostate	125	115	127	125	84	138	95	169	121	130	133	80	117	—
Lung	69	52	54	56	62	59	92	86	72	89	62	55	84	194
Colorectal[§]	61	52	56	63	66	58	65	64	74	60	90	58	83	107
Bladder[§]	27	28	29	32	29	20	37	31	31	33	25	25	—	—
Non-Hodgkin Lymphoma	20	17	20	21	20	22	19	20	17	17	18	—	18	—
Leukemia	15	13	17	18	17	17	14	13	12	16	8	—	—	—
Kidney	15	10	13	15	17	15	16	20	20	27	16	—	—	—
Melanoma	14	16	13	12	11	17	8	16	20	15	14	—	—	—
Oral	13	12	10	11	15	14	13	14	12	18	13	—	23	—
Pancreas	11	9	10	12	8	10	12	10	10	13	5	—	—	—
Stomach	10	9	10	11	12	10	11	9	11	10	17	—	—	—
Brain	8	7	8	8	6	8	9	6	9	7	8	—	—	—
Esophagus	6	7	7	7	5	7	6	8	7	9	7	—	—	—
Liver	6	6	5	4	5	6	7	3	5	5	4	—	—	—
Multiple Myeloma	6	5	6	5	5	6	6	7	7	—	4	—	—	—
Thyroid	5	3	5	3	5	7	4	7	5	—	3	—	—	—
Females														
All Cancers	**364**	**318**	**340**	**343**	**358**	**371**	**377**	**354**	**379**	**376**	**341**	**337**	**352**	**431**
Breast	99	93	93	93	98	100	102	93	104	106	84	96	83	66
Lung	48	41	45	48	49	43	56	56	56	41	37	48	63	164
Colorectal[§]	41	36	35	38	41	40	43	39	49	50	57	47	76	74
Body of Uterus	21	19	20	24	24	22	20	18	15	16	22	21	—	—
Thyroid	18	9	16	8	17	24	17	18	15	14	16	—	—	—
Non-Hodgkin Lymphoma	14	13	14	13	14	15	13	16	16	11	16	—	—	—
Ovary	11	9	10	13	11	13	12	10	7	9	6	—	—	—
Melanoma	11	15	11	9	11	14	6	16	17	16	10	—	—	—
Leukemia	10	8	10	10	10	11	8	10	6	6	6	—	—	—
Kidney	9	5	8	9	9	9	9	11	11	11	11	—	—	—
Pancreas	9	7	8	9	9	8	10	9	8	10	5	—	—	—
Bladder[§]	8	8	7	8	7	5	11	9	8	5	9	—	—	—
Cervix	8	6	8	11	8	8	7	7	8	12	9	—	—	—
Brain	6	5	5	5	5	6	6	5	7	—	4	—	—	—
Oral	5	5	4	3	6	6	5	4	5	7	4	—	—	—
Stomach	5	4	4	4	3	5	5	3	5	2	11	—	—	—
Multiple Myeloma	4	4	4	4	2	4	4	3	3	4	3	—	—	—

— Fewer than three cases per year.

* 2007 for Canada, Ontario, Quebec, Newfoundland and Labrador; 2008 for British Columbia, Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island; 2004–2008 average for Yukon, Northwest Territories, Nunavut. The numbers of cases from death certificate only for Quebec in 2007 are estimated.

† Canada totals include provincial and territorial estimates.

‡ The number of cases for some cancers that were used to calculate the overall 2011 estimates for this province was underestimated.

§ Definitions for these cancers have changed; see Table A7. Ontario does not currently report in situ bladder cases.

Note: Rates for "All Cancers" exclude non-melanoma skin cancer (basal and squamous). Rates are age-standardized to the 1991 Canadian population.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Cancer Registry database at Statistics Canada

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

Table A5

Actual Data for Cancer Deaths for the Most Common Cancers by Sex and Geographic Region*, Canada, 2006

	Deaths													
	Canada†	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YT	NT	NU
Males														
All Cancers	**35,600**	**4,400**	**2,800**	**1,200**	**1,350**	**13,100**	**9,500**	**900**	**1,350**	**170**	**760**	**30**	**20**	**20**
Lung	10,200	1,150	690	310	360	3,500	3,200	290	410	40	210	10	5	10
Colorectal	4,400	510	320	140	160	1,650	1,200	110	170	20	130	5	5	5
Prostate	3,600	470	350	210	140	1,400	710	80	130	20	75	—	—	—
Pancreas	1,750	270	150	60	60	610	450	45	70	10	35	—	—	—
Non-Hodgkin Lymphoma	1,350	200	110	45	70	480	340	30	30	5	15	—	—	—
Leukemia	1,300	160	120	45	50	520	300	30	40	5	15	—	—	—
Stomach	1,250	160	85	20	50	460	350	30	45	—	40	—	—	—
Bladder	1,200	180	100	40	40	460	280	30	40	5	20	—	—	—
Esophagus	1,200	170	110	35	45	460	240	40	50	10	20	—	—	—
Brain	970	120	85	20	30	350	280	20	35	5	20	—	—	—
Kidney	910	110	70	40	45	340	230	30	35	5	20	—	—	—
Oral	710	75	70	20	25	290	170	15	20	5	20	—	—	—
Multiple Myeloma	600	65	55	20	25	230	150	15	25	5	5	—	—	—
Melanoma	560	75	35	15	20	270	100	5	30	5	15	—	—	—
Liver	540	80	35	—	25	220	150	10	15	—	5	—	—	—
Females														
All Cancers	**32,200**	**4,100**	**2,600**	**1,050**	**1,300**	**11,900**	**8,700**	**830**	**1,100**	**160**	**520**	**20**	**20**	**15**
Lung	8,000	1,050	610	220	310	2,800	2,300	250	290	40	110	5	5	5
Breast	4,800	570	380	150	210	1,850	1,250	120	160	25	100	5	5	—
Colorectal	3,800	470	270	130	150	1,400	1,050	85	150	15	75	5	5	—
Pancreas	1,850	270	160	65	70	620	530	55	65	10	10	—	—	—
Ovary	1,550	220	130	65	70	600	360	40	45	—	25	—	—	—
Non-Hodgkin Lymphoma	1,150	160	75	50	60	420	290	35	40	5	15	—	—	—
Leukemia	1,000	130	75	40	40	400	250	25	35	5	5	—	—	—
Stomach	740	95	40	20	30	260	230	20	20	10	25	—	—	—
Body of Uterus	720	85	65	15	20	290	200	20	25	—	10	—	—	—
Brain	690	95	50	25	20	220	240	15	15	5	10	—	—	—
Multiple Myeloma	560	55	50	20	25	230	130	10	20	—	5	—	—	—
Kidney	550	60	50	25	25	190	150	20	15	5	10	—	—	—
Bladder	520	55	45	10	15	220	140	10	15	5	10	—	—	—
Cervix	380	40	50	10	10	170	60	10	20	5	5	—	—	—
Melanoma	320	55	40	5	10	140	50	5	10	—	—	—	—	—
Oral	310	40	30	10	10	130	85	5	10	—	—	—	—	—

— Fewer than three deaths per year.

* 2002–2006 average for Yukon, Northwest Territories, Nunavut.

† Row totals may not equal the total for Canada due to rounding. Canada totals include provincial and territorial estimates.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Data source: Canadian Vital Statistics Death database at Statistics Canada

Table A6

Actual Age-Standardized Mortality Rates for the Most Common Cancers by Sex and Geographic Region, Canada, 2006*

	Deaths per 100,000													
	Canada†	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YT	NT	NU
Males														
All Cancers	**202**	**173**	**183**	**196**	**206**	**196**	**223**	**208**	**241**	**203**	**256**	**275**	**221**	**399**
Lung	58	45	45	51	54	53	74	66	73	50	72	96	57	199
Colorectal	25	20	21	24	24	25	29	25	29	26	42	41	47	64
Prostate	21	19	24	31	20	21	18	19	24	23	27	—	—	—
Pancreas	10	10	10	10	9	9	10	11	12	14	10	—	—	—
Non-Hodgkin Lymphoma	7	8	7	8	11	7	8	8	6	8	5	—	—	—
Leukemia	7	6	8	7	8	8	7	7	8	9	5	—	—	—
Stomach	7	6	5	3	8	7	8	7	8	—	13	—	—	—
Bladder	7	7	7	6	6	7	7	6	7	6	7	—	—	—
Esophagus	7	7	7	6	7	7	5	8	8	11	6	—	—	—
Brain	5	5	5	3	5	5	6	5	6	4	6	—	—	—
Kidney	5	4	4	6	7	5	5	6	6	6	6	—	—	—
Oral	4	3	4	4	4	4	4	3	3	5	6	—	—	—
Multiple Myeloma	3	3	4	3	4	3	4	3	5	8	1	—	—	—
Melanoma	3	3	2	2	3	4	2	1	6	—	5	—	—	—
Liver	3	3	2	—	4	3	3	2	2	1	2	—	—	—
Females														
All Cancers	**142**	**131**	**135**	**141**	**149**	**137**	**153**	**145**	**150**	**152**	**147**	**198**	**195**	**347**
Lung	37	36	34	32	40	34	42	45	42	40	31	49	59	198
Breast	22	18	20	22	24	21	23	21	21	27	30	23	31	—
Colorectal	16	14	14	15	15	15	18	14	19	16	20	27	24	—
Pancreas	8	9	8	9	8	7	9	9	9	8	2	—	—	—
Ovary	7	7	7	9	9	7	7	7	6	—	7	—	—	—
Non-Hodgkin Lymphoma	5	5	4	6	7	5	5	6	5	5	5	—	—	—
Leukemia	4	4	4	4	5	4	5	5	5	8	2	—	—	—
Brain	3	3	3	4	2	3	5	2	3	3	3	—	—	—
Stomach	3	3	2	2	3	3	4	4	2	9	6	—	—	—
Body of Uterus	3	3	3	3	2	3	3	3	3	—	3	—	—	—
Multiple Myeloma	2	2	3	3	3	3	2	2	3	—	2	—	—	—
Kidney	2	2	3	3	3	2	2	3	2	4	4	—	—	—
Bladder	2	2	2	1	1	2	2	1	1	4	3	—	—	—
Cervix	2	1	3	2	1	2	1	2	3	3	2	—	—	—
Melanoma	1	2	2	1	1	2	1	1	1	—	—	—	—	—
Oral	1	1	1	1	1	1	1	1	1	—	—	—	—	—

— Fewer than three deaths per year.

* 2002–2006 average for Yukon, Northwest Territories, Nunavut.

† Canada totals include provincial and territorial estimates.

Note: Rates are age-standardized to the 1991 Canadian population.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada

Data source: Canadian Vital Statistics Death database at Statistics Canada

APPENDIX II: DATA SOURCES AND METHODS

DATA SOURCES

Incidence data: The Canadian Cancer Registry (CCR)

Actual cancer incidence data used in this publication cover the period of 1982 to 2008 (except for Quebec for which data in the CCR were available to 2007 in time for this publication). Data for 1992 to 2008 were obtained from the CCR,[23] while data for earlier years were retrieved from its predecessor, the National Cancer Incidence Reporting System (NCIRS). The NCIRS is a fixed, tumour-oriented database containing cases diagnosed as far back as 1969.

- Incidence data originate with the provincial and territorial cancer registries, 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 newly diagnosed with cancer.
- The Health Statistics Division at Statistics Canada maintains the CCR, including linking data internally to track people with tumours diagnosed in more than one province or territory and to identify duplicates. Incidence records are also linked with the mortality data described below for the purposes of survival and prevalence analyses.
- Cancer diagnoses are classified according to the *International Classification of Diseases for Oncology, Third Edition* (ICD-O-3).[59]

Mortality data: The Canadian Vital Statistics – Death Database (CVS: D)

- The actual cancer mortality data cover the period of 1982 to 2006 and were obtained from the CVS: D.[61]
- Death records originate with the provincial and territorial registrars of vital statistics and are provided regularly to Statistics Canada for inclusion in the CVS: D.
- The CVS: D includes demographic and cause of death information for all residents who died in Canada between 1950 and 2006.
- Data are also included for Canadian residents who died in some states of the United States, as Canada currently receives abstracted death data from approximately 10 states.
- The Health Statistics Division at Statistics Canada maintains the CVS: D.
- Cause of death is classified according to the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* (ICD-10).[60]
- Cancer deaths are those attributed by the certifying physician to some form of cancer as the underlying cause of death.

Population data: The Census of Canada

- Population estimates for Canada and the provinces and territories are based on quinquennial censuses conducted from 1981 through to 2006.
- Intercensal estimates prepared by Statistics Canada are used for the years between these censuses and postcensal estimates are used for 2006 to 2009.[62]
- Projected population estimates are used for 2010 and 2011, as prepared by Statistics Canada under assumptions of medium growth (scenario M1).[2] The

scenario M1 incorporates medium-growth and historical trends (1981–2008) of interprovincial migration.

- All population estimates include non-permanent residents and are adjusted for net census under-coverage and Canadians returning from abroad.

Life tables

Life tables are required to estimate relative survival. Sex-specific provincial life tables are produced by Statistics Canada.

- Data from the 1990 to 1992 life tables[63] were used for case follow-up in 1992 and 1993. Data from 1995 to 1997 life tables[64] were used for follow-up from 1994 to 1998. Data from the 2000 to 2002 life tables[65] were used for follow-up from 1999 to 2006.
- As complete life tables were not available for Prince Edward Island or the territories, expected survival proportions for these areas were derived from abridged life tables for Canada, Prince Edward Island and the territories, using a method suggested by Dickman et al.[66] Where this was not possible (i.e., territories 1990–1992), complete Canadian life table values were used.
- The aforementioned method of Dickman et al. was also used to extend, by single year of age, the 1990 to 1992 set of provincial life tables for ages 85–99.

Cancer definitions

- Cancers are generally defined according to the groupings of ICD-O-3[59] for incidence and ICD-10[60] for mortality, as indicated in Table A10.
- Some definitions have changed slightly over time; changes occurring since the 2004 edition of this publication are outlined in Table A7.
- More specific subgroups, based on ICD-O-3 site (topography) and morphology codes, were used for the special topic section on colorectal cancer, as indicated in Table A11.
- For children and youth aged 0–19 years, cancers were classified and reported according to the *International Classification of Childhood Cancer, Third Edition* (ICCC-3).[12] This system is most appropriate for reporting childhood cancers because it acknowledges the major differences between cancers arising during childhood and those arising later in life.
  - The category "intracranial and intraspinal" excludes non-malignant tumours.

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 (0–4, 5–9, … , 80–84 and 85+ years) and cancer type.

- Rates for each category were calculated by dividing the number of cases or deaths in each category (i.e., province, year, sex, age group, cancer type) by the corresponding provincial or territorial population figure. These formed the basis for calculations of age-standardized rates and for estimates beyond the most recent year of actual data.

- For the section *Incidence and mortality by age and sex*, age-specific rates were computed for broader age groups (0–19, 20–29, 30–39, 40–49, 50–59, 60–69, 70–79 and 80+ years) in the same way.
- Age-standardized incidence rates (ASIR) and mortality rates (ASMR) 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 1991 Canadian population (see *Glossary*).

Estimation of incidence (new cases) and mortality (deaths) for 2011

Two methods were used to estimate incidence and mortality data: Poisson modelling and five-year averaging.

Poisson modelling

Poisson regression modelling was the primary method for estimating the number of new cases and deaths in 2011 for each cancer type by sex (except new cases of non-melanoma skin cancer; see below) reported in Tables 1.1 and 1.2. The assumption underlying Poisson modelling is that the annual number of new cases and deaths are independent Poisson random variables with mean values equal to the product of the population size for a particular year and the (true) annual rate.

- A separate Poisson model was fit for each province, sex and type of cancer for the period of 1986 to 2008 (1986–2007 for Quebec) for incidence and 1986 to 2006 for mortality.
- For prostate cancer incidence, Poisson modelling started in 1991 rather than 1986. This is because the "spike" in incidence rates for this cancer associated with the introduction of the PSA test for detection of early disease in the late 1980s means that longer-term trends result in poor estimates.
- Age was included in all models as a factor with 18 levels (representing the 18 different five-year age groupings described above). Terms for time trends were evaluated by a stepwise selection algorithm available in S-Plus 2000 (MathSoft Inc., 1999). Age-specific incidence rate trends were then extrapolated to 2011. The predicted numbers of cancer cases in 2011 were calculated by multiplying these extrapolated incidence rates by the sex-, age- and province-specific population projections for the same year.

Five-year averaging

New cases and deaths in 2011 for each type of cancer were also estimated based on the average of the five most recent years of data. This method may be more realistic for cancers for which there are recent changes in trend (Poisson modelling results in poor estimates for these cancers because it is based on a longer-term trend) or when frequencies are low and result in unstable estimates using the Poisson model. The average of rates for the most recent five years was calculated for each sex, five-year age group, cancer type and province. The predicted numbers were then obtained by multiplying these rates by the corresponding projected population sizes.

Selection of "best" estimates

Estimates from the two methods were compared for each sex, cancer type and geographic region for all ages combined. The "best" estimate for each category was

selected in consultation with individual provincial or territorial cancer registries, according to the following guidelines:

- The Poisson-based estimate was generally preferred, especially for cancers where there was a pre-existing long-term trend. Such trends were identified for stomach, larynx, liver, cervical, testicular and thyroid cancers.
- Five-year average estimates were used for the territories and are reported only for "All Cancers" because of small sample sizes.
- Five-year average estimates were the default for Prince Edward Island.
- The absolute value of the difference between the age-standardized rates estimated by the two methods was calculated and expressed relative to the five-year average estimate. For example, if the Poisson model estimated a rate of 4.0 and the five-year average estimated a rate of 4.5, the relative difference would be $(4.0 - 4.5) \div 4.5$, or 11.1%.
- Provinces closely examined estimates for cancers where the absolute value of the relative difference exceeded 10%. Such situations may be indicative of important deviations from the long-term trend.
- Provinces were asked to recommend their choice of estimation method, along with a rationale. The rationale was usually the availability of in-house projections, knowledge of local trends or access to more current data, which permitted an assessment of the estimates produced by the two different estimation methods.
- Estimates for Canada as a whole were computed as sums of the estimates for the individual provinces and territories.

Tables A8 and A9 indicate the cancer types that were reported according to the five-year average method for 2011. In these situations, the age-standardized rates for 2011 reported in this publication were calculated using the most recent five years of actual data.

All cancers combined

Provincial estimates of incidence counts for "All Cancers" for males were computed as the sum of the "best" estimates for prostate cancer and all cancers excluding prostate, as estimated by Poisson modelling.

For incidence and mortality in females and mortality in males, provincial estimates for "All Cancers" were those based on Poisson modelling of all cancers combined. For the territories, "All Cancers" estimates were based on five-year averages in all situations.

Non-melanoma skin cancer incidence

Only a few provinces routinely collect data on the incidence of basal cell and squamous cell carcinoma of the skin (generally referred to as non-melanoma skin cancer or NMSC). The numbers of NMSC in all of Canada, by sex, were estimated using these data.

- Pathology laboratories in British Columbia send all diagnostic reports of NMSC to the provincial registry. The age- and sex-specific incidence rates in British Columbia for 1992 to 1994 and 2003 were projected to 2011 by the British Columbia Cancer Registry and applied to the projected Canadian population estimates to generate an estimate of the number of cases for Canada as a whole.

APPENDIX II: DATA SOURCES AND METHODS

- Counts of NMSC for 1989 to 2008 by year, sex and age group were provided by the Manitoba Cancer Registry and by the New Brunswick Cancer Registry. Linear regressions using a logarithmic transformation of the annual rates for each province and age group (0–39, 40–59, 60–79 and 80+ years) were conducted and projected to 2011.
- The predicted numbers of NMSC cases for all of Canada were calculated by multiplying the projected incidence rates for each of Manitoba and New Brunswick by the sex- and age-specific Canadian population projections for 2011.
- Reported new cases of NMSC for all of Canada are the average of 2011 estimates from British Columbia, Manitoba and New Brunswick registries.

Rounding for reporting

- Estimates of incidence and mortality presented in this publication have been rounded as follows:
  - numbers between 0 and 99 to the nearest 5
  - numbers between 100 and 999 to the nearest 10
  - numbers between 1,000 and 1,999 to the nearest 50
- numbers greater or equal to 2,000 to the nearest 100
- Percentages, age-standardized rates and age-specific rates were rounded to the nearest 10th, except in Tables 1.1, 1.2, 2.3, 2.5, A4 and A6, where space restrictions forced rounding to the nearest whole number.
- Age-specific and sex-specific numbers or rates were combined before rounding, so it is possible that the totals in the tables do not add up. However, any such discrepancies are within the precision of the rounding units described above.

Precision of 2011 estimates

Estimates of precision (standard errors, coefficients of variation and confidence limits) for 2011 counts and rates are available on request from the Chronic Disease Surveillance and Monitoring Division (Centre for Chronic Disease Prevention and Control, Public Health Agency of Canada). The precision of an estimate depends primarily on the number of observed cases and the population size for each combination of cancer type, age, sex and province or territory.

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

The estimated 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 ASIRs or ASMRs in each segment. The models incorporated estimated standard errors of the ASIRs or ASMRs. 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 increase or decrease in the rate.

- Changepoint analysis was applied to annual age-standardized rates over the period of 1986 to 2007 (for incidence) and 1986 to 2006 (for mortality) in order to determine years in which the APC changed significantly; such years are referred to as *changepoints*.

- A minimum of five years of data before and after a changepoint was required for a new trend to be identified. Thus, the most recent possible changepoint is 2003 for incidence and 2002 for mortality.
- If no changepoint was detected within the periods of 1998 to 2007 (for incidence) or 1997 to 2006 (for mortality), then the APC was estimated by fitting a model within these time periods, in the same way as described above.
- If a changepoint was detected within these decades, then the APC was estimated from the trend in the last segment. Both the changepoint year and the APC for the years beyond the changepoint are indicated in Table 4.5.

Changepoints in cancer incidence rates for 1983 to 2006 are reported in the Special topic section on colorectal cancer.

Contribution of change in cancer rate, population growth and population age structure to incidence and mortality trends

Figures 4.3 and 4.4 display the determinants of increases in incidence and mortality for males and females, respectively. The section on *Time trends in incidence and mortality* provides a description of the three series. The series were calculated as follows:

- Uppermost series: the annual number of Canadian cancer cases or deaths, for males or females
- Next to uppermost series: annual total population multiplied by the annual age-standardized rate, using the 1982 population distribution for males or females as the standard weights
- Next to baseline series: the 1982 total population multiplied by the annual age-standardized rate, using the 1982 population distribution for males or females as the standard weights
- Baseline (dotted line): the observed number of Canadian cancer cases or deaths during 1982, for males or females

Probability of developing or dying from cancer

Probabilities of developing or dying from cancer were calculated according to the age- and sex-specific cancer incidence and mortality rates for Canada in 2006 and life tables based on 2004 to 2006 all-cause mortality rates. The methodology used was that of Zdeb[67] and Seidman et al.[68]

- For the probability of developing cancer, the method used assumes that current age-specific incidence rates will prevail throughout the future lifetime of a person as he or she advances in age. Since this assumption may not be true, the probabilities should be regarded only as approximations.
- The probability of dying from cancer represents the proportion of people dying from cancer in a cohort subjected to the mortality conditions prevailing in the population at large in 2006. It was estimated by determining the proportion of deaths attributed to specific types of cancer for each sex and age group, multiplying this proportion by the corresponding number of deaths in the life table and summing the life table deaths over all sex and age groups to obtain the probability of dying from each cause.

APPENDIX II: DATA SOURCES AND METHODS

Relative survival

Five-year relative survival ratios were estimated by comparing the actual survival experience of persons diagnosed with cancer to that expected in the general population of Canadians of the same age, sex, province of residence and time period. It is computed as a ratio and expressed as a percentage.

- Deaths of people diagnosed with cancer are identified through record linkage of the CCR to the CVS: D and from information reported by provincial or territorial cancer registries. For deaths reported by a registry but not confirmed by record linkage, it was assumed that the individual died on the date submitted by the reporting province or territory. At the time of the analysis, registration of new cases and follow-up for vital status were complete through December 31, 2006.
- Analyses were based on all primary cancers. The effect of including multiple cancers in survival analyses has been studied internationally[69,70] and in Canada.[71]
- Analyses were based on those individuals aged 15–99 years at diagnosis.
- Persons whose diagnosis was established through death certificate only or autopsy only were excluded.
- Analyses were based on a publicly available algorithm[72] with some minor adaptations. Expected survival proportions were derived, using the Ederer II approach,[73] from sex-specific provincial life tables produced by Statistics Canada.
- Survival analyses were conducted using both period (2004–2006) and cohort analysis methods.[18] The period approach to survival analysis provides up-to-date predictions of cancer survival.[74] 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.
- Conditional five-year relative survival expresses the probability of surviving five years into the future at various points since the time of diagnosis, relative to the expected survival of similar people in the general population.[58,75]
- As an indication of the level of statistical uncertainty in the survival estimates, confidence intervals formed from standard errors estimated using Greenwood's method[76] are provided. To avoid implausible lower limits less than zero or upper limits greater than one for observed survival estimates, asymmetric confidence intervals based on the log (–log) transformation were constructed. Relative survival ratio confidence limits were derived by dividing the observed survival limits by the corresponding expected survival proportion.
- Age-standardized estimates were calculated using the direct method by weighting age-specific estimates for a given cancer to the age distribution of persons diagnosed with that cancer during 1992 to 2001. Confidence intervals for age-standardized relative survival ratios were formed by multiplying the corresponding age-standardized observed upper and lower limits by the ratio of the age-standardized relative survival point estimate to the age-standardized observed survival point estimate.

- Only observed survival is reported for children and youth (0–19) as the estimates of observed and relative survival for this age range are essentially the same.

Prevalence

The primary type of prevalence reported in this publication is tumour based. Two-, five- and 10-year limited duration prevalences are estimated by the numbers of cancers diagnosed in the previous two, five and 10 years among living cancer patients.

Prevalence was determined directly, using the counting method.[77,78]

- All primary invasive cancers (including in situ bladder cancers) among persons alive on January 1, 2007 that were diagnosed in the relevant time period prior to that date were counted, regardless of whether they were first or subsequent primaries.
  - Different methods had to be employed for Quebec data. See *Data and methods issues* below.
- Age-specific prevalence estimates were derived using the age attained as of January 1, 2007.
- The population used to determine prevalence rates as of January 1, 2007 was derived by averaging the 2006 and 2007 mid-year population estimates.
- Person-based 10-year prevalence is estimated as the number of individuals represented in the tumour-based 10-year prevalence counts.

DATA AND METHODS ISSUES

Incidence

Although the Canadian Council of Cancer Registries and its Standing Committee on Data Quality 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 tumours and carcinomas in situ are not routinely captured or reported except for in situ carcinomas of the bladder; all cancer registries except Ontario report in situ bladder cancers to the CCR.
- The Newfoundland and Labrador Cancer Registry did not receive information on death certificates that mentioned cancer until very recently. This has led to underestimates of the incidence of some cancers because there were no ”death certificate only” (DCO) cases. This could result in death counts or rates exceeding those for incidence in a specific year; this especially affects highly fatal cancers. The number of DCO cases for 2008 in Newfoundland and Labrador was estimated from 2007 data.
- In Quebec, cases diagnosed only through death certificates have not generally been reported to the CCR with the exception of the 2000 to 2006 data years. The number of death certificate only cases for 2007 in Quebec was estimated from the average of 2002 to 2006. In addition, because of the registry’s dependence on hospital data, the numbers of cases of some cancers, particularly those where pathology reports

represent the main source of diagnostic information, are underestimated. Prostate cancer, melanoma and bladder cancers are affected in particular.[1]

- The number of DCO cases for 2008 in Ontario was estimated from the average of 2003–2007 data.
- The number of death certificate only cases is less than 2% of total cases.
- Non-melanoma skin cancers are excluded since most provincial and territorial cancer registries do not collect information on these cases. These cancers are difficult to register completely because they may be diagnosed and treated in a variety of settings and are very numerous. Estimates based on the three registries that include these cancers (see *Non-melanoma skin cancer incidence* above) are therefore likely to be underestimates.

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 Table A7), there is one major earlier change of note:

- In the versions of this publication published before 2003, mortality due to colorectal cancer was based on the *International Classification of Diseases, Ninth Revision* (ICD-9), codes 153–154, to be consistent with other publications. However, this underestimates colorectal cancer mortality by about 10%, because most deaths registered as ICD-9 code 159.0 (intestine not otherwise specified) are cases of colorectal cancer.
- Commencing with the 2003 edition, 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 reports prior to 2003.

Survival

Cases diagnosed in the province of Quebec were excluded from survival analyses, in part because the method of ascertaining the date of diagnosis of cancer cases in this province clearly differed from that of the other provincial cancer registries[79] and because of issues in correctly ascertaining the vital status of cases.

Prevalence

Due to issues in correctly ascertaining the vital status of cases diagnosed in Quebec, prevalence data for this province were determined indirectly. The probability of surviving until the index date was used to randomly assign the vital status of each incident case in Quebec. Survival probabilities were derived using the corresponding observed survival proportion calculated for the rest of Canada, stratified on age group (0–39, 40–49, 50–59, 60–69, 70–79 and 80+), sex, cancer type and month of diagnosis. For further detail, please see Ellison and Wilkins, 2009.[80]

Table A7
Cancer Definition Changes Since 2004

Cancer Incidence	Cancer Mortality	Definition in 2004	Changes Since 2004
Bladder		ICD-O-3, C67 not including in situ cancers	2006: C67 including in situ cancers except for Ontario since Ontario does not report in situ bladder cancer
Colorectal		ICD-O-3 C18–C21, C26.0	2011: C18–C20, C26.0
Kidney	Kidney	ICD-O-3/ICD-10 C64–C66, C68	2008: C64–C65
Lung	Lung	ICD-O-3/ICD-10 C33–C34	2006: C34 2007: C33–C34 2008: C34
Ovary	Ovary	ICD-O-3/ICD-10 C56, C57.0–C57.4	2006: C56
	Leukemia	ICD-10 C91–C95	2008: C91–C95, C90.1
	Liver	ICD-10 C22	2006: C22.0, C22.2–C22.9 2007: C22.0, C22.2–C22.7
	Multiple Myeloma	ICD-10 C88, C90	2007: C90 2008: C90.0, C90.2
	All Other and Unspecified Cancers	ICD-10 C44, C46, C76–C80, C96.0–C96.2, C96.7–C96.9, C97	2007: C88 added

Note: According to ICD-O-3 cancer incidence for bladder, kidney, lung and ovary excludes histology types 9590–9989 (leukemia, lymphoma and multiple myeloma) and 9050–9055 (mesothelioma). ICD-O-3 refers to the *International Classification of Diseases for Oncology, Third Edition*.[59]

Table A8

Use of Five-Year Average Method for Incidence Projection by Cancer Type and Province, 2011

	BC	AB	SK	MB	ON	QC	NB	NS	PE*	NL
All Cancers										
Oral					F				M,F	
Esophagus								M	M,F	
Stomach									M,F	
Colorectal						F			F	
Pancreas									M,F	
Larynx									M,F	
Melanoma		F							M,F	
Breast										
Cervix									F	
Body of Uterus									F	
Ovary									F	
Prostate†	M	M	M	M	M	M	M	M	M	M
Testis									M	
Bladder									M,F	
Brain			F						M,F	
Thyroid									M,F	
Hodgkin Lymphoma									M,F	
Non-Hodgkin Lymphoma								M	M,F	
Liver									M,F	
Lung			F		F		F	F	F	F
Kidney									M,F	
Multiple Myeloma									M,F	
Leukemia									M,F	

* Poisson estimate is the default for all provinces except Prince Edward Island, where the five-year average estimate is the default for most cancers.

† Five-year average method was used for prostate cancer to better capture the stabilizing trend in incidence observed for this cancer.

Note:

M = males; F = females.

Poisson modelling was strongly recommended for "All Cancers" and cancers of the stomach, larynx, cervix, testis, thyroid and liver. For territories, five-year average method was used for "All Cancers" because of small numbers (not shown).

Table A9

Use of Five-Year Average Method for Mortality Projection by Cancer Type and Province, 2011

	BC	AB	SK	MB	ON	QC	NB	NS	PE*	NL
All Cancers										
Oral	M	M							M,F	
Esophagus								M	M,F	
Stomach									M,F	
Colorectal	F									
Pancreas		F							M,F	
Larynx									M,F	
Melanoma	M				M			M	M,F	
Breast										
Cervix									F	
Body of Uterus									F	
Ovary									F	
Prostate			M							
Bladder									M,F	
Brain									M,F	
Non-Hodgkin Lymphoma			F	M	M,F			M	M,F	
Liver									M,F	
Lung			F	F	F		F	F	F	F
Kidney			F						M,F	
Multiple Myeloma									M,F	
Leukemia									M,F	

* Poisson estimate is the default for all provinces except Prince Edward Island, where the five-year average estimate is the default for most cancers.

Note:

M = males; F = females.

Poisson modelling was strongly recommended for "All Cancers" and cancers of the stomach, larynx, cervix and liver. For territories, five-year average method was used for "All Cancers" because of small numbers (not shown).

Table A10
Cancer Definitions

Cancer	ICD-O-3 Site/Histology Type* (Incidence)	ICD-10 (Mortality)
Oral	C00–C14	C00–C14
Esophagus	C15	C15
Stomach	C16	C16
Colorectal	C18–C20,C26.0	C18–C21,C26.0
Liver	C22.0	C22.0,C22.2–C22.7
Pancreas	C25	C25
Larynx	C32	C32
Lung	C34	C34
Melanoma	C44 (Type 8720–8790)	C43
Breast	C50	C50
Cervix	C53	C53
Body of Uterus	C54–C55	C54–C55
Ovary	C56.9	C56
Prostate	C61.9	C61
Testis	C62	C62
Bladder (including in situ)	C67	C67
Kidney	C64.9,C65.9	C64–C65
Brain	C70–C72	C70–C72
Thyroid	C73.9	C73
Hodgkin Lymphoma*	Type 9650–9667	C81
Non-Hodgkin Lymphoma*	Type 9590–9596,9670–9719, 9727–9729 Type 9823, all sites except C42.0,.1,.4 Type 9827, all sites except C42.0,.1,.4	C82–C85,C96.3
Multiple Myeloma*	Type 9731,9732,9734	C90.0, C90.2
Leukemia*	Type 9733,9742,9800–9801,9805, 9820,9826,9831–9837,9840, 9860–9861,9863,9866–9867, 9870–9876,9891,9895–9897,9910, 9920,9930–9931,9940,9945–9946, 9948,9963–9964 Type 9823 and 9827, sites C42.0,.1,.4	C91–C95,C90.1
All Other Cancers	All sites C00–C80, C97 not listed above	All sites C00–C80, C97 not listed above

Table A10 *(continued)*
Cancer Definitions

Cancer	ICD-O-3 Site/Histology Type* (Incidence)	ICD-10 (Mortality)
All Other and Unspecified Cancers (grouping used only in Tables A1 and A2)	Type 9140,9740,9741,9750–9758, 9760–9769,9950–9962, 9970–9989 C76.0–C76.8 (type 8000–9589) C80.9 (type 8000–9589) C42.0–C42.4 (type 8000–9589) C77.0–C77.9 (type 8000–9589) C44.0–C44.9 excluding type 8050–8084,8090–8110, 8720–8790,9590–9989	C26.1,C44,C46,C76–C80,C88, C96.0–.2,C96.7–.9,C97
All Cancers	All invasive sites	All invasive sites

* Histology types 9590–9989 (leukemia, lymphoma and multiple myeloma) and 9050–9055 (mesothelioma) are excluded from other specific organ sites.

Note: ICD-O-3 refers to the *International Classification of Diseases for Oncology, Third Edition*.[59] ICD-10 refers to the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision.*[60]

Table A11
Cancer Definitions for Special Topic

Cancer	ICD-O-3 Site (Incidence)	ICD-10 (Mortality)
Colorectal	C18–C20,C26.0	C18–C20,C26.0
Colon		C18
Right Colon	C18.0,C18.2–.5	
Left Colon	C18.6,C18.7	
Rectum	C19.9,C20.9	C19–C20
Other & Not Otherwise Specified	C18.1,C18.8,C18.9,C26.0	C26.0

Note: ICD-O-3 refers to the *International Classification of Diseases for Oncology, Third Edition*.[59] ICD-10 refers to the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision.*[60]

APPENDIX III: PREVIOUS SPECIAL TOPICS

Previous special topics are available at www.cancer.ca/statistics. In past years, special topics included the following:

2010	End-of-life care
	Cancer in depth: Esophagus cancer
	Cancer in depth: Kidney cancer
2009	Cancer in adolescents and young adults (15–29 years)
2008	Childhood cancer (ages 0–14)
2007	Breast cancer
2006	Progress in cancer control: screening
2005	Progress in cancer prevention: modifiable risk factors
2004	International variation in cancer incidence, 1993–1997
	Economic burden of cancer in Canada, 1998
2003	Non-Hodgkin's lymphoma
2002	Cancer incidence in young adults
	Five-year relative cancer survival in Canada, 1992
2001	Colorectal cancer
2000	Progress in cancer control
1999	Factors contributing to the population burden of cancer incidence and mortality
	A new national cancer surveillance system for Canada
1998	International comparisons
1997	Ten years of Canadian cancer statistics
1996	Prostate cancer
	Direct costs of cancer in Canada, 1993
	Evaluation of cancer estimates: 1987–1991
1995	Prevalence of cancer
	Colorectal cancer
1993	Female breast cancer
1991	Smoking and lung cancer
	Cancer among the Inuit and Indians
1990	Cancer of the female breast and genital organs – recent trends
	Hodgkin's disease and cancer of the testis
	Cancer mortality by income quintile
	Economic cost of illness in Canada
	Cancer control
1989	Cancer incidence and mortality: an international comparison
1988	Tobacco consumption from smoking and mortality from lung cancer
	Cancer mortality: an international comparison

Age

The age of the person with cancer at the time of diagnosis or death.

Age-standardized incidence rate (ASIR)

The incidence rate that would have occurred if the age distribution in the population of interest was the same as that of the standard. It is generally expressed per 100,000 population at risk per year. It can be calculated for all ages combined or for specific broad age groups (generally age groupings of greater than 10 years). It is calculated as a weighted average of the actual age-specific rates, where the weights are the proportions of persons in the corresponding age groups of a standard population. In Canada, we use the 1991 Canadian population (males and females combined) as standard. The potential confounding effect of age is reduced when comparing age-standardized rates computed using the same standard population.

Age-standardized mortality rate (ASMR)

The mortality rate that would have occurred if the age distribution in the population of interest was the same as that of the standard. It is generally expressed per 100,000 population at risk per year. It can be calculated for all ages combined or for specific broad age groups (generally age groupings of greater than 10 years). It is calculated as a weighted average of the actual age-specific rates, where the weights are the proportions of persons in the corresponding age groups of a standard population. In Canada, we use the 1991 Canadian population (males and females combined) as standard. The potential confounding effect of age is reduced when comparing age-standardized rates computed using the same standard population.

Age-standardized relative survival ratio

The all-ages survival estimate that would have occurred if the age distribution of the cancer group under study had been the same as that of the standard population (i.e., all persons who were diagnosed with that cancer in Canada between 1992 and 2001). Age-standardization permits relative survival ratios to be compared across jurisdictions or over time, independent of differences in age distributions of cancer cases.

Annual percent change (APC)

The estimated change in the rate of new cases (incidence) or deaths (mortality) from one year to the next over some period of time, reported as a percentage. It is estimated by fitting a linear model to logarithmically transformed annual rates, assuming that the rate is changing over the modelled period of time as a constant percentage of the rate of the previous year.

Conditional survival

The probability of surviving an additional number of years given that the person has already survived a fixed number of years since diagnosis. Conditional five-year relative survival expresses the likelihood of surviving five years into the future at various points since the time of diagnosis, relative to the expected survival of people with similar characteristics (e.g., sex, age, area of residence) in the general population.

ICCC-3

International Classification of Childhood Cancer, Third Edition.[12] This system accounts for the important differences between types of cancer common during childhood and those of adulthood, and it is more appropriate and informative than the ICD-O-3 for reporting childhood cancers.

ICD-10

International Statistical Classification of Diseases and Related Health Problems, Tenth Revision.[60] This is a general system for classifying diseases and causes of death, including cancer.

GLOSSARY

ICD-O-3

International Classification of Diseases for Oncology, Third Edition.[59] This is the most current system specifically designed for classifying tumours. It is based on ICD-10 but encompasses both body organ where the tumour arose and its morphologic type.

Incidence (new cases)

The total number of new cases of cancer diagnosed in a given population during a specific period of time. This counts the cancers, not the number of people; a person can have more than one cancer.

Incidence rate

The number of new cancer cases (of all types or of a specific site or type) occurring in a given population during a year, usually expressed as the number of cancers per 100,000 population at risk. It is calculated as the number of new cases divided by the population size, then multiplied by 100,000. It can be calculated for all ages combined or for specific age groups when it is referred to as an age-specific rate.

Mortality (deaths)

The number of deaths due to cancer in a given population during a specific period of time, regardless of when the diagnosis of cancer was made (e.g., during or prior to the period of interest, or at the time of death).

Mortality rate

The number of cancer deaths (of all types or of a specific site or type) occurring in a given population during a year, usually expressed as the number of cancer deaths per 100,000 population at risk. It is calculated as the number of deaths divided by the population size, then multiplied by 100,000. It can be calculated for all ages combined or for specific age groups when it is referred to as an age-specific rate.

Observed survival proportion (OSP)

The proportion of people with cancer who are alive after a given length of time (e.g., five years) since diagnosis.

Person-based prevalence

Prevalence based on the number of people with a prior diagnosis of cancer who are alive on the index date.

Prevalence (limited duration)

The number of new or pre-existing cancer cases or people with cancer in a given population who are alive on a specific date (index date). Limited duration represents the number of cases or people alive on a certain day with a cancer diagnosis within a certain number of years (e.g., 10).

Probability of developing or dying from cancer

The chance a person has of developing or dying from cancer over some period of life. It can be calculated as lifetime probability or can be age- and duration-specific (e.g., the probability at age 30 of developing cancer within the next 10 years). It is generally expressed as either a percentage or as a "one in *x* chance." It is calculated by applying current cancer incidence and mortality rates to a hypothetical cohort of persons free of disease at the beginning of the age range of interest.

Province/territory

The province or territory of the person's permanent residence at the time of cancer diagnosis or death. This may not be the same location as where the new case of cancer or the cancer death was registered, or where treatment was delivered.

Relative survival ratio (RSR)

A measure of the impact of cancer on life expectancy. It is estimated by the ratio of the observed survival for a group of persons diagnosed with cancer to the survival that would be expected for members of the general population, assumed to be practically free of the cancer of interest, who have the same main non-tumour characteristics affecting survival (e.g., sex, age, area of residence) as those with cancer. Estimates of the relative survival ratio greater than 100% are possible and indicate that the observed survival of the people with cancer is better than that expected for the general population.

Tumour-based prevalence

Prevalence based on the number of cancers among people who are alive on the index date.

1991 Canadian Standard Population

Age Group	Population (per 100,000)
0–4	6,946.4
5–9	6,945.4
10–14	6,803.4
15–19	6,849.5
20–24	7,501.6
25–29	8,994.4
30–34	9,240.0
35–39	8,338.8
40–44	7,606.3
45–49	5,953.6
50–54	4,764.9
55–59	4,404.1
60–64	4,232.6
65–69	3,857.0
70–74	2,965.9
75–79	2,212.7
80–84	1,359.5
85+	1,023.7
Total	100,000

Note: The Canadian population distribution is based on the final postcensal estimates of the July 1, 1991, Canadian population, adjusted for census undercoverage. The age distribution of the population has been weighted and normalized.

Data source: Census and Demographics Branch, Statistics Canada

REFERENCES

1. Brisson J, Major D, Pelletier E. *Evaluation of the completeness of the Fichier des tumeurs du Québec*. Institut national de la santé publique du Québec; 2003.
2. Statistics Canada. *Population Projections for Canada, Provinces and Territories 2009 to 2036*. Catalogue no. 91-520-X. Ottawa, ON: Minister of Industry; 2010. Available at: http://www.statcan.gc.ca/pub/91-520-x/91-520-x2010001-eng.htm (accessed Jan 3, 2011).
3. Health Canada. Canadian Tobacco Use Monitoring Survey (CTUMS) 2009. Available at: http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/ctums-esutc_2009-eng.php (accessed Dec 13, 2010).
4. Bray F, McCarron P, Parkin DM. *The changing global patterns of female breast cancer incidence and mortality*. Breast Cancer Res 2004;6(6):229–239.
5. Health Canada. Canadian Alcohol and Drug Use Monitoring Survey (CADUMS) 2009. Available at: http://www.hc-sc.gc.ca/hc-ps/drugs-drogues/stat/_2009/summary-sommaire-eng.php#alc (accessed Jan 3, 2011).
6. El-Serag HB, Davila JA, Petersen NJ, et al. *The continuing increase in the incidence of hepatocellular carcinoma in the United States*: *an update.* Ann Intern Med 2003;139:817–823.
7. Nordenstedt H, White DL, El-Serag HB. *The changing pattern of epidemiology in hepatocellular carcinoma.* Dig Liver Dis 2010 Jul;42 Suppl 3:S206–S214.
8. Andriole GL, Crawford ED, Grubb RL 3rd, Buys SS, Chia D, Church TR, et al. *Mortality results from a randomized prostate-cancer screening trial.* N Engl J Med 2009;360(13):1310–1319.
9. Schröder 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;360(13):1320–1328.
10. Kent WD, Hall SF, Isotalo PA, Houlden RL, George RL, Groome PA. *Increased incidence of differentiated thyroid carcinoma and detection of subclinical disease*. CMAJ 2007;177:1357–1361.
11. Oeffinger KC, Eshelman DA, Tomlinson GE, Buchanan GR, Foster BM. *Grading of late effects in young adult survivors of childhood cancer followed in an ambulatory adult setting.* Cancer 2000;88:1687–1695.
12. Steliarova-Foucher E, Stiller CA, Lacour B, Kaatsch P. *International classification of childhood cancer, third edition.* Cancer 2005;103:1457–1467.
13. Du WB, Chia KS, Sankaranarayanan R, Sankila R, Seow A, Lee HP. *Population-based survival analysis of colorectal cancer patients in Singapore, 1968-1992*. Int J Cancer 2002;99:460–465.
14. Dickman PW, Adami HO. *Interpreting trends in cancer patient survival*. J Int Med 2006;260:103–117.
15. Ederer F, Axtell LM, Cutler SJ. *The relative survival rate: a statistical methodology.* Natl Cancer Inst Monogr 1961;6:101–121.
16. Black RJ, Sankaranarayanan R, Parkin DM. Interpretation of population-based cancer survival data. In: Sankaranarayanan R, Black RJ, Parkin DM, editors. *Cancer Survival in Developing Countries.* IARC Scientific Publication no. 145. Lyon, France: International Agency for Research on Cancer; 1998.

17. 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 2004;15:903–910.

18. Ellison LF, Gibbons L. *Survival from cancer – up-to-date predictions using period analysis.* Health Rep 2006;17:19–30.

19. Ellison LF, Wilkins K. *An update on cancer survival*. Health Rep 2010;21(3):55–60.

20. Statistics Canada. *Cancer Survival Statistics.* Catalogue no. 82-226-X. Ottawa, ON: Minister of Industry; 2011. Available at: http://www.statcan.gc.ca/pub/82-226-x/82-226-x2011001-eng.htm (accessed Feb 15, 2011).

21. De Angelis R, Grande E, Inghelmann R, et al. *Cancer prevalence estimates in Italy from 1970 to 2010.* Tumori 2007;93:392–397.

22. Micheli A, Mugno E, Krogh V, et al. *Cancer prevalence in European registry areas*. Ann Oncol 2002;13:840–865.

23. Statistics Canada. *Cancer Incidence in Canada, 2007 and 2008*. Catalogue no. 82-231-X. Ottawa, ON: Minister of Industry; 2010. Available at: http://www.statcan.gc.ca/pub/82-231-x/82-231-x2009001-eng.htm (accessed Jan 3, 2011).

24. Jessup JM, Gallick GE. *The biology of colorectal carcinoma*. Curr Probl Cancer 1992 Sep-Oct;16(5):261–328.

25. Center MM, Jemal A, Smith RA, Ward E. *Worldwide variations in colorectal cancer.* CA Cancer J Clin 2009 Nov-Dec;59(6):366–378.

26. Marchand LL. *Combined influence of genetic and dietary factors on colorectal cancer incidence in Japanese Americans*. J Natl Cancer Inst Monogr 1999(26):101–105.

27. Koyama Y, Kotake K. *Overview of colorectal cancer in Japan: report from the Registry of the Japanese Society for Cancer of the Colon and Rectum*. Dis Colon Rectum 1997 Oct;40(10 Suppl):S2–S9.

28. Green RC, Green JS, Buehler SK, Robb JD, Daftary D, Gallinger S, et al. *Very high incidence of familial colorectal cancer in Newfoundland: a comparison with Ontario and 13 other population-based studies.* Fam Cancer 2007;6(1):53–62.

29. Mason JB, Dickstein A, Jacques PF, Haggarty P, Selhub J, Dallal G, et al. A temporal association between folic acid fortification and an increase in colorectal cancer rates may be illuminating important biological principles: a hypothesis. Cancer Epidemiol Biomarkers Prev 2007 Jul;16(7):1325-9.

30. Iacopetta B. *Are there two sides to colorectal cancer?* Int J Cancer 2002;101(5):403-8.

31. National Cancer Institute. Surveillance Epidemiology and End Results (SEER). *SEER Stat Fact Sheets: Colon and Rectum.* Available at: http://seer.cancer.gov/statfacts/html/colorect.html#survival (accessed Dec 13, 2010).

32. Canadian Cancer Society. *Causes of colorectal cancer.* Available at: www.cancer.ca/Canada-wide/About%20cancer/Types%20of%20cancer/Causes%20of%20colorectal%20cancer.aspx?sc_lang=en (accessed Dec 13, 2010).

33. Public Health Agency of Canada. *Colorectal Cancer.* Available at: www.phac-aspc.gc.ca/cd-mc/cancer/colorectal_cancer-cancer_colorectal-eng.php (accessed Dec 13, 2010).

34. Liang PS, Chen TY, Giovannucci E. *Cigarette smoking and colorectal cancer incidence and mortality: systematic review and meta-analysis.* Int J Cancer 2009 May 15;124(10):2406–2415.

REFERENCES

35. Dube C, Rostom A, Lewin G, Tsertsvadze A, Barrowman N, Code C, et al. *The use of aspirin for primary prevention of colorectal cancer: a systematic review prepared for the U.S. Preventive Services Task Force.* Ann Intern Med 2007 Mar 6;146(5):365–375.

36. Rostom A, Dube C, Lewin G, Tsertsvadze A, Barrowman N, Code C, et al. *Nonsteroidal anti-inflammatory drugs and cyclooxygenase-2 inhibitors for primary prevention of colorectal cancer: a systematic review prepared for the U.S. Preventive Services Task Force.* Ann Intern Med 2007 Mar 6;146(5):376–389.

37. Hildebrand JS, Jacobs EJ, Campbell PT, McCullough ML, Teras LR, Thun MJ, et al. C*olorectal cancer incidence and postmenopausal hormone use by type, recency, and duration in cancer prevention study II.* Cancer Epidemiol Biomarkers Prev 2009 Nov;18(11):2835–2841.

38. World Cancer Research Fund, American Institute for Cancer Research. *Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective.* Washington, DC: American Institute for Cancer Research 2007.

39. 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 2009 Feb 1;116(3):544–573.

40. Mandel JS, Church TR, Ederer F, Bond JH. *Colorectal cancer mortality: effectiveness of biennial screening for fecal occult blood.* J Natl Cancer Inst 1999 Mar 3;91(5):434–437.

41. Jorgensen OD, Kronborg O, Fenger C. *A randomised study of screening for colorectal cancer using faecal occult blood testing: results after 13 years and seven biennial screening rounds.* Gut 2002 Jan;50(1):29–32.

42. Canadian Partnership Against Cancer. Cancer Risk Management Model. Available at http://www.cancerriskmgmt.ca/ (accessed March 18, 2011).

43. National Committee on Colorectal Cancer Screening. 2002 Available at: www.phac-aspc.gc.ca/publicat/ncccs-cndcc/ (accessed Dec 13, 2010).

44. Smith RA, Cokkinides V, Brawley OW. *Cancer screening in the United States, 2009: a review of current American Cancer Society guidelines and issues in cancer screening.* CA Cancer J Clin 2009 Jan-Feb;59(1):27–41.

45. De Grasse CE, O'Connor AM, Boulet J, Edwards N, Bryant H, Breithaupt K. *Changes in Canadian women's mammography rates since the implementation of mass screening programs.* Am J Public Health 1999 Jun;89(6):927–929.

46. *The Colon Cancer Screening in Canada* survey, commissioned by the Canadian Partnership Against Cancer's National Colorectal Cancer Screening Network. Conducted by Angus Reid Public Opinion in partnership with The Applied Health Research Centre at St. Michael's Hospital in Toronto, released January 2010.

47. Cunningham D, Atkin W, Lenz HJ, Lynch HT, Minsky B, Nordlinger B, et al. *Colorectal cancer*. Lancet 2010 Mar 20;375(9719):1030–1047.

48. Coleman MP, Quaresma M, Berrino F, Lutz JM, De Angelis R, Capocaccia R, et al. *Cancer survival in five continents: a worldwide population-based study (CONCORD)*. Lancet Oncol 2008 Aug;9(8):730–756.

49. Figueredo A, Rumble RB, Maroun J, Earle CC, Cummings B, McLeod R, et al. *Follow-up of patients with curatively resected colorectal cancer: a practice guideline.* BMC Cancer 2003 Oct 6;3:26.

50. Jeffery M, Hickey BE, Hider PN. *Follow-up strategies for patients treated for non-metastatic colorectal cancer.* Cochrane Database Syst Rev 2007(1):CD002200.

51. Renehan AG, Egger M, Saunders MP, O'Dwyer ST. *Impact on survival of intensive follow up after curative resection for colorectal cancer: systematic review and meta-analysis of randomised trials.* Br Med J 2002 Apr 6;324(7341):813.

52. Sisler J, Seo B, Katz A, Shu E, Chateau D, Czaykowski P. *Using administrative data to describe adherence to colon cancer follow-up testing in Manitoba, Canada.* J Clin Oncol 2010;28(15 suppl):abstract 6079.

53. Cooper GS, Kou TD, Reynolds HL Jr. *Receipt of guideline-recommended follow-up in older colorectal cancer survivors: a population-based analysis.* Cancer 2008 Oct 15;113(8):2029–2037.

54. Cheung WY, Pond GR, Rother M, Krzyzanowska MK, Swallow C, Brierley J, et al. *Adherence to surveillance guidelines after curative resection for stage II/III colorectal cancer.* Clin Colorectal Cancer 2008 May;7(3):191–196.

55. Spratlin JL, Hui D, Hanson J, Butts C, Au HJ. *Community compliance with carcinoembryonic antigen: follow-up of patients with colorectal cancer.* Clin Colorectal Cancer 2008 Mar;7(2):118–125.

56. Grunfeld E, Earle CC. *The interface between primary and oncology specialty care: treatment through survivorship.* J Natl Cancer Inst Monogr 2010;2010(40):25–30.

57. Canadian Task Force on Preventive Health Care. Colorectal Cancer Screening. 2001. Available at: http://www.canadiantaskforce.ca/recommendations/2001_03_eng.html (accessed Dec 13, 2010).

58. Ellison LF, Bryant H, Lockwood G, Shack L. *Conditional survival analyses across cancer sites.* Health Rep (in press).

59. Fritz A, Jack A, Parkin DM, et al., editors. *International Classification of Diseases for Oncology. Third Edition.* Geneva, Switzerland: World Health Organization; 2000.

60. World Health Organization. *International Statistical Classification of Diseases and Related Health Problems*. *Tenth Revision.* Volumes 1 to 3. Geneva, Switzerland: World Health Organization; 1992.

61. Statistics Canada. *Causes of Death*. Catalogue no. 84-208-X. Ottawa, ON: Minister of Industry; 2010. Available at: http://www.statcan.gc.ca/pub/84-208-x/84-208-x2010001-eng.htm (accessed Jan 4, 2011).

62. Statistics Canada. *Demographic Estimates Compendium 2009*. Ottawa, ON: Minister of Industry; 2009. CANSIM table 051-0001 released on November 27, 2009.

63. Millar WJ, David P. *Life Tables, Canada and the Provinces, 1990–1992*. Statistics Canada Catalogue no. 84-537-X. Ottawa, ON: Minister of Industry; 1995.

64. Duchesne D, Tully P, Thomas B, Bourbeau R. *Life Tables, Canada, Provinces and Territories, 1995-1997*. Statistics Canada Catalogue no. 84-537-X. Ottawa, ON: Minister of Industry; 2002. Available at: http://www.statcan.gc.ca/pub/84-537-x/84-537-x1997001-eng.htm (accessed Jan 4, 2011).

65. Statistics Canada. *Life Tables, Canada, Provinces and Territories, 2000-2002.* Catalogue no. 84-537-X. Ottawa, ON: Minister of Industry; 2006. Available at: http://www.statcan.gc.ca/pub/84-537-x/84-537-x2006001-eng.htm (accessed Jan 4, 2011).

REFERENCES

66. Dickman PW, Auvinen A, Voutilainen ET, Hakulinen T. *Measuring social class differences in cancer patient survival: Is it necessary to control for social classdifferences in general population mortality? A Finnish population-based study.* J Epidemiol Community Health 1998;52:727–734.

67. Zdeb MS. *The probability of developing cancer*. Am J Epidemiol 1977;106:6–16.

68. Seidman H, Silverberg BS, Bodden A. *Probabilities of eventually developing and dying of cancer. Risk among persons previously undiagnosed with cancer*. CA Cancer J Clin 1978;28:33–46.

69. Brenner H, Hakulinen T. *Patients with previous cancer should not be excluded in international comparative cancer survival studies.* Int J Cancer 2007;121:2274–2278.

70. Rosso S, De Angelis R, Ciccolallo L, et al. *Multiple tumours in survival estimates*. Eur J Cancer 2009;45:1080–1094.

71. Ellison LF. *Measuring the effect of including multiple cancers in survival analyses using data from the Canadian Cancer Registry.* Cancer Epidemiol 2010;34:550–555.

72. Dickman PW. *Population-based cancer survival analysis*. 2000.Available at: http://www.pauldickman.com/book/chapter1.pdf (accessed Jan 4, 2011).

73. Ederer F, Heise H. *The effect of eliminating deaths from cancer on general population survival rates, methodological note 11, End Results Evaluation section*. National Cancer Institute; August 1959.

74. Ellison LF. *An empirical evaluation of period survival analysis using data from the Canadian Cancer Registry*. Ann Epidemiol 2006;16:191–196.

75. Henson DE, Ries LA. *On the estimation of survival.* Semin Surg Oncol 1994;10(1):2–6.

76. Greenwood M. *The Errors of Sampling of the Survivorship Table, Volume 33 of Reports on Public Health and Medical Subjects.* London, UK: Her Majesty's Stationery Office; 1926.

77. Feldman AR, Kessler L, Myers MH, Naughton MD. *The prevalence of cancer. Estimates based upon the Connecticut Tumor Registry.* N Engl J Med 1986;315:1394–1397.

78. Gail MH, Kessler L, Midthune D. Scoopa S. *Two approaches for estimating disease prevalence from population-based registries of incidence and total mortality.* Biometrics 1999;55:1137–1144.

79. Ellison LF, Gibbons L, and the Canadian Cancer Survival Analysis Group. *Five-year relative survival from prostate, breast, colorectal and lung cancer.* Health Rep 2001;13(1):23–34.

80. Ellison LF, Wilkins K. *Cancer prevalence in the Canadian population.* Health Rep 2009;20(1):7–14.

FOR FURTHER INFORMATION

Data contained in this publication and additional information are available from the following:

- Canadian Cancer Society
  www.cancer.ca
- Public Health Agency of Canada
  www.phac-aspc.gc.ca (select surveillance)
- Statistics Canada
  www.statcan.gc.ca (search "cancer")

Additional information related to this publication can be found in other print sources, including the following:

- reports from provincial and territorial cancer registries
- *Cancer Incidence in Canada*,[23] *Cancer Survival Statistics*[20] and *Health Reports*, published by Statistics Canada
- *Chronic Diseases in Canada,* published by Health Canada/Public Health Agency of Canada
- a collaborative monograph entitled *Cancer in North America*: *2003–2007,* published by the North American Association of Central Cancer Registries in May 2010 and available at: http://www.naaccr.org/DataandPublications/CINAPubs.aspx.
- Cancer Incidence in Five Continents, published by the International Agency for Research on Cancer in 2007 and available at: http://www.iarc.fr/en/publications/pdfs-online/epi/sp160/index.php.

Information from the Canadian Cancer Society
For general information about cancer statistics or any other aspect of cancer (such as cancer prevention, screening, diagnosis, treatment or care), contact the Canadian Cancer Society's ***Cancer Information Service*** **at 1 888 939-3333**. Contact information for the Canadian Cancer Society, National, and divisions is provided on page 130. Your local Canadian Cancer Society office is listed in the white pages of the telephone directory.

For information about cancer research funded by the **Canadian Cancer Society Research Institute,** contact the Canadian Cancer Society, National, at the address provided on page 130.

Information from the Public Health Agency of Canada
More detailed information on methodology is available from the Surveillance Division, CCDPC, Public Health Agency of Canada, 785 Carling Avenue, Ottawa, Ontario, K1A 0K9. Tel: (613) 957-9646, Fax: (613) 941-2057.

Chronic Disease Infobase Cubes (www.infobase.phac-aspc.gc.ca) is an interactive online tool for easy access to cancer surveillance data. It allows you to generate tables, chart and maps according to a choice of parameters, such as cancer type, geographic area and period of time.

Information from Statistics Canada
Detailed standard tables are available on the Statistics Canada website (www.statcan.gc.ca). Custom tabulations are available on a cost recovery basis upon request from the Health Statistics Division, Statistics Canada, National Enquiries Line: 1 800 263-1136 or the Health Statistics Division: (613) 952-5176. Analytical articles appear regularly in *Health Reports,* Statistics Canada, Catalogue no. 82-003. Catalogue no. 82-003. www.statcan.gc.ca/bsolc/olc-cel/olc-cel?catno=82-003-x&lang=eng

Information from the provincial or territorial cancer registries
Cancer incidence data are supplied to Statistics Canada by provincial and territorial cancer registries. Detailed information regarding the statistics for each province or territory is available from the relevant registry (see pages 128–129 for contact information).

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Incidence and mortality by age and sex	❑	❑	❑
Time trends in incidence and mortality	❑	❑	❑
Incidence, mortality and survival in children and youth (0–19 years)	❑	❑	❑
Probability of developing or dying from cancer	❑	❑	❑
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Tim Catterall
In November 2004, Tim Catterall, a firefighter for the Burlington, Ontario Fire Department, was diagnosed with chronic lymphocytic leukemia. He took a stand and created Firefighters Against Cancer's Existence.
Photography: Caitlin den Boer

Deanne
After being diagnosed with Hodgkin's disease at age 26, Deanne was determined to survive. She would joke, "I have to keep living: I haven't found the perfect shade of purple nail polish yet!"
Photography: Sheilagh O'Leary

Eddie
Photographer Larry Frank was Eddie's peer support volunteer. They met through Cancer Connection, a division of the Canadian Cancer Society. The two spoke regularly during the two years following Eddie's cancer diagnosis, while he underwent surgery and radiation. Eddie is now well and looking forward to a healthy life with his wife Tara and young daughter.
Photography: Larry Frank

Dan Blackburn
The photographer took this image of her Uncle Dan, who has a passion for cooking, sitting peacefully in his kitchen in December 2007. He was receiving chemotherapy, having been diagnosed with colon cancer four months earlier. Sadly, he passed away in March 2008.
Photography: Kendra Vamplew

Evan Pickard
Throughout his battle with cancer, Evan Pickard's heart was continuously open to others, making everyone around him laugh. He died in April 2007, leaving behind endless hearts touched by his sincere generosity.
Photography: Jennifer Globush

Francilla Charles
Francilla Charles has been diagnosed twice with pancreatic cancer and survived for 10 years and counting. She now lives with diabetes and continues to inspire and amaze her daughter, photographer Michele Clarke.
Photography: Michele Clarke

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