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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 offer ideas on how the report can be improved please complete the *Evaluation and Order Form* or email stats@cancer.ca.

Additional copies may be requested from Divisions of the Canadian Cancer Society or by calling Cancer Information Service 1 888 939-3333 (see *For Further Information*).

La version française de cette publication est disponible sur demande.

Estimates for Cancer Incidence and Mortality

- An estimated 166,400 new cases of cancer and 73,800 deaths from cancer will occur in Canada in 2008.
- Three types of cancer account for the majority of new cases in each sex: prostate, lung and colorectal in males and breast, lung and colorectal in females.
- Lung cancer remains the leading cause of cancer death for both men and women.
- Overall, colorectal cancer is the second leading cause of death from cancer.

Geographic Patterns of Cancer Occurrence

- Generally, both incidence and mortality rates are higher in Atlantic Canada and Quebec and lowest in British Columbia.
- Incidence rates among both sexes and mortality rates among females are relatively high in Manitoba.
- Generally, incidence and mortality rates in Ontario are lower than the national average.
- Lung cancer incidence and mortality rates continue to be higher in Quebec and New Brunswick (with the exception of mortality among females in New Brunswick) and lower in British Columbia.

Trends in Incidence and Mortality

- The increased number of new cases of cancer, exclusive of non-melanoma skin cancers, is primarily due to a growing and aging population.
- Between 1995 and 2004, incidence rates rose by more than 5% per year for thyroid cancer in both sexes.
- Liver cancer in males rose by more than 2% per year in the same time frame.
- Between 1995 and 2004, incidence rates declined by 2% or more per year for lung cancer in males (since 1999), stomach and larynx cancers in both sexes and for females, brain cancer (since 2000) and cervical cancer.
- Excluding lung cancer, cancer mortality rates have dropped by 20% in women since 1979.

Age and Sex Distribution of Cancer

- 42% of new cancer cases and 60% of deaths due to cancer occur among those who are at least 70 years old.
- 30% of new cancer cases and 18% of cancer deaths will occur in young and middle-aged adults ages 20-59 in their most productive stage of life.
- Cancer incidence is rising in young women ages 20-39.
- Mortality is declining for males at all ages and for females under 70. Declines are most rapid in children and adolescents (ages 0-19).

HIGHLIGHTS

Probability of Developing/Dying from Cancer

- On the basis of current incidence rates, almost 40% of Canadian women and almost 45% of men will develop cancer during their lifetimes.
- On the basis of current mortality rates, 24% of women and almost 29% of men, or approximately 1 out of every 4 Canadians, will die from cancer.

Prevalence

- In 2004, 2.5% of Canadian men and 2.8% of Canadian women had a diagnosis of cancer in the previous 15 years.
- 1.0% of the female population are survivors of breast cancer, and 0.8% of the male population are survivors of prostate cancer, diagnosed within the previous 15 years.

Five-year Relative Cancer Survival

- Relative survival ratios were highest for thyroid, testicular, prostate cancer, and melanoma.
- Relative survival ratios were lowest for pancreatic, esophageal, lung, and liver cancer.
- Relative survival for lung cancer tends to decline with increasing age.

Childhood Cancer (Ages 0-14)

- Approximately 850 Canadian children aged 0-14 develop cancer each year, but due to the successful treatment of the most common cancers, the number of deaths is one-sixth the number of cases.
- While the cancer incidence rate in children has been relatively constant since 1985, the cancer mortality rate continues to decline.
- Although childhood cancer is rare, it remains of significant public health importance.
- The dramatic improvement in childhood cancer survival has been ascribed to several factors: better diagnostic procedures, the development of multi-modal therapies, and the centralization of care and support services.
- In Canada, nearly 80% of children with cancer are either enrolled in a clinical trial or treated according to a registered protocol established by a clinical trial.
- Improving survival in childhood cancer (now at 82%), places increasing need for long term follow-up of late effects.

This publication, which is part of an annual series that began in 1987, has been developed by members of the Canadian Cancer Statistics Steering Committee, supported by the National Cancer Institute of Canada. The Steering Committee is responsible for developing content, reviewing statistical information, interpreting the data and writing the text. The Steering Committee includes representatives of the National Cancer Institute of Canada, the Canadian Cancer Society, Public Health Agency of Canada (PHAC), Statistics Canada, the Canadian Council of Cancer Registries, the Canadian Association of Provincial Cancer Agencies, as well as university-based and provincial/territorial cancer agency researchers. Information about the purpose, preparation, production and distribution of this publication, which is possible only because of collaboration amongst the organizations represented on the Steering Committee, is noted below.

Purpose and intended audiences

The main purpose of this annual publication is to provide detailed information regarding incidence and mortality of the most common types of cancer by age, sex, time period and province/territory for health professionals, researchers and policy makers. These data may stimulate new research and assist decision-making and priority-setting processes at the individual, community, provincial/territorial and national levels. This report is also used by educators, the media and members of the public with an interest in cancer.

Data Sources (for additional information see *Appendix II: Methods*)

The Canadian Cancer Registry (CCR), National Cancer Incidence Reporting System (NCIRS) and mortality data files are maintained in Health Statistics Division, Statistics Canada. A description of these primary data sources and how they are used follows. Statistics Canada also provides the population counts and estimates and life tables needed to calculate a number of the measures used in this publication.

Incidence

- Incidence data collected by provincial and territorial cancer registries are reported to the CCR, beginning with cases diagnosed in 1992. The CCR is regularly updated; it is internally linked to track patients with tumours diagnosed in more than one province/territory, and its records are linked to death certificates, which reduces duplication to a negligible rate. The CCR evolved from the National Cancer Incidence Reporting System, which contains incidence data from 1969 to 1991.
- Cancers included in this report are defined according to the groupings listed in the *Glossary: Cancer Definitions* unless otherwise noted.
- Although every effort is made by the Canadian Council of Cancer Registries and its Standing Committee on Data Quality to achieve uniformity in defining and classifying new cases, reporting procedures and completeness still vary across the country. The standardization of case-finding procedures, including linkage to provincial/territorial mortality files, has improved the registration of cancer cases and the data have become more comparable across the country.
- The following have been excluded from most or all of the tables and figures in this publication:

- Non-melanoma skin cancers (basal cell and squamous cell carcinomas): Most provincial/territorial cancer registries do not collect non-melanoma skin cancer incidence data. Though these cancers are common, they are difficult to register completely because they are often treated successfully in a doctor's office and generally do not require hospitalization. As a result, estimates for the country as a whole, which are based on data provided by the B.C. Cancer Agency, CancerCare Manitoba and the Department of Health, New Brunswick, are shown only in Table 1. A change in the method of estimating the incidence of non-melanoma skin cancer was introduced in the 2006 publication, so comparisons with years prior to this change should be made with caution.
- Benign tumours and carcinomas in situ (except for in situ carcinomas of the bladder) are excluded from all counts.

Mortality

- Cancer mortality statistics are derived from death records maintained by the provincial/territorial registrars of vital statistics for people residing in that province or territory at the time of death.
- Cancer deaths are those attributed to some form of cancer as the underlying cause of death by the certifying physician.
- 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 the type of cancer provided on the death certificate is usually less accurate than that obtained by the cancer registries from hospital and pathology records.

Actual and Estimated Data

It is important to emphasize that the information provided in this publication includes both actual and estimated data:

- Incidence data for 2005 were not available from the province of Quebec because their data were not submitted to the CCR in a timely manner; the corresponding data from the provinces of Manitoba and Alberta were deemed too provisional for use in this publication. Incidence data for the period 2006-2008 (as well as 2005 for Quebec, Manitoba and Alberta) are estimated.
- For 2003 and 2004 Ontario "death certificate only" cases (the only source of information about the case was a death certificate), numbers were obtained directly from the Ontario Cancer Registry as these were not available in the CCR for the June 2007 release. Ontario 2005 actual incidence data as received did not include death certificate only (DCO) cases. As a result, estimated numbers of DCO cases, based on 2004 data, were added to actual numbers for purposes of projections.
- Actual mortality data to 2004 are available for all provinces/territories and are estimated for the period 2005-2008.
- Incidence and mortality data for years beyond the last year of actual data, are estimated by projecting forward, based on long term trends in incidence rates (since 1986 for all cancers except prostate cancer, where the trend from 1991 is used) and projected populations. This means that a recent major change in long-term trend may not be reflected in projected rates.

Review and Analysis

- The Chronic Disease Surveillance Division, Centre for Chronic Disease Prevention and Control (CCDCP), PHAC, conducted the data analysis for most of the sections. Chris Waters provided technical and analytical support. Tables and figures were updated by Bob McRae.
- Provincial and territorial cancer registries reviewed the cancer estimates for incidence and mortality data for their own jurisdictions before publication in this report (the results of their input are noted in Table A7).
- The French translation of this publication was reviewed by Michel Beaupré of the Fichier des tumeurs du Québec and Jean-Marc Daigle of the Institut National de Santé Publique du Québec.

Special Topic

- This year's Special Topic is Childhood Cancer (Ages 0 to 14). Comments on early drafts were provided by the following external reviewers:
  - Members of The Council of Canadian Pediatric Hematology/Oncology Directors, now known as the C^{17} Council, including Dr. Mark Bernstein, Dr. Paul Grundy, Dr. Lawrence Jardin, Dr. Rod Rassekh, Dr. Paul Rogers, and Dr. Yvan Samson; and Dr. Rod Rassekh and Louise Parker PhD.
  - Ms. Kathy Brodeur-Robb of the C^{17} Research Network.
- Ms. Amanda Shaw of the Public Health Agency of Canada, assisted with the writing of the late effects summary, reviewed this section and provided helpful comments.
- For a complete list of previous special topics please refer to *Appendix III*.
- Copies of previous years' special topics are available online (1997 to 2008) or in hard copy form on request (write to stats@cancer.ca).

Production and distribution

The National Cancer Institute of Canada and Canadian Cancer Society supports the production, printing and distribution of this publication, with charitable funds collected by the Canadian Cancer Society. Candice Anderson and Monika Dixon coordinated the process, and provided administrative support from initial planning to the distribution of the publication.

How to access the contents of this publication

Electronic copies of this publication in English and French and some additional statistical information not included in this publication are available in PDF format on the Canadian Cancer Society's website www.cancer.ca. PowerPoint versions of the figures from the 2007 publication onwards are also available at www.cancer.ca. This material may be used without permission; please refer to the front of the publication for proper citation information.

Individuals who require additional information can refer to the section entitled *For Further Information.*

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ESTIMATES FOR CANCER INCIDENCE AND MORTALITY

The importance of different types of cancer in Canada in 2008 can be measured in two ways, as shown in Table 1. Incidence is expressed as the number of new cases of a given type of cancer diagnosed per year. Mortality is expressed as the number of deaths attributed to a particular type of cancer during the year.

An estimated 166,400 new cases of cancer and 73,800 deaths from cancer will occur in Canada in 2008. Men outnumber women for both new cases and deaths, by 9.6% for incidence and 11% for mortality (Table 1).

A change in this year's publication is the addition of the estimated number of non-melanoma skin cancers (basal cell and squamous cell carcinomas) to Table 1. These cancers comprise 73,000 cases in total and 260 deaths. They have been included in the table for completeness because they represent the most common form of cancer, although they account for very few deaths.

Not counting non-melanoma skin cancers, three types of cancer account for at least 55% of new cases in each sex: prostate, lung, and colorectal cancers in males, and breast, lung, and colorectal cancers in females. Twenty-eight percent of cancer deaths in men and 26% in women are due to lung cancer alone (Figures 1.1 and 1.2).

In Canadian women, lung cancer will continue as the leading cause of cancer death in 2008, increasing to an estimated 9,200 deaths, compared with the 5,300 deaths expected for breast cancer. This reflects the rapid increase in lung cancer mortality rates among women over the past three decades, while age-standardized breast cancer mortality rates declined slightly. Lung cancer incidence among women also continues to rise. With an estimated 11,300 new cases, lung cancer is the second leading type of cancer in women, ahead of the 9,700 new cases expected for colorectal cancer, which ranks third. Breast cancer continues to lead in incidence among Canadian women; 22,400 new cases represent twice as many new cases as lung cancer.

In Canadian men in 2008, prostate cancer will continue as the leading type of cancer, with an estimated 24,700 newly diagnosed cases, compared with 12,600 lung cancers. **Prostate cancer estimates are higher than in previous years' publications because most provinces have opted to use projections based on modeling rather than averaging** (see *Appendix II: Methods* for further details). Lung cancer will remain the leading cause of cancer death in Canadian men in 2008; the estimated 11,000 lung cancer deaths far exceed the 4,800 deaths due to colorectal cancer, the second leading cause of cancer death in men. Prostate cancer is third in mortality, causing 4,300 deaths.

Comparisons to previous editions of *Canadian Cancer Statistics* should be made with caution because of changes in cancer definitions over the years. In particular, definitions for kidney and lung cancer as well as leukemia, and multiple myeloma have changed in this edition (see *Appendix II: Methods* for further details).

The total number of lung cancer cases (men and women combined) is similar to the number of either prostate or breast cancer cases; lung cancer remains by far the leading cause of death from cancer.

Table 1

Estimated New Cases and Deaths for Cancers by Sex, Canada, 2008

	New Cases 2008 Estimates			Deaths 2008 Estimates		
	Total	M	F	Total	M	F
All Cancers	**166,400**	**87,000**	**79,400**	**73,800**	**38,800**	**35,000**
Prostate[1]	24,700	24,700	–	4,300	4,300	–
Lung*	23,900	12,600	11,300	20,200	11,000	9,200
Breast	22,600	170	22,400	5,400	50	5,300
Colorectal	21,500	11,800	9,700	8,900	4,800	4,100
Non-Hodgkin Lymphoma	7,000	3,800	3,200	3,100	1,700	1,400
Bladder[2]	6,700	5,100	1,700	1,800	1,250	530
Melanoma	4,600	2,500	2,100	910	560	350
Leukemia*	4,500	2,600	1,850	2,400	1,400	1,000
Kidney*	4,400	2,700	1,750	1,600	1,000	600
Thyroid	4,300	890	3,400	180	65	110
Body of Uterus	4,200	–	4,200	790	–	790
Pancreas	3,800	1,800	1,950	3,700	1,800	1,950
Oral	3,400	2,300	1,100	1,150	760	380
Stomach	2,900	1,850	1,000	1,850	1,150	720
Brain	2,600	1,450	1,100	1,750	1,000	740
Ovary	2,500	–	2,500	1,700	–	1,700
Multiple Myeloma*	2,100	1,150	960	1,350	730	630
Esophagus	1,600	1,200	410	1,750	1,300	430
Liver	1,550	1,200	380	680	520	150
Cervix	1,300	–	1,300	380	–	380
Larynx	1,200	1,000	220	530	440	90
Hodgkin Lymphoma	890	480	410	110	60	50
Testis	890	890	–	30	30	–
All Other Cancers	13,500	7,100	6,400	9,300	4,900	4,400
Non-melanoma Skin	73,000	40,000	33,000	260	160	100

– Not applicable

* Caution is needed if the 2008 estimates are compared to previously published estimates as definitions for these cancers have changed.

[1] Prostate cancer estimates are higher than in previous years' publications because most provinces have opted to use projections based on modeling rather than averaging.

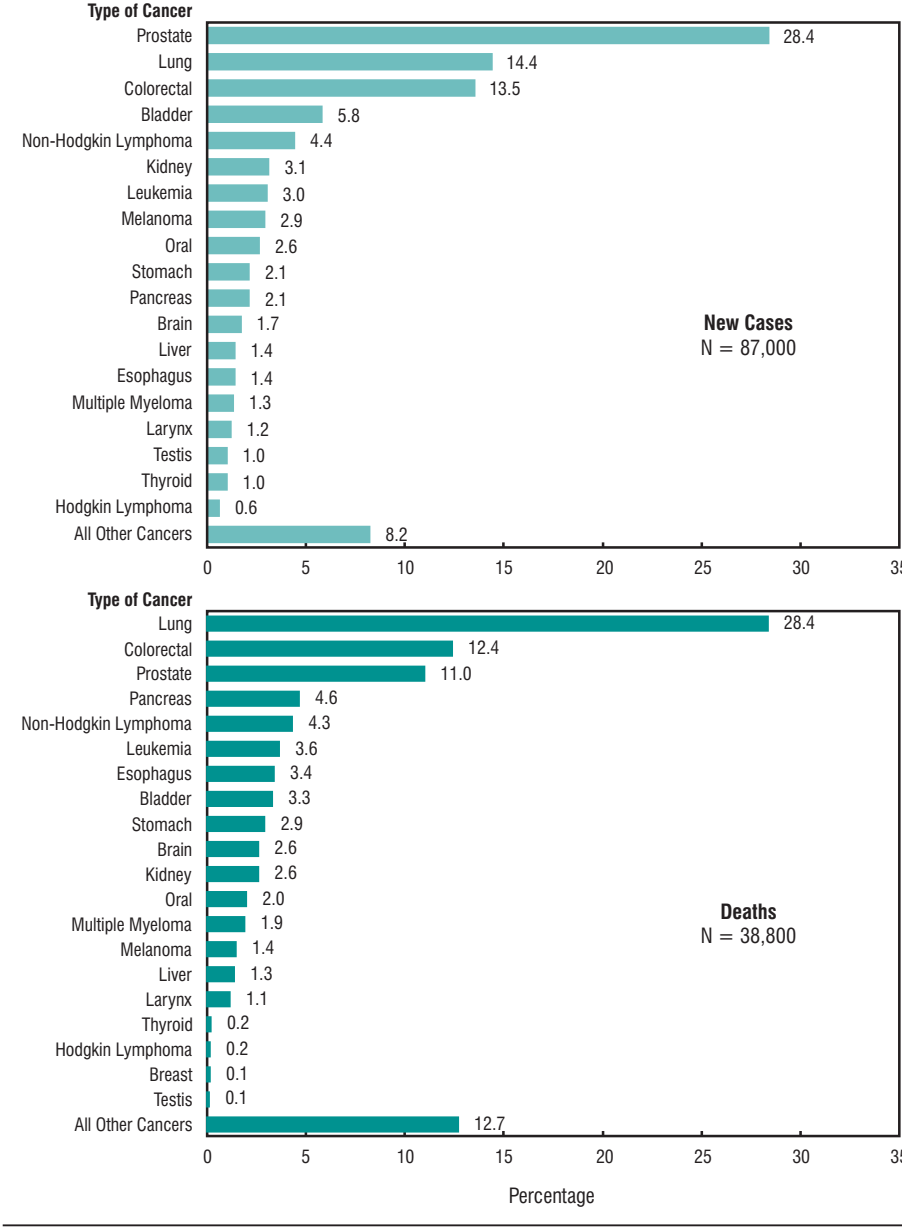
[2] The substantial increase in incidence of bladder cancer as compared with previous years reflects the decision to include in situ carcinomas (excluding Ontario) as of the 2006 edition of *Canadian Cancer Statistics*. See Table A3 for in situ bladder cancer in Ontario.

Note: 'All Cancers' excludes the estimated new cases of non-melanoma skin cancer (basal and squamous) but includes the estimated 260 deaths with underlying cause of other malignant neoplasms of skin (ICD-10 code C44). Total of rounded numbers may not equal rounded total number. Please refer to *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 1.1

Percentage Distribution of Estimated New Cases and Deaths for Selected Cancers, Males, Canada, 2008

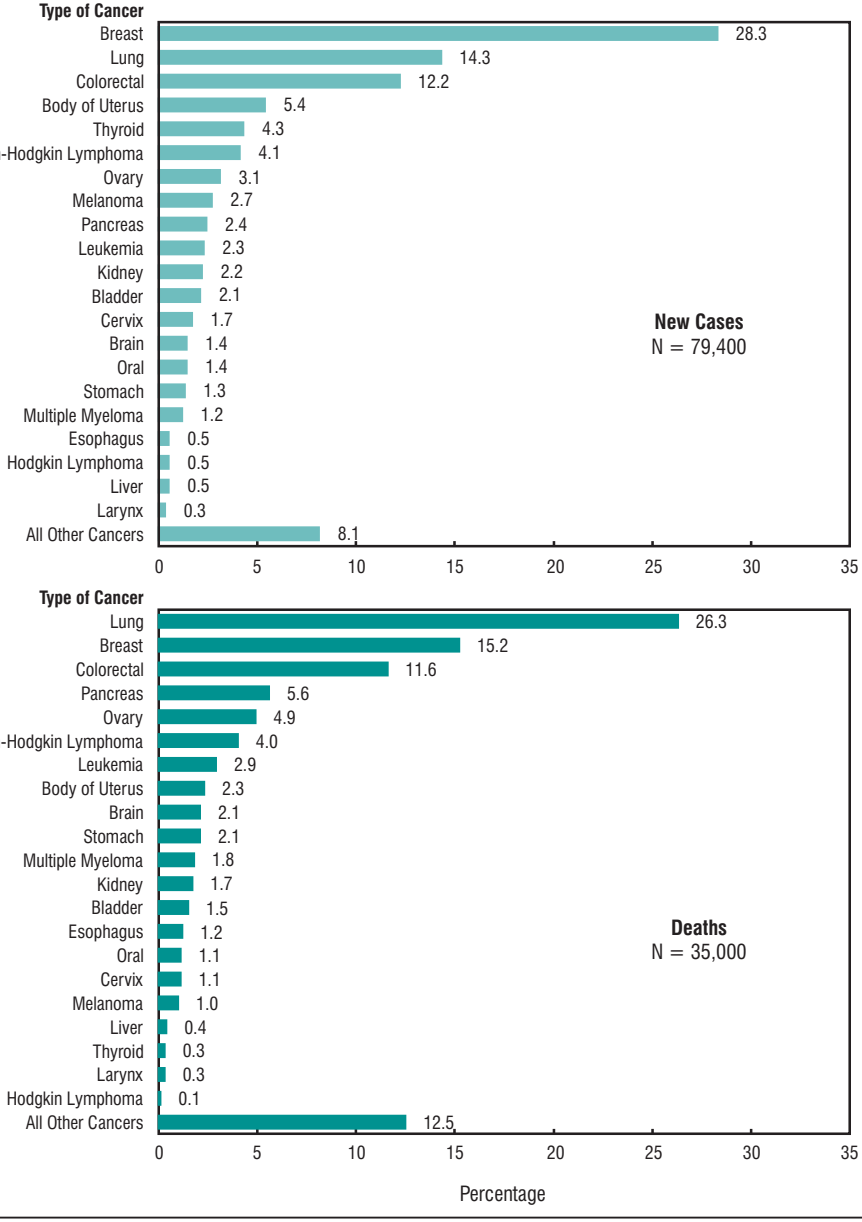


Note: Incidence figures exclude an estimated 73,000 new cases of non-melanoma skin cancer (basal cell and squamous cell) among both sexes combined. Mortality figures for 'All Other Cancers' include about 260 deaths with underlying cause 'other malignant neoplasms' of skin among both sexes combined.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 1.2

Percentage Distribution of Estimated New Cases and Deaths for Selected Cancers, Females, Canada, 2008



Note: Incidence figures exclude an estimated 73,000 new cases of non-melanoma skin cancer (basal cell and squamous cell) among both sexes combined. Mortality figures for 'All Other Cancers' include about 260 deaths with underlying cause 'other malignant neoplasms' of skin among both sexes combined.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

GEOGRAPHIC PATTERNS OF CANCER OCCURRENCE

Table 2 presents population projections and estimates of new cases and deaths for all cancers combined, by sex and province/territory for 2008. Tables 3 and 4 present estimates of the number of new cases and the age-standardized incidence rates for each of the most common cancers, by sex and province/territory for 2008. The corresponding estimates of the number of deaths and the age-standardized mortality rates are presented in Tables 5 and 6. Tables A3 to A6 in *Appendix I* provide the most recent actual numbers and corresponding rates.

The use of age-standardization adjusts for differences in age distributions among the provinces and territories, allowing for interprovincial comparisons. The calculation of these rates, using the 1991 Canadian population as the standard, is described in the *Glossary*, and in more detail in *Appendix II: Methods*.

Incidence rates for all cancers combined are generally higher in Atlantic Canada and Quebec, and are lowest in British Columbia (after excluding prostate cancer, which shows large provincial differences due to diversity in Prostate Specific Antigen (PSA) screening, and discounting the effects of undercounting in Newfoundland and Labrador) (Table 4). Overall incidence rates are, however, third highest in Manitoba among males (excluding prostate cancer) and second highest among females. Lung cancer incidence rates are highest in Quebec and New Brunswick and lowest among men in British Columbia and among women in Saskatchewan. The highest colorectal cancer incidence rates are seen among men in Newfoundland and Labrador and among women in Prince Edward Island; the lowest are in British Columbia. Breast cancer incidence rates appear to be reasonably consistent across the country.

Mortality rates for all cancers combined are higher in Atlantic Canada and Quebec, and are lowest in British Columbia. An exception is seen in Manitoba where the mortality rate among females is surpassed only by that of Nova Scotia (Table 6). Among males, the lung cancer mortality rate is highest in Quebec and lowest in British Columbia; among females the rate is highest in Nova Scotia and lowest in Saskatchewan. It is interesting to note that while the mortality rate due to lung cancer in New Brunswick among men is second highest, among women it is second lowest. Given that female lung cancer incidence rates in Canada are currently highest in New Brunswick, it is quite likely that there will be an increase in the corresponding mortality rates in this province in the future. Colorectal cancer mortality rates are approximately twice as high in Newfoundland and Labrador as they are in British Columbia.

Interpretation

Canada is one of the few nations in the world with a population-based cancer registry system that allows cancer patterns to be monitored for the entire Canadian population. The provincial/territorial and national cancer registries are important resources that enable the geographic comparison of rates of new cancer cases and deaths. This results in valuable information that can be used for research, knowledge exchange, and planning and decision-making at the provincial/territorial level. These data are therefore of interest to researchers, health care workers, planners and policy-makers.

Interpretation of geographical differences should, however, be approached with caution since there may be a number of possible alternative explanations.

GEOGRAPHIC PATTERNS OF CANCER OCCURRENCE

True differences in incidence or mortality rates between provinces/territories may be due to any one of several factors including:

- variation in the prevalence of cancer risk factors (e.g., higher historic smoking rates in Quebec and Atlantic Canada are 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., mamographic screening for breast cancer) or in screening procedures that are not programmatic (e.g., PSA testing for prostate cancer), or because of differences in availability of diagnostic services
- variation in access to and quality of treatment

However, in situations where variation in cancer rates and any of these factors agree, one can not assume that the relationship is causal. Such a determination could only be made after more detailed studies, involving individual people, are conducted. It is also important to note that for many cancers there is a long interval between exposure to a risk factor and the occurrence of disease, and often the information on the prevalence of risk factors from previous decades is inadequate. Where true differences in cancer risk and causal associations are demonstrated in subsequent epidemiologic studies, these findings can be used in planning cancer control programs that aim to reduce the burden of cancer by targeting unmet needs.

Issues that should be kept in mind when interpreting interprovincial variations:

- If the cancer is rare, the number of cases occurring annually in a given province/territory may be so small that estimates may be unreliable and vary considerably from one year to the next.
- While the completeness of registration of new cancer cases is generally very good across the country, there are exceptions. For example, death certificate information has not been available for registry purposes in Newfoundland and Labrador and this falsely lowers the number of newly diagnosed cases, mainly among those cancers with a poor prognosis such as lung and pancreatic cancer (see *Appendix II*: *Data Sources and Processing*). Cases diagnosed only through the use of death certificates have not been reported to the Canadian Cancer Registry by the province of Quebec since 2000 and were very likely underreported in years prior to that. The degree to which death certificate information is actively followed back to hospital records also varies in different provinces/territories and this affects the accuracy of information on incidence data (e.g., year of diagnosis). In Quebec, because of the registry's dependence on hospital data, the numbers of microscopically confirmed prostate, melanoma and bladder cases have been estimated to be underreported by 32%, 35% and 14% respectively.[1]

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 they are not collected.

Table 2

Estimated Population, New Cases and Deaths for All Cancers by Sex and Geographic Region, Canada, 2008

	Population (in thousands) 2008 Estimates[1]			New Cases 2008 Estimates[2]			Deaths 2008 Estimates		
	Total	M	F	Total	M	F	Total	M	F
CANADA	**33,095**	**16,386**	**16,709**	**166,400**	**87,000**	**79,400**	**73,800**	**38,800**	**35,000**
Newfoundland and Labrador*	514	252	262	2,500	1,350	1,150	1,350	770	580
Prince Edward Island	140	68	72	810	450	360	350	190	160
Nova Scotia	943	462	481	5,800	3,200	2,600	2,700	1,400	1,250
New Brunswick	755	372	382	4,300	2,300	2,000	1,950	1,050	890
Quebec*	7,725	3,816	3,909	42,100	21,500	20,500	19,700	10,500	9,300
Ontario	12,961	6,397	6,563	63,000	32,700	30,300	27,400	14,200	13,100
Manitoba	1,195	594	601	6,100	3,100	3,000	2,800	1,450	1,350
Saskatchewan	987	490	497	5,000	2,700	2,300	2,400	1,300	1,100
Alberta	3,371	1,701	1,670	15,900	8,600	7,300	5,900	3,100	2,800
British Columbia	4,399	2,179	2,220	20,500	10,800	9,700	9,200	4,800	4,400
Yukon	31	16	15	110	60	50	60	35	25
Northwest Territories	45	23	22	100	50	55	60	30	25
Nunavut	31	16	15	65	35	35	40	20	20

* An underestimate of the number of cases for some cancers for the years used to generate the 2008 estimates.
[1] The 2008 population projections were provided by the Census and Demographics Branch, Statistics Canada.[2]
[2] Figures exclude non-melanoma skin cancer (basal and squamous).
Note: Total of rounded numbers may not equal rounded total number. Please refer to *Appendix II: Methods*.
Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of 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.

Table 3

Estimated New Cases for the Most Common Cancers by Sex and Province, Canada, 2008

	New Cases										
	Canada[1]	NL*	PE	NS	NB	QC*	ON	MB	SK	AB	BC
Males											
All Cancers	**87,000**	**1,350**	**450**	**3,200**	**2,300**	**21,500**	**32,700**	**3,100**	**2,700**	**8,600**	**10,800**
Prostate	24,700	390	150	900	620	4,400	10,500	680	890	3,100	2,900
Lung	12,600	180	65	500	410	4,200	4,100	440	350	950	1,400
Colorectal	11,800	280	55	440	280	3,100	4,300	440	380	1,000	1,450
Bladder**	5,100	80	25	200	150	1,650	1,300	200	170	470	750
Non-Hodgkin Lymphoma	3,800	45	15	110	100	880	1,500	150	120	340	540
Kidney	2,700	45	15	110	85	760	920	120	85	250	270
Leukemia	2,600	20	15	70	60	610	1,050	110	100	300	320
Melanoma	2,500	40	15	100	70	320	1,150	70	70	230	420
Oral	2,300	45	10	85	60	630	850	100	55	180	280
Stomach	1,850	50	5	60	50	470	700	70	50	150	240
Pancreas	1,800	10	10	60	55	540	600	75	55	160	250
Brain	1,450	30	5	45	35	390	530	50	35	130	190
Esophagus	1,200	15	5	50	35	260	450	35	30	110	170
Liver	1,200	10	–	15	10	310	460	35	15	130	190
Multiple Myeloma	1,150	10	10	30	30	300	480	40	30	90	140
Larynx	1,000	25	5	30	30	380	330	25	25	60	90
Females											
All Cancers	**79,400**	**1,150**	**360**	**2,600**	**2,000**	**20,500**	**30,300**	**3,000**	**2,300**	**7,300**	**9,700**
Breast	22,400	360	95	690	550	5,900	8,500	780	620	2,100	2,700
Lung	11,300	130	50	360	340	3,400	4,000	410	290	980	1,400
Colorectal	9,700	200	60	380	240	2,500	3,700	380	300	750	1,200
Body of Uterus	4,200	65	20	140	95	960	1,700	200	120	400	540
Thyroid	3,400	40	5	55	90	670	1,850	75	55	310	210
Non-Hodgkin Lymphoma	3,200	40	10	95	80	770	1,300	120	90	280	420
Ovary	2,500	25	10	70	60	640	1,000	100	65	180	290
Melanoma	2,100	40	15	95	55	270	970	60	60	210	320
Pancreas	1,950	5	10	65	55	540	670	75	60	180	270
Leukemia	1,850	15	5	55	40	460	720	85	65	190	220
Kidney	1,750	30	5	75	60	480	640	75	50	150	170
Bladder**	1,700	30	10	65	50	540	470	65	55	150	250
Cervix	1,300	20	10	55	35	280	500	45	40	180	160
Oral	1,100	15	5	35	20	270	430	50	30	95	150
Brain	1,100	15	5	35	25	300	440	40	35	90	130
Stomach	1,000	25	5	30	25	270	380	35	25	95	120

– Fewer than 3 cases

* An underestimate of the number of cases for some cancers for the years used to generate the 2008 estimates.

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

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

Note: Total of rounded numbers may not equal rounded total number. The Canada and provincial totals for all cancers exclude non-melanoma skin cancer (basal and squamous). Caution is needed if the 2008 estimates are compared to previously published estimates. See *Appendix II: Methods* for further details. Please see *Appendix I* for most current actual data or contact provincial cancer registries for further information.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 4

Estimated Age-Standardized Incidence Rates for the Most Common Cancers by Sex and Province, Canada, 2008

	Rate per 100,000										
	Canada[1]	NL*	PE	NS	NB	QC*	ON	MB	SK	AB	BC
Males											
All Cancers	**462**	**434**	**536**	**550**	**499**	**479**	**459**	**484**	**466**	**513**	**418**
Prostate	129	124	172	149	132	94	145	103	153	183	108
Lung	67	54	80	85	89	93	57	66	59	58	52
Colorectal	62	86	65	76	60	68	60	65	64	61	54
Bladder**	27	26	32	35	33	37	19	30	28	29	28
Non-Hodgkin Lymphoma	20	14	20	20	21	19	21	23	20	20	20
Leukemia	14	7	19	13	14	14	15	16	17	18	12
Kidney	14	14	16	19	18	16	13	18	15	14	10
Melanoma	13	13	20	17	14	7	16	11	12	13	16
Oral	12	13	9	14	13	13	11	14	9	10	10
Stomach	10	16	9	10	11	11	10	10	8	9	9
Pancreas	10	3	13	10	12	12	8	11	9	10	9
Brain	8	11	7	8	8	9	8	8	6	8	7
Liver	6	3	2	3	2	7	6	5	3	7	7
Multiple Myeloma	6	4	10	6	6	7	7	6	5	5	5
Esophagus	6	5	8	9	7	6	6	6	5	7	6
Larynx	5	7	8	5	6	8	5	4	4	4	3
Females											
All Cancers	**361**	**313**	**369**	**388**	**366**	**371**	**362**	**383**	**342**	**379**	**322**
Breast	103	98	99	101	101	109	102	101	94	108	91
Lung	51	37	49	53	62	61	46	52	43	52	46
Colorectal	41	52	59	52	41	42	41	45	40	38	37
Body of Uterus	19	17	18	20	17	17	20	25	19	21	18
Thyroid	19	13	6	11	21	16	26	12	10	17	9
Non-Hodgkin Lymphoma	15	11	12	14	14	14	16	15	13	15	14
Ovary	11	7	9	10	12	12	12	13	10	9	9
Melanoma	10	12	17	15	11	6	12	9	10	12	12
Leukemia	9	4	7	8	8	8	9	11	10	10	7
Pancreas	8	2	8	9	10	9	7	8	8	9	8
Kidney	8	8	7	11	11	8	8	10	8	8	6
Bladder**	7	7	7	9	9	9	5	8	7	8	8
Cervix	7	7	10	11	8	6	7	7	8	10	6
Brain	6	5	6	5	6	6	6	5	6	5	5
Oral	5	4	5	5	4	5	5	6	5	5	5
Stomach	4	7	3	4	4	5	4	4	4	5	4

* An underestimate of the number of cases for some cancers for the years used to generate the 2008 estimates.

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

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

Note: Rates exclude non-melanoma skin cancer (basal and squamous) and are adjusted to the age distribution of the 1991 Canadian population. Caution is needed if the 2008 estimates are compared to previously published estimates. See *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 5

Estimated Deaths for the Most Common Cancers by Sex and Province, Canada, 2008

	Deaths										
	Canada[1]	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC
Males											
All Cancers	**38,800**	**770**	**190**	**1,400**	**1,050**	**10,500**	**14,200**	**1,450**	**1,300**	**3,100**	**4,800**
Lung	11,000	230	60	440	360	3,600	3,600	350	320	780	1,250
Colorectal	4,800	130	25	190	120	1,300	1,750	200	160	360	570
Prostate	4,300	80	25	140	130	870	1,650	180	230	430	560
Pancreas	1,800	30	5	70	55	460	640	65	60	140	250
Non-Hodgkin Lymphoma	1,700	15	5	65	50	380	690	65	50	130	220
Leukemia	1,400	20	5	45	25	310	580	55	55	120	190
Esophagus	1,300	20	5	55	30	250	540	55	40	110	210
Bladder	1,250	25	5	45	35	290	490	50	40	95	180
Stomach	1,150	35	5	35	25	330	420	35	30	75	130
Brain	1,000	20	–	35	25	300	350	30	25	95	130
Kidney	1,000	20	5	40	30	260	350	50	35	95	110
Oral	760	15	5	30	20	220	270	30	15	55	100
Multiple Myeloma	730	10	5	25	20	180	290	30	25	45	100
Melanoma	560	10	–	20	10	90	280	20	15	45	75
Liver	520	5	–	10	5	160	220	15	5	40	60
Larynx	440	10	–	15	15	160	130	15	10	30	50
Females											
All Cancers	**35,000**	**580**	**160**	**1,250**	**890**	**9,300**	**13,100**	**1,350**	**1,100**	**2,800**	**4,400**
Lung	9,200	150	40	360	200	2,700	3,300	300	230	760	1,150
Breast	5,300	100	30	190	130	1,350	2,000	220	160	430	640
Colorectal	4,100	100	25	170	100	1,100	1,500	160	130	290	470
Pancreas	1,950	25	10	70	55	510	710	70	55	170	270
Ovary	1,700	30	5	55	40	370	680	75	55	150	240
Non-Hodgkin Lymphoma	1,400	15	10	50	35	340	570	60	50	100	180
Leukemia	1,000	10	5	35	20	230	400	40	35	100	130
Body of Uterus	790	10	5	30	20	210	310	30	20	65	85
Brain	740	10	5	25	20	210	260	25	20	65	95
Stomach	720	25	–	25	15	210	250	25	20	65	85
Kidney	600	15	5	20	20	170	190	25	25	55	75
Bladder	530	10	–	15	15	130	210	15	10	45	75
Oral	380	–	–	10	10	95	140	15	10	35	60
Cervix	380	15	5	20	15	70	150	15	15	40	50
Melanoma	350	5	–	15	10	60	160	10	10	30	50

– Fewer than 3 deaths

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

Note: Total of rounded numbers may not equal rounded total number. Caution is needed if the 2008 estimates are compared to previously published estimates. See *Appendix II: Methods*.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 6

Estimated Age-Standardized Mortality Rates for the Most Common Cancers by Sex and Province, Canada, 2008

	Rate per 100,000										
	Canada[1]	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC
Males											
All Cancers	**209**	**252**	**227**	**245**	**234**	**236**	**200**	**213**	**216**	**191**	**178**
Lung	59	75	75	76	79	81	51	53	53	49	46
Colorectal	26	41	31	33	25	29	25	30	26	22	21
Prostate	24	29	33	25	29	21	23	26	35	28	20
Pancreas	9	10	9	12	11	10	9	9	10	9	9
Non-Hodgkin Lymphoma	9	5	8	11	11	8	10	10	8	8	8
Leukemia	8	6	8	8	6	7	8	9	9	7	7
Esophagus	7	6	8	9	6	5	7	8	6	7	8
Bladder	7	9	6	8	7	7	7	7	7	6	7
Stomach	6	12	8	6	6	7	6	5	5	5	5
Brain	5	6	2	6	5	7	5	5	5	5	5
Kidney	5	7	8	7	6	6	5	8	6	6	4
Oral	4	4	5	5	4	5	4	4	3	3	4
Multiple Myeloma	4	4	5	4	4	4	4	4	4	3	4
Melanoma	3	2	3	4	2	2	4	3	2	3	3
Liver	3	2	1	1	1	4	3	3	1	2	2
Larynx	2	3	3	3	3	4	2	2	2	2	2
Females											
All Cancers	**147**	**152**	**154**	**169**	**151**	**155**	**145**	**155**	**145**	**143**	**134**
Lung	40	40	41	50	35	48	37	37	33	40	37
Breast	22	27	27	25	21	23	22	25	21	21	20
Colorectal	16	26	23	21	16	17	16	17	15	14	13
Pancreas	8	7	8	9	9	8	8	8	7	8	8
Ovary	7	9	6	8	7	6	8	9	8	8	8
Non-Hodgkin Lymphoma	6	4	7	7	6	6	6	7	7	5	5
Leukemia	4	3	4	5	3	4	4	5	5	5	4
Brain	4	4	4	4	4	4	3	3	4	4	3
Body of Uterus	3	3	3	4	4	3	3	3	3	3	3
Stomach	3	7	1	3	2	3	3	2	3	3	2
Kidney	2	3	3	2	4	3	2	3	3	3	2
Bladder	2	2	1	2	2	2	2	1	1	2	2
Cervix	2	4	3	3	3	1	2	2	2	2	2
Oral	2	0	2	2	1	2	2	2	1	2	2
Melanoma	2	1	1	2	1	1	2	1	1	1	2

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

Note: Rates adjusted to the age distribution of the 1991 Canadian population. Caution is needed if the 2008 estimates are compared to previously published estimates. See *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

TRENDS IN INCIDENCE AND MORTALITY

Trends in incidence and mortality for major types of cancer are assessed by comparing annual age-standardized rates. The use of age-standardized rates results in more meaningful comparisons over place and time because it adjusts for variation in the age distributions of populations across geographic regions and over time. Rates in this publication have been standardized to the 1991 Canadian population.

Figures 2.1 and 2.2 present the number of new cases and deaths for Canadian men and women, together with the corresponding age-standardized rates from 1979 to 2004 and estimates to the year 2008. Figures 3.1 and 3.2 show the relative contribution to the change in the total number of new cases and deaths that can be attributed to changes in cancer rates, population size and the aging of the population, while Figure 4 demonstrates the impact of changes in lung cancer mortality rates on overall cancer mortality trends. Detailed depictions of the trends in annual rates for selected cancers over the past 30 years are presented in Figures 5.1, 5.2 and 6.1 and 6.2 with the data points provided in Tables 7.1, 7.2 and 8.1, 8.2. The average annual percent changes in cancer-specific incidence and mortality rates between 1995 and 2004 are listed in Table 9.

All Cancers Combined

The cancer mortality rate among men, after reaching a peak in 1988, is declining slowly as a result of decreases in mortality rates for lung, colorectal and other cancers (Figure 2.2, Table 7.2). In contrast, the cancer incidence rate rose in the early 1990s and then declined sharply, following the trend in prostate cancer incidence during this period. This has had the likely temporary effect of levelling off the gradual decline in the overall cancer incidence rate due to declining lung cancer incidence. **Note that prostate cancer estimates for 2005 through 2008 are higher than those in previous years' of *Canadian Cancer Statistics* because most provinces have opted to use projections based on modeling rather than averaging** (see *Appendix II: Methods* for further details). With the consistent use of this method, the previous gradual decline in overall cancer incidence in males is expected to continue.

The numbers of new cases and of deaths are important measures of cancer burden on the Canadian population and health care system. Despite the relative stability in age-standardized rates, the numbers of new cancer cases and deaths continue to rise steadily as the Canadian population grows and ages (Figure 2.1 and 2.2). In 2008, the number of new cases is estimated to be 166,400 and the number of deaths to be 73,800. This represents an additional 6,500 new cases and 1,100 deaths in 2008 compared to the estimates for 2007 in last year's publication. These new cases include 2,400 more prostate cases, 700 more colorectal and 600 more lung cancers than estimated for 2007.

Figure 3.1 and 3.2 show that the main reasons for the rising numbers of new cases and deaths from cancer are the growing and aging population. The lowest solid line represents the total number of cases (or deaths) that would have occurred each year if only the rates had changed but the population size and age structure had remained as in 1979. The middle line represents the number of cases (or deaths) that would have occurred each year if that year's rates were applied to a population that was the same size as that year's population but with the age distribution of 1979. The top line represents the number of cases (or deaths) that actually occurred and thus reflects the

combined impact of rate change, population growth and the aging of the population. These figures demonstrate that changes in population size and age structure have been the major determinants of the increasing burden of cancer among Canadians. For as long as this trend continues, there will be a commensurate annual increase in the number of new cases and deaths unless a major drop in the risk of developing cancer occurs. Decreasing mortality from cardiovascular disease as the other major cause of death contributes to the increasing numbers of patients with cancer.

Figure 4 plots the relative change in age-standardized mortality rates (See definition in *Glossary*) from 1979 to 2008 for all cancers and for all cancers *excluding* lung cancer. The different pattern between males and females illustrates partly the different state of the lung cancer problem in the two sexes and partly different mortality trends for other cancers:

- In males, the all cancer mortality trend largely reflects the trend in lung cancer mortality (the two lines are very close through the time period): declining overall cancer mortality since 1988 is predominantly due to dropping lung cancer rates.
- In females, however, the lung cancer mortality rate is still increasing. Thus, the "all cancer" mortality rate that has been essentially stable since 1979 conceals the major (20%) decline that has occurred for other types of cancer over the 30 year period.

Trends for selected cancers

The cancers included in Figures 5.1, 5.2, 6.1 and 6.2 and Tables 7.1, 7.2, 8.1 and 8.2 are those that are most common (prostate, lung, breast, colorectal, and non-Hodgkin lymphoma) plus others from Table 9 that exhibit significantly increasing or decreasing trends in their rates of at least 2% per year over the period 1995-2004.

Of the 23 cancers listed in Table 9, statistically significant differences (increases or decreases) of 2% or more per year have been observed in the following cancers:

- Incidence:
  - Increases: liver cancer in males (+2.7%) and thyroid cancer in both sexes (+5.5% and +10.1%, in males and females respectively).
  - Decreases: stomach and larynx in both sexes, lung cancer in men (-2.5% per year since 1999) and for women, brain cancer (-3.6% per year since 2000) and cervical cancer.
- Mortality:
  - Increases: liver cancer in males (+ 2.2%).
  - Decreases: Rates have declined for most types of cancer especially:
    - stomach (-3.6%), larynx (-3.2%), prostate (-2.9%), oral (-2.5%), and lung cancer (-2.1%), as well as Hodgkin lymphoma (-4.2%) and non-Hodgkin lymphoma (-2.3%) in males; and
    - Hodgkin lymphoma (-3.7%), cervical (-3.3%) and stomach cancer (-3.1%) in females.

TRENDS IN INCIDENCE AND MORTALITY

Comments about trends for specific cancers follow.

Prostate cancer*

- Against a backdrop of gradually increasing incidence rates, two peaks are evident: one in 1993 and another smaller one in 2001, each time followed by a decline. These peaks are compatible with two waves of intensified screening activity with the PSA test for early prostate cancer. The first follows the introduction of PSA as a screening test; the second, which does not appear in the US, may be explained by the publicity around the then Canadian Minister of Health's diagnosis with 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; the second decline is too recent to know whether the increasing trend will return.
- Although some of the long-term and apparently ongoing increase in incidence may be due to more gradual changes in early detection, changes in risk or protective factors might also be partly responsible. However, little is known about the causes of prostate cancer.
- In contrast to incidence, mortality rates rose much more slowly from 1979, and started to decline in the mid 1990s. Mortality declined significantly by 2.9% per year between 1995 and 2004 (Table 9), probably due to a combination of earlier detection and improved treatment.

Lung cancer

- In males, rising incidence and mortality rates began to level off in the mid-1980s and have been declining ever since (Table 7.1 and 7.2). Rates have dropped significantly by 2.5% per year since 1999 for incidence and by 2.1% per year for mortality over the period 1995-2004.
- In females, incidence and mortality rates have been increasing since at least 1979, and continue to do so (by 1.2% per year for both incidence and mortality).
- Males continue to have higher incidence and mortality rates than females (67 per 100,000 versus 51 per 100,000 and 59 per 100,000 versus 40 per 100,000, respectively, Tables 4 and 6).
- These patterns reflect the drop in tobacco consumption that began for males in the mid 1960's and much later – in about the mid-1980's – for females.

Breast cancer

- Breast cancer incidence rose steadily but gradually between 1979 and 1999 but has since declined significantly by 1.7% per year.† Much of the increase was probably due to the gradual uptake of screening mammography that took place during the 1980s and 1990s. This results in identification of cases of breast cancer earlier than would have occurred without screening. Similar to prostate cancer, screening may have eventually exhausted the pool of prevalent cancers in the screened population,

* Note that prostate cancer estimates for 2005 through 2008 are higher than those in previous years of *Canadian Cancer Statistics* because most provinces opted to use projections based on modeling rather than averaging (See *Appendix II: Methods*).

† Projected estimates for breast cancer beyond 2004 reflect the long term increasing trend in breast cancer incidence and are not sensitive to the recent decline.

resulting in recent declines, as the incidence rate dropped back closer to pre-screening levels. However, changes in risk and protective factors such as changing patterns of childbearing and hormones likely also have played a role.

- Female breast cancer mortality rates have been declining since the mid-1980s. The age-standardized mortality rate has fallen by more than 25% since 1986 from 32 to 23.1 per 100,000 (Table 8.2). The downward trend has accelerated to 1.6% per year since 1999. This is likely the result of a combination of uptake of mammography screening, and the use of more effective adjuvant therapies following breast cancer surgery. The breast cancer death rate is the lowest it has been since 1950. Similar declines have also occurred in the US, UK and Australia.

Colorectal cancer

- Trends for colorectal cancer incidence between 1979 and 2004 (the last year of complete data) are complex. In both sexes, incidence rose (or was relatively stable in the case of women) between 1979 and 1985, then declined to the mid-1990s (more strongly in women than in men), then rose through 2000 only to decline significantly thereafter. Because causes of the recent short-term fluctuations are not understood, colorectal cancer projections to 2008 are based on long term data (1986-2004), which is the standard methodology for this publication. They should be used with caution.
- Mortality rates continue to decline in both sexes, by 1.7% in females and by 1.3% per year in males (Table 9), and are likely the result of improvements in treatment, specifically chemotherapy.
- Screening for colorectal cancer can reduce both incidence and mortality. Limited opportunistic screening has already been occurring, which may account for some of the mortality decline. Several provinces have announced that they are implementing a population-based colorectal cancer screening program (Ontario, Manitoba, Alberta) and the remainder have it under thorough review.
- The Canadian Partnership Against Cancer's Screening Action Group has recently established a colorectal cancer screening network to provide a national forum to review, discuss and take action to enhance and improve colorectal cancer screening in Canada.

Non-Hodgkin lymphoma

- In both males and females, incidence rates increased approximately 50% between 1978 and the late 1990s. Since that time, they have stabilized.
- Mortality rates have followed a similar pattern, although a statistically significant decline of 2.3% per year since 2000 in males is noted. This may reflect recent improvements in treatment, notably immunotherapy (Rituximab).
- The observed incidence patterns likely result from a combination of improved detection and classification of this complex set of diseases, and changes in risk factors. The clearest risk factor for non-Hodgkin lymphoma is immunosuppression (which can result from immune disorders, immunosuppessive therapy, or the 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.

Other types of cancer

- *Melanoma incidence* continues to increase in men and women (by 1.8% and 1.0% per year, respectively). This is likely related to more leisure time spent in the sun without adequate protection and to improvements in the detection of the disease. Mortality rates were stable in men but decreased in women (0.8% per year).
- Incidence rates for *kidney cancer* increased (by 0.7% and 1.2% per year in male and females respectively) between 1995 and 2004, although mortality rates remained stable. Increasing incidence is partly due to improved detection but may also be related to the rising prevalence of obesity, which is a strong risk factor for renal cell carcinoma, the major type of kidney cancer.
- *Thyroid cancer* incidence is increasing the most rapidly of all cancers (5.5% in men, and 10.1% per year in females since 1997). Similar increases have been noted in Europe and parts of the United States. More frequent use of medical imaging (ultrasound, needle biopsy, and potentially computed tomography and magnetic resonance imaging) may be improving detection of earlier stage, asymptomatic cancers more frequently than was possible in the past.[3] Mortality rates have remained stable, most likely because modern treatment is highly effective in the management of early thyroid cancers.
- *Liver cancer* incidence and mortality rates are increasing in males (2.7% and 2.2% per year, respectively, and both are statistically significant), and in females (by 1.3% and 1.7% per year, respectively, but neither are statistically significant).
- *Cervical cancer* incidence and mortality rates have been declining for many decades, largely due to widespread regular use of Pap test screening whereby malignant as well as pre-malignant lesions can be detected early and treated. Recent announcements by some provinces to institute vaccination of school aged girls with the HPV vaccine 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 health care.
- *Larynx cancer* incidence rates are significantly decreasing for both males and females (3.6% and 3.4% annually, respectively) while mortality rates for men show a significant decline of 3.2%. Larynx cancer is associated with tobacco use and alcohol.
- Mortality rates are very low for *Hodgkin lymphom*a, and have declined sharply between 1995 and 2004 (by 4.2% and 3.7% per year, in males and females respectively).
- The incidence of *testicular cancer* continues to increase at a rate that is now statistically significant (1.8% per year between 1995 and 2004). Testicular cancer incidence has been increasing for several decades for reasons which are not well understood. The decline in testicular cancer mortality continues but is no longer statistically significant. Because there are few testicular cancer deaths each year, mortality rates tend to be unstable, which can result in substantial year-to-year variation.

Implications

Figures 2.1 and 2.2 highlight that continuing increases in incidence and deaths from cancer will place an increasing burden on Canadian society, largely independent of trends in incidence and mortality rates. This vividly illustrates why cancer prevention and health promotion programs are so vital.

Current and projected cancer trends in Canada underline the importance of planning for the increasing number of cancer cases that are presently unavoidable. We must enhance capacity for adequate prevention, health promotion programs and for palliation when treatment no longer offers hope of a cure. In addition, we must do a much better job of primary prevention to reduce the number of cases that are avoidable.

We must enhance capacity for adequate prevention, health promotion programs and for palliation when treatment no longer offers hope of a cure. In addition, we must do a much better job of primary prevention to reduce the number of cases that are avoidable.

Figure 2.1

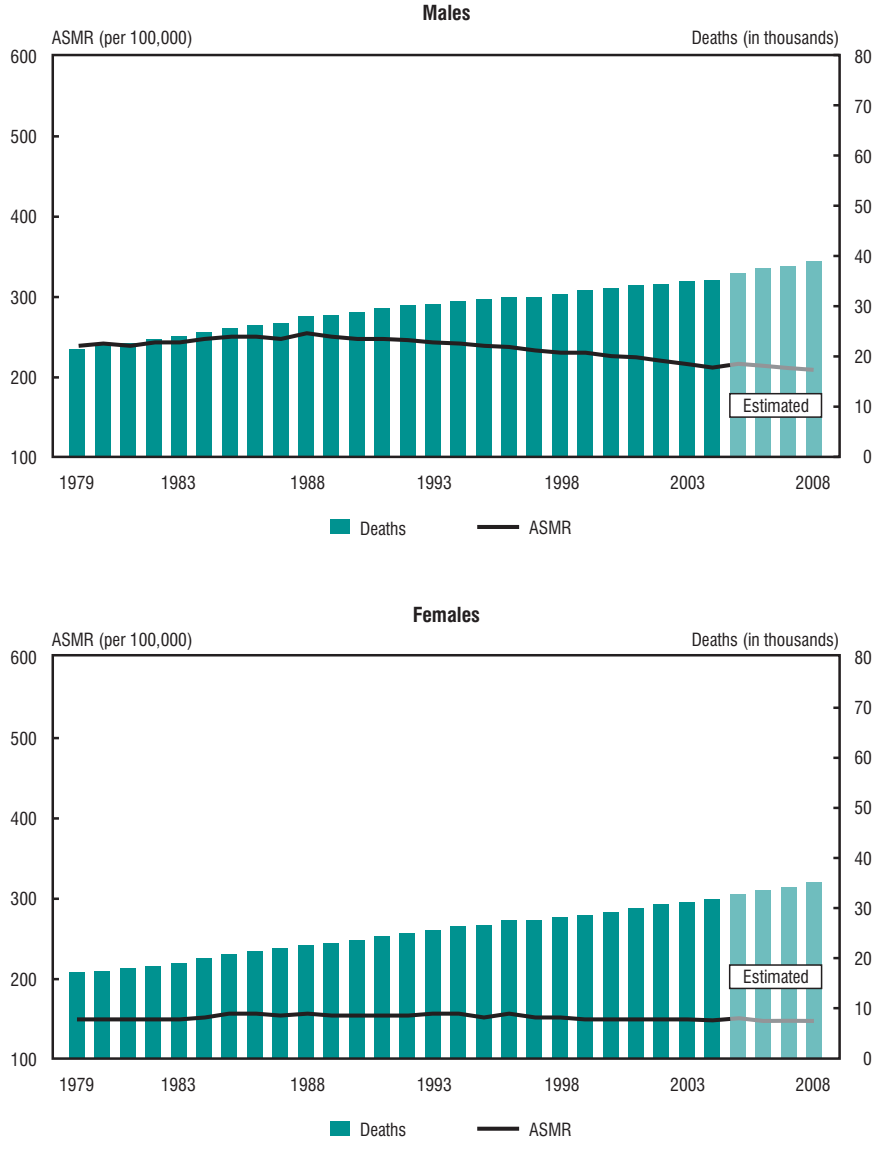
New Cases and Age-Standardized Incidence Rates (ASIR) for All Cancers, Canada, 1979-2008

Note: All cancers exclude non-melanoma skin cancer. Rates are standardized to the 1991 Canadian population. Actual incidence data are available to 2005 except for Quebec, Manitoba, and Alberta where 2005 is estimated. Please refer to *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 2.2

Deaths and Age-Standardized Mortality Rates (ASMR) for All Cancers, Canada, 1979-2008

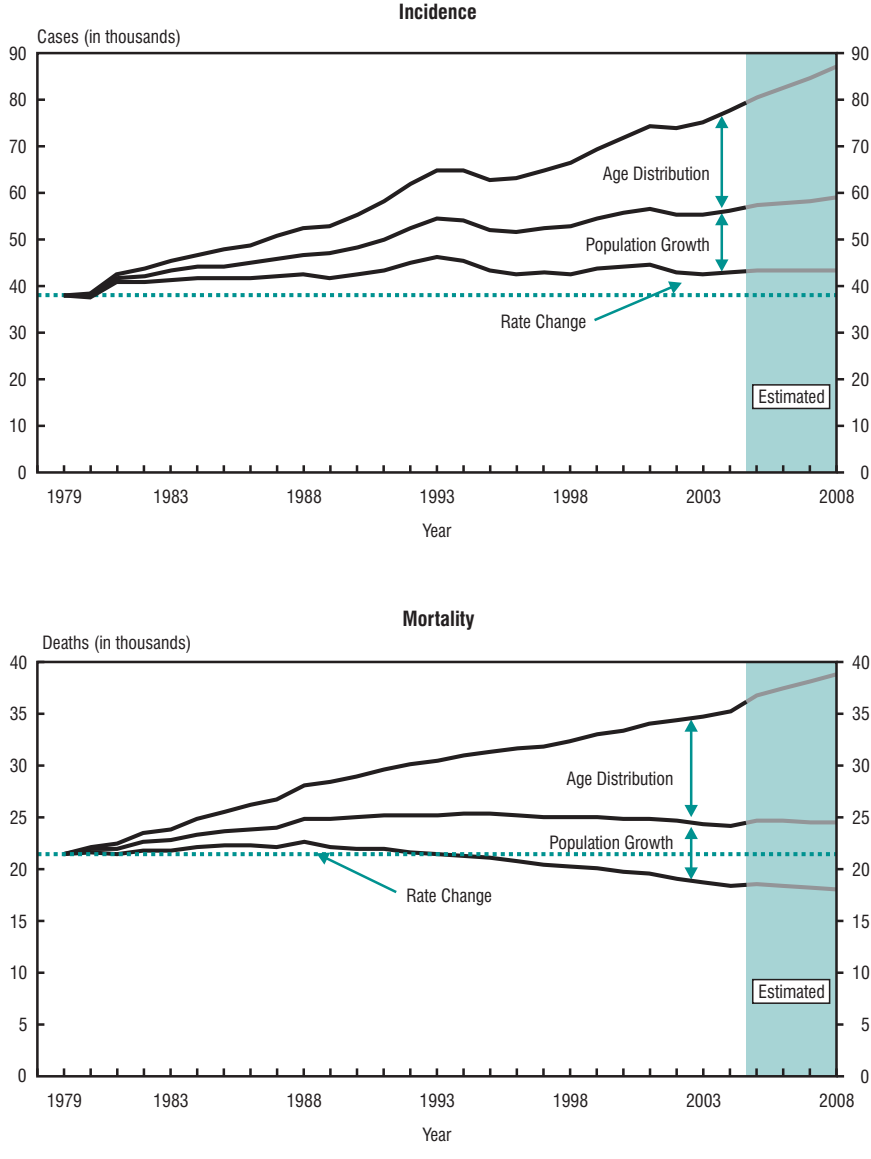


Note: Rates are standardized to the 1991 Canadian population. See also the *Glossary* and *Appendix II: Methods*.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 3.1

Trends in New Cases and Deaths, Attributed to Cancer Rate, Population Growth, and Population Age Distribution, All Cancers, All Ages, Males, Canada, 1979-2008

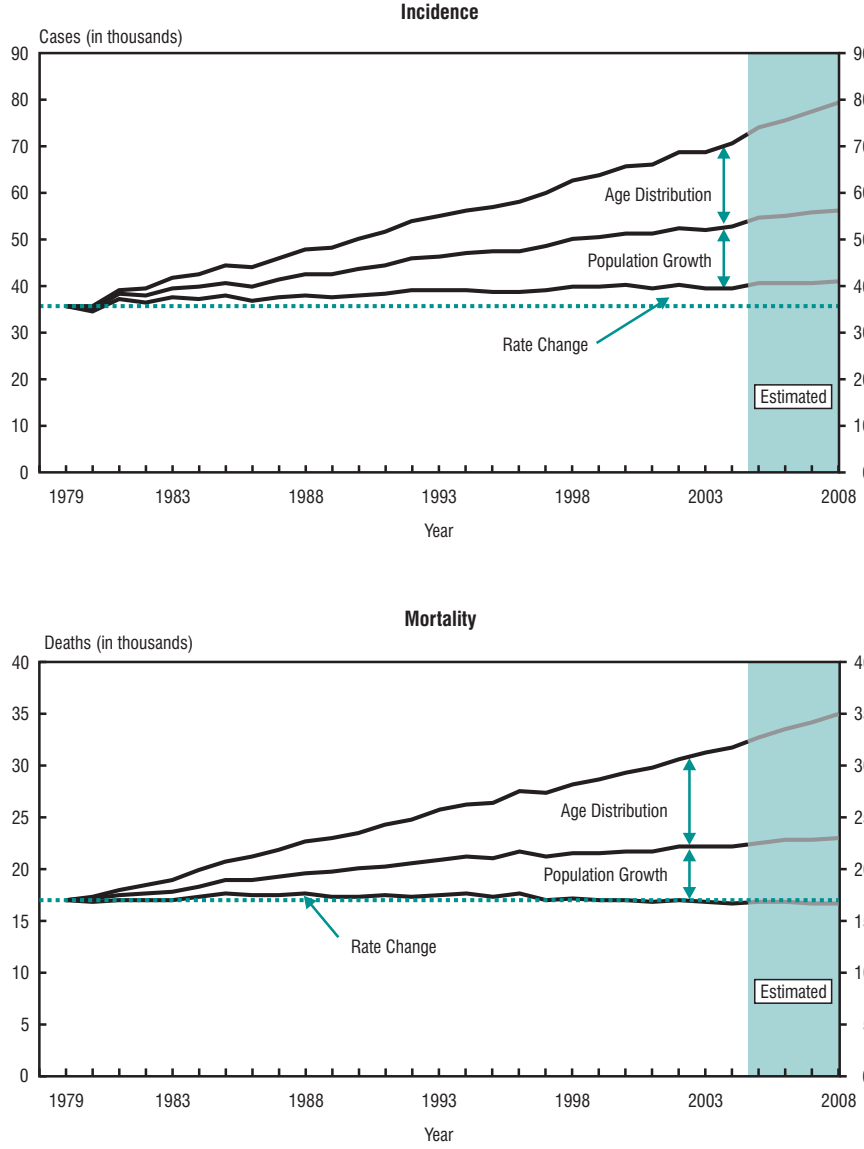


Note: Incidence figures exclude non-melanoma skin cancer (basal and squamous). Magnitude of area represents the number of cases/death due to each change. Actual incidence data are available to 2005 except for Quebec, Manitoba and Alberta where 2005 incidence is estimated. Please refer to *Appendix II: Methods* for further details. Incidence and mortality each have a different scale.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 3.2

Trends in New Cases and Deaths, Attributed to Cancer Rate, Population Growth, and Population Age Distribution, All Cancers, All Ages, Females, Canada, 1979-2008

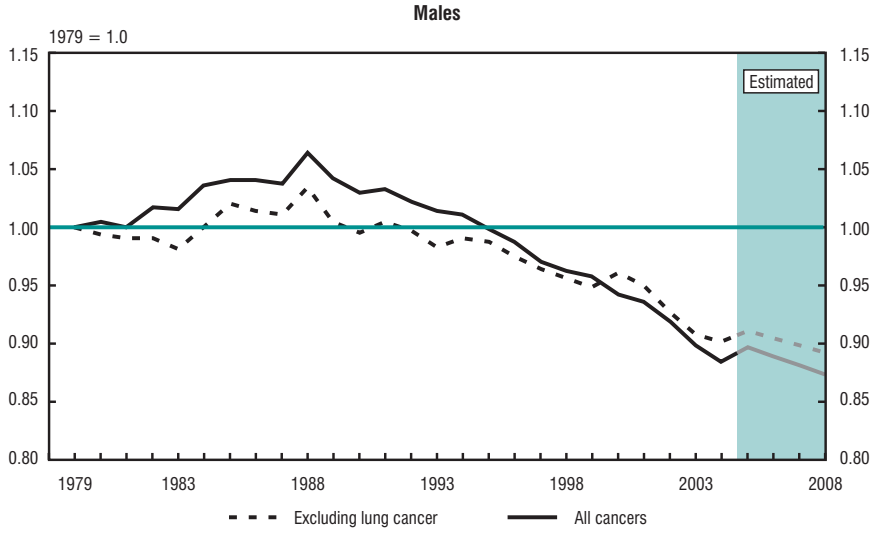


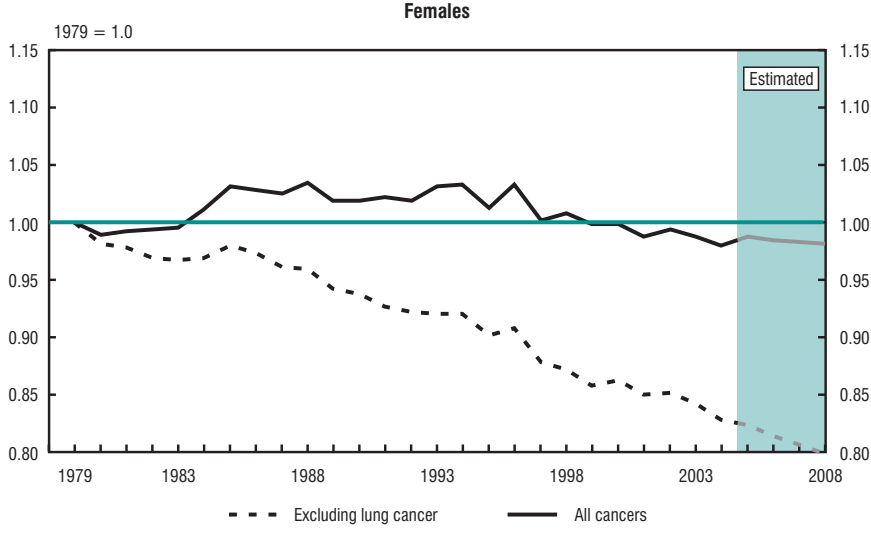
Note: Incidence figures exclude non-melanoma skin cancer (basal and squamous). Magnitude of area represents the number of cases/death due to each change. Actual incidence data are available to 2005 except for Quebec, Manitoba and Alberta where 2005 incidence is estimated. Please refer to *Appendix II: Methods* for further details. Incidence and mortality each have a different scale.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 4

Relative Change in Age-Standardized Mortality Rates Including and Excluding Lung Cancer, Canada, 1979-2008*





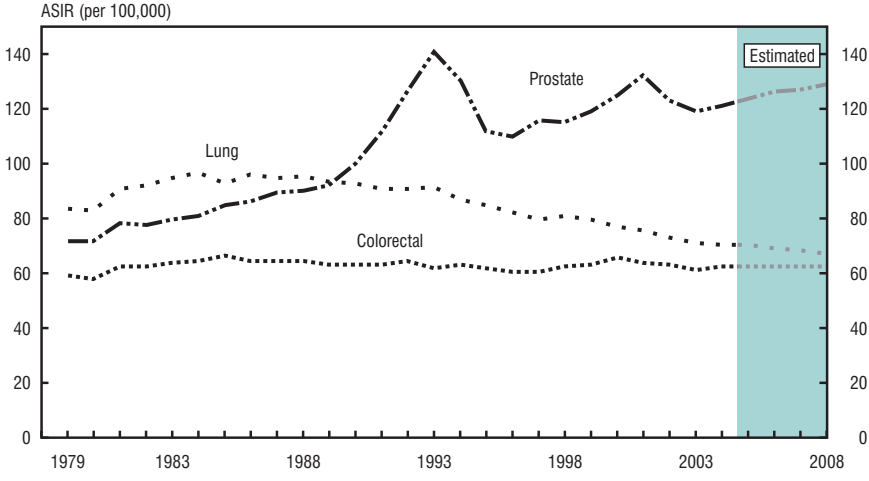
* Rates are relative to 1979 (current year divided by 1979 rate).

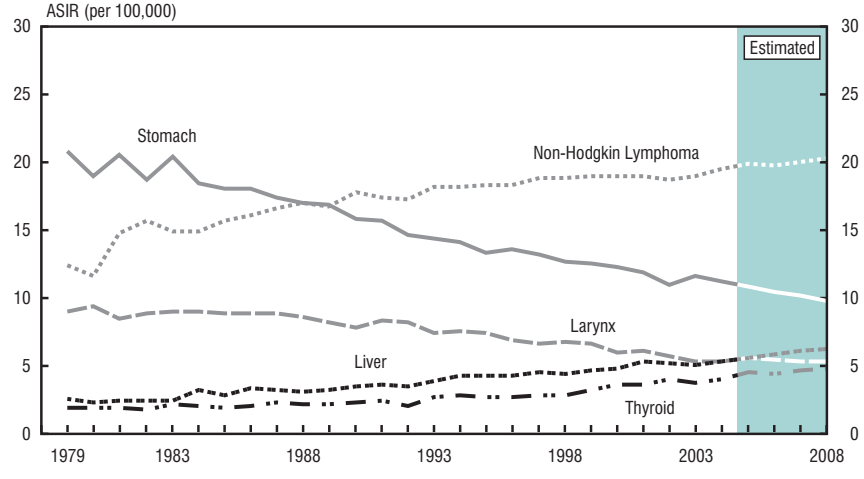
Note: Rates are standardized to the age distribution of the 1991 Canadian population. See also the *Glossary* and *Appendix II: Methods*.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 5.1

Age-Standardized Incidence Rates (ASIR) for Selected Cancers, Males, Canada, 1979-2008



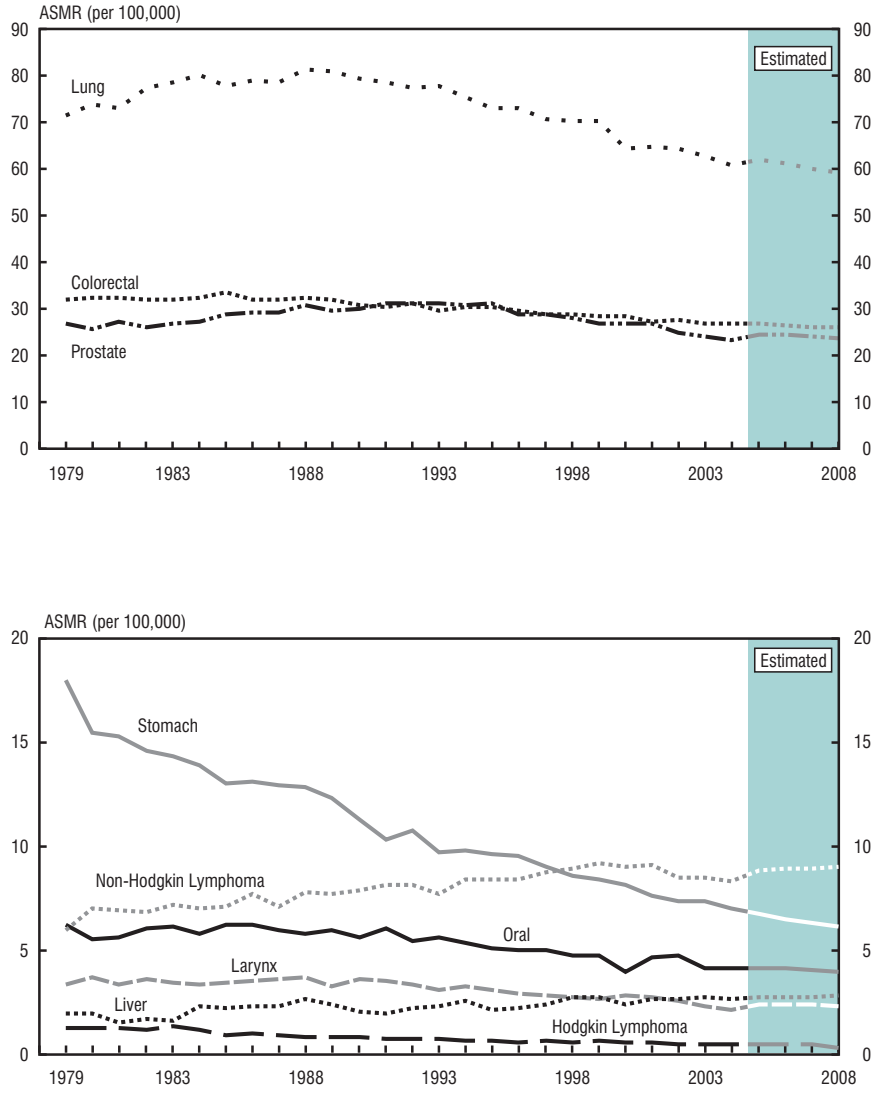


Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 7.1 for data points. Actual incidence data are available to 2005 except for Quebec, Manitoba and Alberta where 2005 incidence is estimated. Please refer to *Appendix II: Methods* for further details. Please note that each graph has a different scale for the vertical axis because of the wide range.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 5.2

Age-Standardized Mortality Rates (ASMR) for Selected Cancers, Males, Canada, 1979-2008

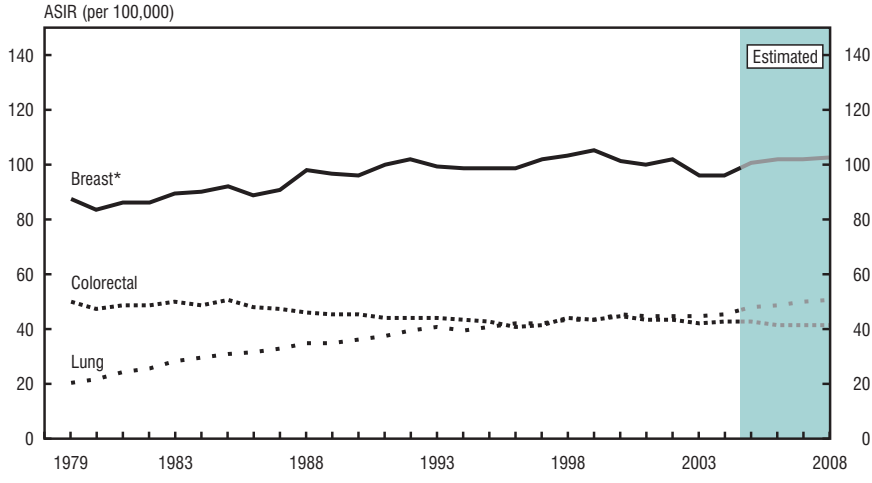


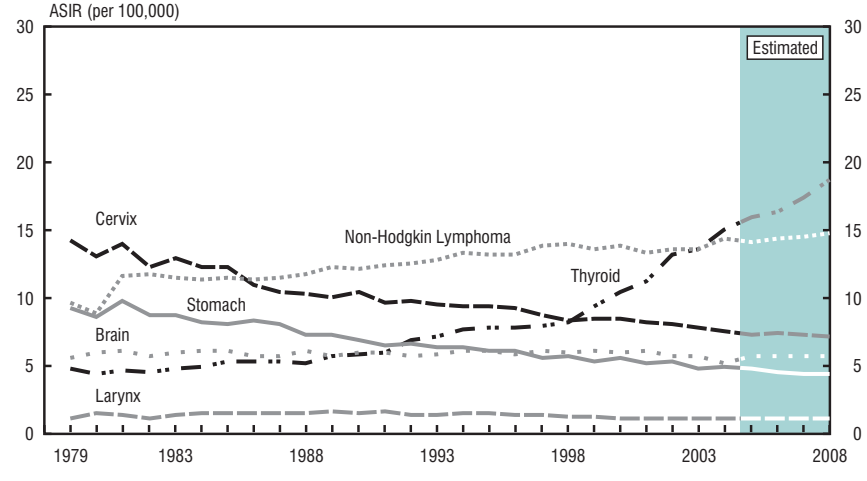
Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 7.2 for data points. Please note that each graph has a different scale for the vertical axis because of the wide range. Testis cancer is excluded because of low mortality rates (an estimated 30 deaths in 2008).

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 6.1

Age-Standardized Incidence Rates (ASIR) for Selected Cancers, Females, Canada, 1979-2008





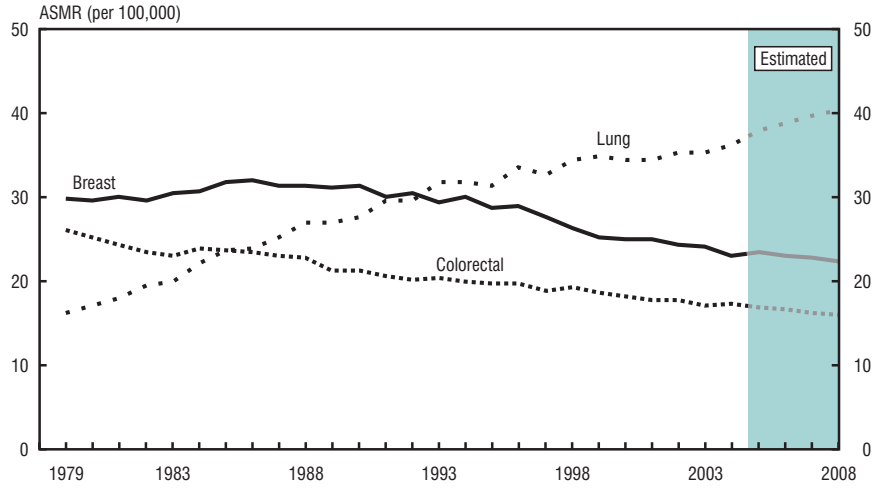
* Projected estimates for breast cancer beyond 2004 reflect the long-term increasing trend in breast cancer incidence and are not sensitive to recent decline.

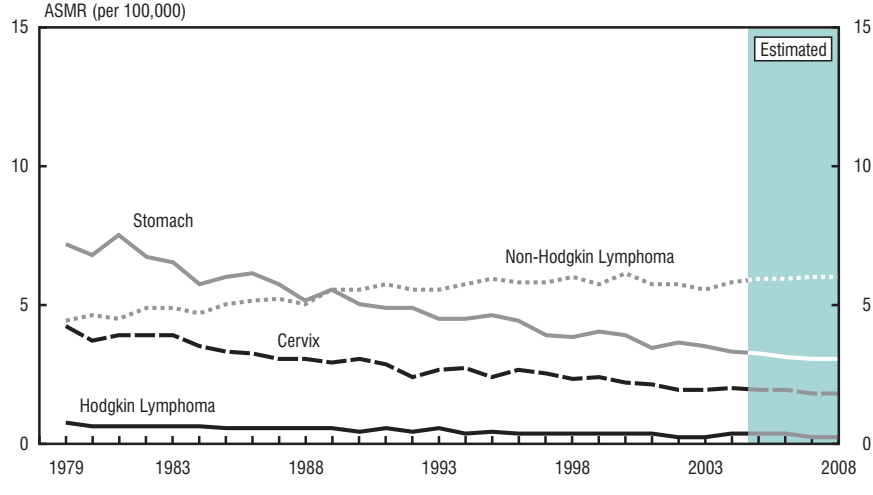
Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 8.1 for data points. Actual incidence data are available to 2005 except for Quebec, Manitoba and Alberta where 2005 incidence is estimated. Please refer to *Appendix II: Methods* for further details. Please note that each graph has a different scale for the vertical axis because of the wide range.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 6.2

Age-Standardized Mortality Rates (ASMR) for Selected Cancers, Females, Canada, 1979-2008





Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 8.2 for data points. Please note that each graph has a different scale for the vertical axis because of the wide range.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 7.1

Age-Standardized Incidence Rates for Selected† Cancers, Males, Canada, 1979-2008

Year	Rate per 100,000								
	All Cancers	Prostate	Lung	Colorectal	Non-Hodgkin Lymphoma	Thyroid	Stomach	Liver	Larynx
1979	411.1	72.0	83.5	59.2	12.4	1.8	20.8	2.5	9.0
1980	407.1	71.4	82.9	57.9	11.6	1.9	19.0	2.2	9.3
1981	442.9	78.5	90.8	62.6	14.7	1.9	20.5	2.4	8.4
1982	442.0	77.8	92.4	62.7	15.6	1.7	18.7	2.4	8.8
1983	450.3	79.6	95.0	63.9	14.9	2.1	20.4	2.4	9.0
1984	452.0	80.9	96.8	64.8	14.9	2.0	18.4	3.1	8.9
1985	451.9	85.1	93.0	66.2	15.7	1.8	18.0	2.8	8.8
1986	453.9	86.1	96.1	64.7	16.0	2.0	18.0	3.3	8.8
1987	458.8	89.6	94.9	64.7	16.6	2.2	17.4	3.1	8.8
1988	461.2	90.4	95.2	64.6	17.0	2.1	17.0	3.0	8.6
1989	454.0	91.9	93.4	63.1	16.7	2.1	16.8	3.2	8.1
1990	460.4	99.9	92.5	63.0	17.7	2.2	15.8	3.4	7.7
1991	472.0	112.3	90.5	62.9	17.4	2.4	15.6	3.6	8.4
1992	490.1	125.5	90.5	64.2	17.2	2.0	14.6	3.4	8.1
1993	502.8	140.5	91.5	62.0	18.2	2.6	14.3	3.8	7.4
1994	491.0	129.7	86.8	63.2	18.2	2.7	14.1	4.2	7.5
1995	466.8	111.7	84.7	61.6	18.3	2.6	13.3	4.2	7.4
1996	458.4	110.1	82.3	60.7	18.3	2.6	13.6	4.2	7.0
1997	461.4	115.6	79.5	60.3	18.8	2.7	13.1	4.5	6.6
1998	460.5	114.9	80.6	62.5	18.9	2.7	12.6	4.4	6.7
1999	471.3	119.3	79.5	63.4	18.9	3.2	12.6	4.6	6.6
2000	475.8	124.7	77.1	65.5	19.0	3.5	12.3	4.8	5.9
2001	477.8	132.4	75.8	64.1	19.0	3.6	11.8	5.3	6.0
2002	461.7	122.9	73.0	63.4	18.7	4.0	10.9	5.2	5.7
2003	456.9	119.3	70.9	61.1	18.9	3.7	11.6	5.0	5.3
2004	458.9	121.3	70.4	62.3	19.5	3.9	11.2	5.2	5.2
2005**	463.7	123.6	70.7	62.8	19.9	4.5	10.8	5.5	5.5
2006*	462.1	125.8	69.4	62.3	19.9	4.4	10.4	5.8	5.4
2007*	461.9	127.3	68.2	62.3	20.0	4.6	10.1	6.0	5.3
2008*	462.1	129.0	67.1	62.3	20.2	4.8	9.8	6.2	5.2

* Estimated rates

** Estimated for Quebec, Manitoba and Alberta.

† Five most frequent cancers (both sexes combined) and those cancers in Table 9 with a statistically significant incidence rate increase or decrease of more than 2% per year.

Note: Rates exclude non-melanoma skin cancer (basal and squamous) and are standardized to the age distribution of the 1991 Canadian population. See *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 7.2

Age-Standardized Mortality Rates for Selected† Cancers, Males, Canada, 1979-2008

Year	Rate per 100,000									
	All Cancers	Prostate	Lung	Colorectal	Non-Hodgkin Lymphoma	Oral	Stomach	Liver	Larynx	Hodgkin Lymphoma
1979	239.4	26.7	71.6	31.8	5.9	6.2	18.0	1.9	3.3	1.2
1980	240.7	25.8	73.9	32.3	7.0	5.5	15.5	1.9	3.7	1.2
1981	239.2	27.1	73.1	32.2	6.9	5.6	15.3	1.5	3.3	1.2
1982	243.5	26.0	77.3	31.9	6.8	6.0	14.6	1.7	3.6	1.1
1983	242.9	26.7	78.4	31.8	7.2	6.1	14.3	1.6	3.4	1.3
1984	247.9	27.4	80.1	32.4	7.0	5.8	13.9	2.3	3.3	1.1
1985	249.0	28.9	77.9	33.4	7.1	6.2	13.0	2.2	3.4	0.9
1986	249.0	29.4	78.8	32.0	7.7	6.2	13.1	2.3	3.5	1.0
1987	248.2	29.4	78.5	32.0	7.1	5.9	12.9	2.3	3.6	0.9
1988	254.8	30.7	81.2	32.4	7.8	5.8	12.8	2.6	3.7	0.8
1989	249.6	29.7	81.0	31.9	7.7	5.9	12.3	2.4	3.2	0.8
1990	246.5	30.1	79.4	30.9	7.9	5.6	11.3	2.0	3.6	0.8
1991	247.2	31.2	78.7	30.4	8.1	6.0	10.3	1.9	3.5	0.7
1992	244.7	31.0	77.5	31.1	8.1	5.4	10.7	2.2	3.3	0.7
1993	242.8	31.1	77.8	29.7	7.7	5.6	9.7	2.3	3.1	0.7
1994	241.8	30.7	75.5	30.3	8.4	5.3	9.8	2.5	3.2	0.6
1995	239.0	31.0	73.2	30.2	8.4	5.1	9.6	2.1	3.1	0.6
1996	236.5	29.0	72.9	29.5	8.4	5.0	9.5	2.2	2.9	0.5
1997	232.3	28.7	70.5	29.0	8.7	5.0	9.0	2.4	2.8	0.6
1998	230.5	28.0	70.2	28.9	8.9	4.7	8.6	2.7	2.7	0.5
1999	229.4	26.9	70.4	28.5	9.2	4.7	8.4	2.7	2.6	0.6
2000	225.4	26.8	64.3	28.5	9.0	3.9	8.1	2.4	2.8	0.5
2001	224.0	26.7	64.6	27.1	9.1	4.6	7.6	2.6	2.7	0.5
2002	219.9	25.0	64.4	27.7	8.5	4.7	7.3	2.6	2.5	0.4
2003	215.0	23.9	62.6	26.8	8.5	4.1	7.3	2.7	2.3	0.4
2004	211.7	23.3	60.6	26.8	8.3	4.1	7.0	2.6	2.1	0.4
2005*	214.7	24.6	61.9	26.7	8.8	4.1	6.7	2.7	2.4	0.4
2006*	212.8	24.3	61.0	26.5	8.9	4.1	6.5	2.7	2.4	0.4
2007*	210.9	23.9	60.1	26.2	8.9	4.0	6.3	2.7	2.4	0.4
2008*	209.0	23.6	59.2	25.9	9.0	3.9	6.1	2.8	2.3	0.3

* Estimated rates

† Five most frequent cancers (both sexes combined) and those cancers in Table 9 with a statistically significant mortality rate increase or decrease of more than 2% per year except for testis cancer, which has a low mortality rate (an estimated 30 deaths in 2008).

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

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 8.1

Age-Standardized Incidence Rates for Selected† Cancers, Females, Canada, 1979-2008

Year	Rate per 100,000									
	All Cancers	Lung	Breast‡	Colorectal	Non-Hodgkin Lymphoma	Thyroid	Stomach	Brain	Cervix	Larynx
1979	314.1	20.2	87.3	49.7	9.6	4.7	9.2	5.5	14.2	1.1
1980	305.8	21.6	83.3	47.4	8.8	4.4	8.6	5.9	13.0	1.4
1981	328.3	24.2	86.5	48.6	11.6	4.6	9.8	6.1	13.9	1.3
1982	321.3	25.8	86.0	48.9	11.7	4.5	8.7	5.7	12.3	1.1
1983	333.2	28.2	89.3	50.2	11.5	4.8	8.7	5.9	12.9	1.3
1984	329.9	29.5	90.4	48.9	11.3	4.9	8.1	6.0	12.2	1.4
1985	336.1	30.8	92.2	50.6	11.4	5.3	8.0	6.1	12.3	1.5
1986	325.5	31.5	88.6	48.2	11.3	5.2	8.3	5.7	10.9	1.4
1987	331.4	33.2	91.1	47.6	11.5	5.2	8.0	5.7	10.4	1.5
1988	336.8	34.6	97.8	46.1	11.7	5.1	7.2	6.0	10.2	1.5
1989	330.7	34.9	96.4	45.3	12.2	5.6	7.2	5.7	10.0	1.6
1990	333.9	36.3	96.0	45.7	12.1	5.8	6.9	5.9	10.4	1.4
1991	337.7	37.5	100.1	44.1	12.4	5.9	6.4	5.9	9.6	1.6
1992	343.8	39.7	101.9	44.3	12.5	6.9	6.6	5.6	9.7	1.3
1993	343.3	40.6	99.1	44.3	12.7	7.1	6.3	5.8	9.5	1.3
1994	343.7	39.8	99.0	43.7	13.3	7.6	6.3	6.1	9.4	1.4
1995	342.1	40.8	98.9	42.5	13.1	7.7	6.0	6.0	9.3	1.4
1996	339.9	42.0	98.7	41.1	13.1	7.8	6.0	5.8	9.2	1.3
1997	344.2	42.0	102.1	41.7	13.8	7.9	5.5	6.0	8.7	1.3
1998	351.7	43.7	103.2	43.9	14.0	8.2	5.6	5.9	8.3	1.2
1999	352.5	43.5	105.1	43.3	13.5	9.4	5.3	6.0	8.4	1.2
2000	354.4	45.1	101.5	44.5	13.8	10.4	5.5	5.9	8.4	1.1
2001	349.2	44.5	99.9	43.2	13.3	11.2	5.1	6.0	8.2	1.1
2002	355.1	45.0	101.8	43.1	13.5	13.2	5.2	5.6	8.0	1.1
2003	347.5	44.9	96.1	42.3	13.6	13.6	4.7	5.6	7.8	1.1
2004	349.5	45.5	96.1	42.5	14.3	15.0	4.9	5.1	7.5	1.0
2005**	359.1	47.9	100.7	42.5	14.1	15.9	4.7	5.6	7.2	1.0
2006*	357.9	48.9	101.8	41.7	14.4	16.3	4.5	5.7	7.4	1.0
2007*	359.3	49.8	102.2	41.5	14.5	17.4	4.4	5.7	7.3	1.0
2008*	360.8	50.8	102.5	41.2	14.7	18.7	4.3	5.7	7.1	1.0

* Estimated rates

** Estimated for Quebec, Manitoba and Alberta.

† Five most frequent cancers (both sexes combined) and those cancers in Table 9 with a statistically significant incidence rate increase or decrease of more than 2% per year.

‡ Projected estimates for breast cancer beyond 2004 reflect the long-term increasing trend in breast cancer incidence and are not sensitive to recent decline.

Note: Rates exclude non-melanoma skin cancer (basal and squamous) and are standardized to the age distribution of the 1991 Canadian population.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 8.2

Age-Standardized Mortality Rates for Selected† Cancers, Females, Canada, 1979-2008

Year	Rate per 100,000							
	All Cancers	Lung	Breast	Colorectal	Non-Hodgkin Lymphoma	Stomach	Cervix	Hodgkin Lymphoma
1979	150.2	16.3	29.8	26.1	4.4	7.2	4.2	0.7
1980	148.5	17.0	29.7	25.3	4.6	6.8	3.7	0.6
1981	149.0	17.9	30.1	24.4	4.5	7.5	3.9	0.6
1982	149.3	19.5	29.7	23.5	4.9	6.7	3.9	0.6
1983	149.4	19.9	30.4	23.1	4.9	6.5	3.9	0.6
1984	151.9	22.2	30.7	23.8	4.7	5.7	3.5	0.6
1985	154.8	23.7	31.8	23.7	5.0	6.0	3.3	0.5
1986	154.4	23.9	32.0	23.5	5.1	6.1	3.2	0.5
1987	154.0	25.3	31.3	23.0	5.2	5.7	3.0	0.5
1988	155.4	26.9	31.4	22.7	5.0	5.1	3.0	0.5
1989	153.1	27.0	31.2	21.3	5.5	5.5	2.9	0.5
1990	153.1	27.6	31.3	21.3	5.5	5.0	3.0	0.4
1991	153.5	29.5	30.1	20.7	5.7	4.9	2.8	0.5
1992	153.1	29.6	30.4	20.2	5.5	4.9	2.4	0.4
1993	154.8	31.7	29.4	20.3	5.5	4.5	2.6	0.5
1994	155.1	31.9	30.0	19.9	5.7	4.5	2.7	0.3
1995	152.0	31.3	28.7	19.8	5.9	4.6	2.4	0.4
1996	155.2	33.6	28.9	19.7	5.8	4.4	2.6	0.3
1997	150.3	32.6	27.7	18.8	5.8	3.9	2.5	0.3
1998	151.3	34.5	26.4	19.3	6.0	3.8	2.3	0.3
1999	149.8	34.9	25.2	18.6	5.7	4.0	2.4	0.3
2000	149.8	34.4	25.1	18.2	6.1	3.9	2.2	0.3
2001	148.2	34.4	25.0	17.8	5.7	3.4	2.1	0.3
2002	149.3	35.3	24.4	17.7	5.7	3.6	1.9	0.2
2003	148.2	35.4	24.1	17.1	5.5	3.5	1.9	0.2
2004	147.1	36.1	23.1	17.3	5.8	3.3	2.0	0.3
2005*	148.2	38.0	23.5	16.8	5.9	3.2	1.9	0.3
2006*	147.9	38.8	23.1	16.6	5.9	3.1	1.9	0.3
2007*	147.6	39.6	22.7	16.3	6.0	3.0	1.8	0.2
2008*	147.3	40.4	22.3	16.0	6.0	3.0	1.8	0.2

* Estimated rates

† Five most frequent cancers (both sexes combined) and those cancers in Table 9 with a statistically significant mortality rate increase or decrease of more than 2% per year.

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

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 9

Average Annual Percent Change (AAPC) in Age-Standardized Incidence and Mortality Rates for Selected Cancers, Canada, 1995-2004

	Incidence 1995-2004				Mortality 1995-2004			
	Males		Females		Males		Females	
	AAPC	Change-point†	AAPC	Change-point†	AAPC	Change-point†	AAPC	Change-point†
All Cancers	**0.0**	**1996**	**-0.3**	**2000**	**-1.3****		**-0.4****	
Prostate	1.2	1996	–		-2.9**		–	
Lung	-2.5**	1999	1.2**		-2.1**		1.2**	
Breast	–		-1.7*	1999	–		-1.6**	1999
Colorectal	-1.5*	2000	-1.1*	2000	-1.3**		-1.7**	
Non-Hodgkin Lymphoma	0.3	1997	0.0	1997	-2.3*	2000	-0.5	1996
Bladder	-0.5		-0.3		-0.4		0.4	
Melanoma	1.8**		1.0**		0.5		-0.8*	
Leukemia	0.3		0.1		-0.8*		-1.0	
Kidney	0.7**		1.2*		-0.5		-0.8	
Body of Uterus	–		0.5*		–		-0.4	
Pancreas	-0.6		0.0		-0.5		0.0	
Oral	-1.4**	1997	0.1		-2.5**		-0.6	
Thyroid	5.5**		10.1**	1997	0.7		-1.5	
Stomach	-2.3**		-2.4**		-3.6**		-3.1**	
Brain	-0.9**		-3.6*	2000	-1.0**		-0.7	
Ovary	–		-0.8*		–		-0.3	
Multiple myeloma	0.2		0.4		-1.5*		-0.3	
Esophagus	0.5		-1.4*		0.3		-0.6	
Liver	2.7**		1.3		2.2*		1.7	
Cervix	–		-2.1**		–		-3.3**	
Larynx	-3.6**		-3.4**		-3.2**		-1.8	
Hodgkin Lymphoma	0.1		0.0		-4.2*		-3.7*	
Testis	1.8**		–		-2.4		–	

– Not applicable
* Significant at p=0.05
** Significant at p=0.01
† Changepoint indicates the baseline year, if the slope of the trend changed after 1995.

Note: Average Annual Percent Change is calculated assuming a log linear model; incidence rates exclude non-melanoma skin cancer (basal and squamous). Changepoints were fit to rates from 1986 to 2004. See *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Cancer is primarily a disease of older Canadians. The estimates for 2008 shown in Table 10 indicate that about 71,000 new cases (42%) and 45,000 cancer deaths (60%) will occur in Canadians aged 70 years or more, while an additional 44,100 new cases (27%) and 16,200 deaths (22%) will occur in those aged 60-69. In contrast, less than 1% of new cases and deaths occur prior to age 20. The median age at cancer diagnosis is between 65 and 69 years of age and at death between 70 and 74 for both sexes.

It is important to note though, that about 50,000 new cases (30%) and 13,000 deaths (18%) will occur between ages 20 and 59. These are the most productive years for employment and raising families. As well, increasing numbers of people over 65 continue to work and made up over 2% of the work force in the 2001 census.[4] Cancer therefore has an enormous impact on the social fabric and economy of Canada.

Figure 7 displays age-specific rates of cancer incidence and mortality by five-year age groups for 2004, the most recent year for which complete national data are available. Cancer incidence and mortality rates increase substantially with age in both sexes.

The age and sex distribution for the most common cancers in Canadians are presented in Table 11. More than half of all newly diagnosed lung and colorectal cancers will occur among Canadians aged 70 or more. In contrast, breast cancer occurs primarily in women between the ages of 50 and 69. Only 28% of breast cancers are diagnosed over age 69, while 20% occur in women under age 50. It is notable that although half the new cases of breast cancer are estimated to occur between age 50 and 69, more deaths from breast cancer will occur in the 80 and older age group, reflecting the benefits of screening and treatment in middle-aged women.

Prostate cancer will be diagnosed most frequently in men aged 60-69, but more prostate cancer deaths occur in the 80 and older age group. This pattern likely reflects the effect of screening in the younger men and the long natural history of the disease in many.

Trends

Trends in age-standardized incidence and mortality rates for all cancers are shown for eight age groups in Figure 8. (Note that each age group has a different scale for the vertical axis because of the wide range in age-specific rates.) Figure 8 demonstrates the prediction of stable or increasing incidence rates in most of the age groups except in men over age 69 at which time the rate will continue to drop. Cancer is more common among males compared to females in youth under 20 and adults over 60. However there will be more cancer cases and deaths in women between the ages of 20-59. Sex-specific cancers, such as breast and cervical cancer in particular, as well as lung cancer, melanoma and thyroid cancer in females account for the marked shift in incidence according to sex in ages 20-59. Breast cancer is the most common cancer and cancer cause of death in this age group, accounting for 36% of cancer cases and 24% of deaths. The increasing cancer rate in young women 20-39 is particularly marked and is explained by the increasing incidence of non-Hodgkin lymphoma, melanoma, thyroid and kidney cancer.[5]

The incidence rate in men over 69 has been dropping primarily due to the decreasing rate of lung cancer as a result of decreased tobacco use. Mortality rates have been dropping for both sexes for ages up to 80. After that, mortality has been increasing in females, while falling for males.

AGE AND SEX DISTRIBUTION OF CANCER

From 1995-2004, mortality rates have dropped significantly in all 10-year age groups for men:

- ages 30-69 by about 2% per year;
- ages 70-79 and 80 or older by about 1% and 0.4% respectively.

In females, significant declines in mortality are also observed in:

- ages 0-19 (greater than 3% per year);
- ages 50-59 and 60-69 by about 1.4% and 0.5% per year, respectively.

Cancer is primarily a disease of older Canadians. Cancer rates are expected to rise in younger women aged 20-39. Notable declines in mortality have occurred in most age groups.

Table 10

Distribution by Age Group and Sex, for All Cancers Combined, Canada, 2008

Age Group	Population (in thousands) 2008 Estimates			New Cases 2008 Estimates			Deaths 2008 Estimates		
	Total	M	F	Total	M	F	Total	M	F
0-19	7,730	3,959	3,770	1,300	690	590	180	99	80
20-29	4,535	2,304	2,231	1,900	880	1,050	230	120	100
30-39	4,601	2,318	2,283	4,400	1,550	2,900	690	290	400
40-49	5,286	2,651	2,635	13,300	4,900	8,400	3,100	1,350	1,750
50-59	4,642	2,295	2,347	30,900	15,100	15,700	8,900	4,400	4,500
60-69	3,121	1,520	1,601	44,100	26,000	18,100	16,200	9,000	7,200
70-79	1,953	897	1,057	41,300	23,900	17,400	21,600	12,300	9,200
80+	1,227	443	785	29,300	14,000	15,300	23,000	11,300	11,700
All Ages	**33,095**	**16,386**	**16,709**	**166,400**	**87,000**	**79,400**	**73,800**	**38,800**	**35,000**

Note: Incidence figures exclude non-melanoma skin cancer (basal and squamous). Total of rounded numbers may not equal rounded total number. Please refer to *Appendix II: Methods* for further details. The 2008 population projections were provided by the Census and Demographics Branch, Statistics Canada.[2]

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 11

Distribution by Age Group and Sex, for Selected Cancers, Canada, 2008

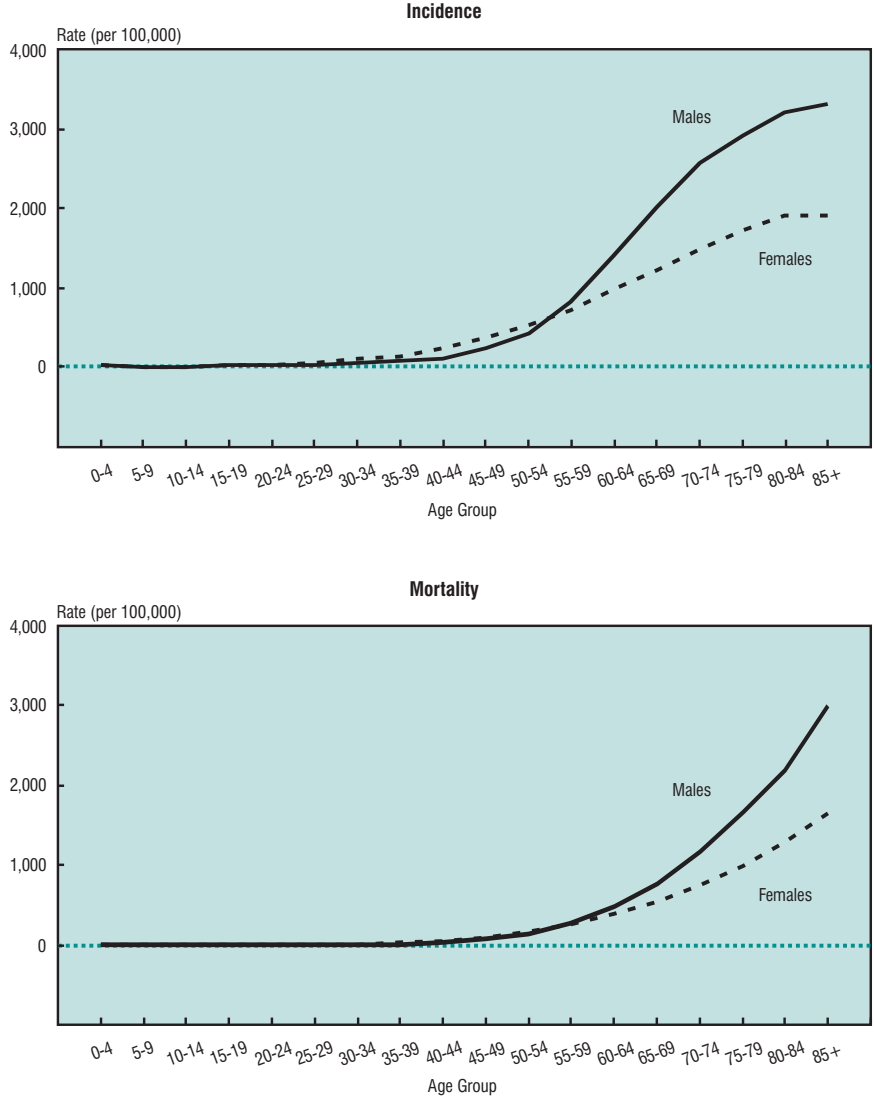
Age Group	Lung			Colorectal			Prostate	Breast
	Total	M	F	Total	M	F	M	F
New Cases								
0-19	10	5	5	10	5	5	10	5
20-29	20	10	10	45	25	20	–	75
30-39	110	45	65	220	120	100	10	840
40-49	1,050	390	660	1,100	580	520	680	3,500
50-59	3,500	1,600	1,850	3,300	1,900	1,400	5,100	6,100
60-69	7,000	3,700	3,300	5,400	3,400	2,100	9,700	5,500
70-79	7,700	4,400	3,300	6,200	3,600	2,600	6,300	3,700
80+	4,600	2,400	2,200	5,200	2,200	2,900	2,900	2,600
All Ages	**23,900**	**12,600**	**11,300**	**21,500**	**11,800**	**9,700**	**24,700**	**22,400**
Deaths								
0-19	–	–	–	5	5	–	–	–
20-29	5	5	5	10	10	5	–	5
30-39	60	25	35	55	25	25	–	100
40-49	710	290	420	290	150	130	10	440
50-59	2,500	1,250	1,250	950	550	400	120	940
60-69	5,400	3,000	2,400	1,800	1,150	640	510	1,050
70-79	6,800	3,900	2,900	2,500	1,500	1,000	1,300	1,100
80+	4,700	2,600	2,200	3,300	1,450	1,850	2,300	1,700
All Ages	**20,200**	**11,000**	**9,200**	**8,900**	**4,800**	**4,100**	**4,300**	**5,300**

– Fewer than 3 cases or deaths.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 7

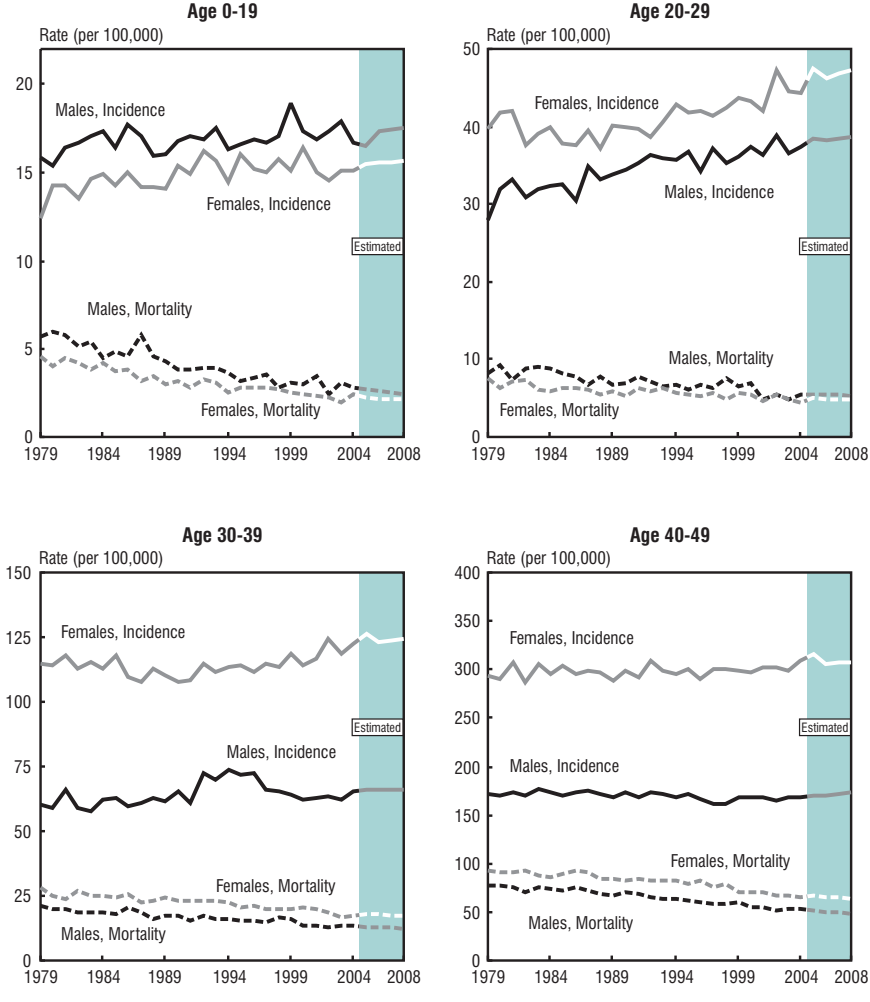
Age-Specific Incidence and Mortality Rates for All Cancers by Sex, Canada, 2004



Note: Incidence rates exclude non-melanoma skin cancer (basal and squamous).
Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 8

Age-Standardized Incidence and Mortality Rates by Age Group, All Cancers, Canada, 1979-2008

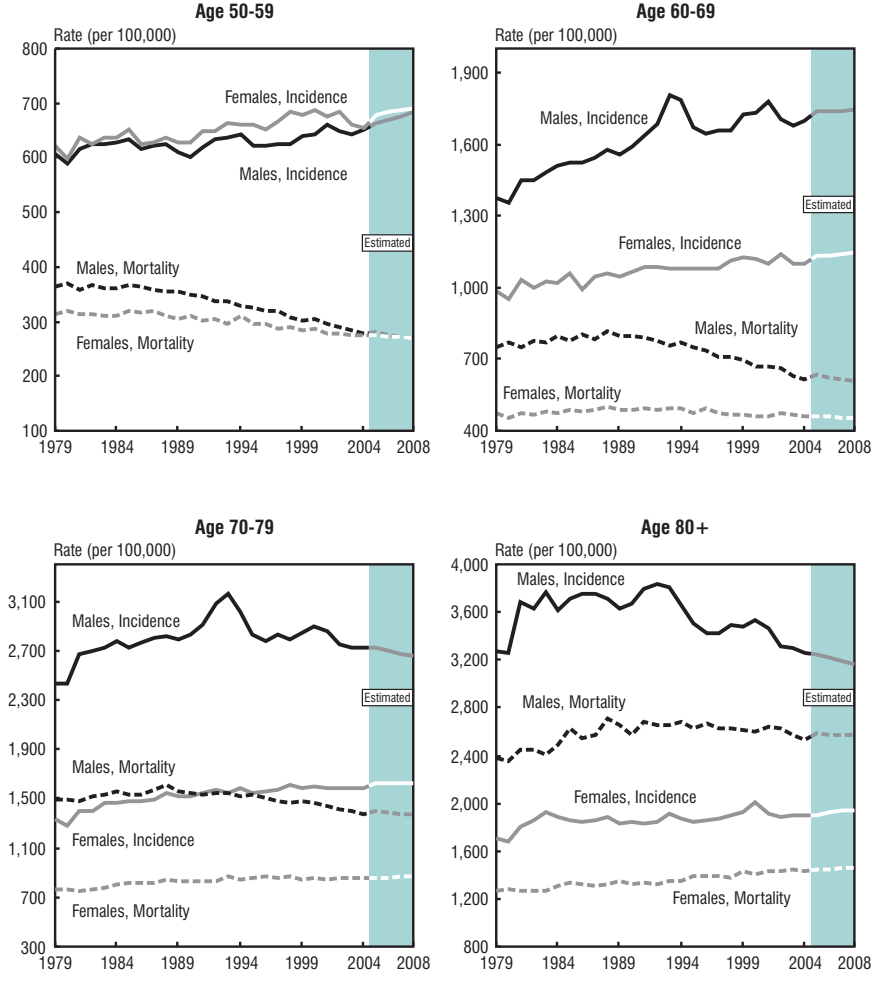


Note: The range of rate scales differ widely between the four age groups. Incidence figures exclude non-melanoma skin cancer (basal and squamous). Actual incidence data are available to 2005 except for Quebec, Manitoba and Alberta where 2005 incidence is estimated. Please refer to *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Figure 8 *(continued)*

Age-Standardized Incidence and Mortality Rates by Age Group, All Cancers, Canada, 1979-2008



Note: The range of rate scales differ widely between the four age groups. Incidence figures exclude non-melanoma skin cancer (basal and squamous). Actual incidence data are available to 2005 except for Quebec, Manitoba and Alberta where 2005 incidence is estimated. Please refer to *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

PROBABILITY OF DEVELOPING/DYING FROM CANCER

Table 12 presents the probability of Canadians developing the more common cancers within specific 10-year age periods, 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 is presented both as a percentage and as a ratio. Men have a lifetime probability of about 45% of developing cancer or 1 in 2.2. This means that nearly one of every two men is expected to develop cancer during his life. Similarly, women have a nearly 40% chance of developing cancer in their lifetime, or slightly more than 1 of every 3. One in 3.5 men and 1 in 4.2 women, or approximately 1 in 4 of all Canadians, will die of cancer.

During his lifetime, 1 in 7 men will be diagnosed with prostate cancer, the most common cancer (excluding non-melanoma skin cancer) to afflict men, and 1 in 27 will die from it. For men, the likelihood of dying from cancer is greatest for lung cancer, at 1 in 13.

During her lifetime, 1 in 9 women is expected to develop breast cancer, the most common cancer (excluding non-melanoma skin cancer) to afflict women, and 1 in 28 women is expected to die from it. For women, the likelihood of dying from cancer is greatest for lung cancer, at 1 in 18.

The probability of developing cancer within the next 10 years gives a useful indication of the short-term risk of cancer. Although the lifetime risk of developing breast cancer is 11% (1 in 9) and risk increases with age, the chance of a 60-year-old woman developing breast cancer before age 70 is only 3% (1 in 33); this figure may be more meaningful than the lifetime probability statistic for a 60-year-old woman contemplating her risk of breast cancer. Table 12 shows how steeply the risk of developing prostate cancer rises with age. A man has very little probability of being diagnosed with prostate cancer by age 50. However, a 70-year-old man has a 6% (1 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. In contrast to the general increase in risk of developing or dying from cancer with increasing decade of age, there is a decrease between ages 70-79 and 80-89 for many cancers. This is due to the increase in the probability of death from other causes at an advanced age.

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

Table 12

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

	Lifetime Probability of Developing		Lifetime Probability of Dying		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	**44.5**	**2.2**	**28.5**	**3.5**	**0.7**	**1.7**	**6.1**	**15.1**	**21.6**	**20.5**
Prostate	13.5	7.4	3.7	26.9	–	0.2	1.7	5.3	6.1	4.8
Lung	8.6	11.7	8.0	12.6	–	0.2	0.8	2.5	4.3	3.6
Colorectal	7.4	13.6	3.7	27.1	0.1	0.2	0.8	2.1	3.3	3.2
Bladder*	3.5	28.3	1.1	95.0	–	0.1	0.3	0.9	1.6	1.8
Non-Hodgkin Lymphoma	2.2	46.3	1.1	93.4	0.1	0.1	0.3	0.6	0.9	0.8
Leukemia	1.7	59.2	1.1	92.7	–	0.1	0.2	0.4	0.6	0.8
Kidney**	1.5	64.9	0.7	137.5	–	0.1	0.3	0.5	0.6	0.5
Stomach	1.4	72.6	0.9	106.1	–	–	0.1	0.4	0.6	0.6
Oral	1.4	72.8	0.5	197.9	–	0.1	0.3	0.4	0.4	0.4
Melanoma	1.3	74.2	0.4	284.4	0.1	0.1	0.2	0.3	0.5	0.5
Pancreas	1.3	79.6	1.3	74.4	–	–	0.1	0.4	0.5	0.5
Multiple Myeloma	0.8	132.3	0.5	194.3	–	–	0.1	0.2	0.3	0.4
Brain	0.8	132.9	0.6	171.2	–	0.1	0.1	0.2	0.2	0.2
Esophagus	0.7	138.7	0.8	121.5	–	–	0.1	0.2	0.3	0.3
Larynx	0.6	164.7	0.3	357.5	–	–	0.1	0.2	0.3	0.2
Liver	0.6	168.1	0.3	307.3	–	–	0.1	0.2	0.2	0.2

– Value less than 0.05

* The substantial increase in the lifetime probability of developing bladder cancer as compared with previous years reflects the decision to include in situ carcinomas (excluding Ontario) as of the 2006 edition of *Canadian Cancer Statistics*.

** The decrease in the lifetime probability of developing kidney cancer as compared with previous years reflects the decision to exclude ureter and other and unspecified urinary organs as of the 2008 edition of *Canadian Cancer Statistics*.

Note: The probability of developing cancer is calculated based on age- and sex-specific cancer incidence (excluding non-melanoma basal cell and squamous cell skin cancer) and mortality rates for Canada in 2004 and on life tables based on 2002-2004 all cause mortality rates. The probability of dying from cancer represents the proportion of persons dying from cancer in a cohort subjected to the mortality conditions prevailing in the population at large in 2004. See *Appendix II: Methods* for details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 12 *(continued)*

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

	Lifetime Probability of Developing		Lifetime Probability of Dying		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	**39.3**	**2.5**	**24.1**	**4.2**	**1.2**	**3.1**	**6.1**	**10.3**	**13.9**	**13.9**
Breast	11.0	9.1	3.6	28.0	0.4	1.3	2.3	2.9	3.1	2.5
Colorectal	6.4	15.7	3.3	30.6	–	0.2	0.6	1.3	2.4	2.8
Lung	6.2	16.0	5.4	18.4	–	0.2	0.7	1.8	2.5	1.8
Body of Uterus	2.4	42.2	0.6	174.5	–	0.1	0.5	0.8	0.7	0.5
Non-Hodgkin Lymphoma	1.9	52.2	1.0	103.6	0.1	0.1	0.2	0.4	0.6	0.7
Ovary	1.4	72.2	1.1	87.0	–	0.1	0.2	0.3	0.4	0.4
Pancreas	1.3	74.4	1.5	68.2	–	–	0.1	0.3	0.5	0.6
Thyroid	1.2	81.3	0.1	1,160.0	0.2	0.3	0.2	0.2	0.1	0.1
Leukemia	1.2	83.1	0.7	134.5	–	0.1	0.1	0.2	0.4	0.5
Bladder*	1.2	84.2	0.4	229.6	–	–	0.1	0.2	0.4	0.5
Melanoma	1.1	90.3	0.2	485.7	0.1	0.1	0.2	0.2	0.3	0.3
Kidney**	1.0	98.6	0.4	233.6	–	0.1	0.2	0.2	0.3	0.3
Stomach	0.8	125.7	0.6	165.6	–	–	0.1	0.1	0.3	0.4
Cervix	0.7	149.7	0.2	422.6	0.1	0.1	0.1	0.1	0.1	0.1
Oral	0.7	150.6	0.3	358.3	–	–	0.1	0.1	0.2	0.2
Multiple Myeloma	0.6	161.0	0.4	229.4	–	–	0.1	0.1	0.2	0.3
Brain	0.6	175.1	0.5	220.2	–	–	0.1	0.1	0.2	0.1

– Value less than 0.05

* The substantial increase in the lifetime probability of developing bladder cancer as compared with previous years reflects the decision to include in situ carcinomas (excluding Ontario) as of the 2006 edition of *Canadian Cancer Statistics*.

** The decrease in the lifetime probability of developing kidney cancer as compared with previous years reflects the decision to exclude ureter and other and unspecified urinary organs as of the 2008 edition of *Canadian Cancer Statistics*.

Note: The probability of developing cancer is calculated based on age- and sex-specific cancer incidence (excluding non-melanoma basal cell and squamous cell skin cancer) and mortality rates for Canada in 2004 and on life tables based on 2002-2004 all cause mortality rates. The probability of dying from cancer represents the proportion of persons dying from cancer in a cohort subjected to the mortality conditions prevailing in the population at large in 2004. See *Appendix II: Methods* for details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Cancer prevalence refers to the total number of people who are living with a diagnosis of cancer at a certain point in time. Table 13 shows the estimated number of people who were living with a cancer that was diagnosed in the 15 year period from 1990 to 2004. Also shown are the percentage of the population represented by this number and its reciprocal (i.e., the population that gives rise to one prevalent case). These estimates are based on survival rates from Saskatchewan for the period 1986 to 2001 (national data were unavailable), applied to the Canadian incidence data.

The overall estimated 15-year prevalence of cancer in the Canadian population is 2.5% among men and 2.8% among women (Table 13). In the year 2004, there were an estimated 396,900 male and 456,500 female cancer survivors, for a total of approximately 853,400 Canadians (2.7% overall). This is a 21% increase from the corresponding 679,800 figure reported previously for 1998.[6] The growth in the number of cancer survivors has been the result of increasing numbers of new cases of cancer and improved survival.

One in 40 Canadian men and 1 in 35 Canadian women had a cancer diagnosis at some time during the previous 15 years. Among men, the most prevalent type of cancer is prostate cancer, at 127,200 prevalent cases or 0.8% of the male population, followed by colorectal (54,800) and lung (18,200) cancers.

Breast cancer is the most prevalent cancer in women (166,000 cases or 1.0% of the female population), which is also followed by colorectal (54,700 cases) and lung (20,200) cancers. Prevalence is influenced by incidence rates and the average period of survival, both of which are age-dependent. Therefore, even though age adjusted incidence rates and survival rates are higher overall for prostate than breast cancer, the prevalence of breast cancer is higher than that of prostate cancer because breast cancer is more common in younger age groups. In the case of lung cancer, survival is poor, so even though incidence is high, prevalence is relatively low.

In estimating prevalence, it was assumed that survival rates from Saskatchewan were representative of those for Canada. Although there are alternative estimation methods, they are limited in their ability to report national prevalence for specific types of cancer. For example, the Canadian Community Health Survey (CCHS 2005) has self-reported data on personal history of cancer, but not for specific types of cancer. The CCHS 2005 survey indicated that 5.4% of Canadians reported a personal history of cancer, which was higher than the prevalence estimate for all Canadians (2.6%). This may be partly because the CCHS 2005 includes non-melanoma skin cancers, which are common and associated with very high survival, but which are not included in the *Canadian Cancer Statistics* estimates. As well, the CCHS asked about ever having had cancer, not just about having had cancer in the previous 15 years. There have also been improvements in survival since 2001 (the last available year for the Saskatchewan data) which means that the prevalence estimates presented herein are likely to be too low.

Prevalence is a useful indicator of the burden cancer poses both at the personal level and at the level of the health care system. 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 to patients and to their families and loved ones. These challenges may persist beyond the point of physical recovery from the cancer itself, often requiring extensive use of rehabilitation

and supportive care resources. A large number of Canadians live with the effects of cancer, require repeated active treatment and have continuing needs for cancer care resources and support services. This increased demand and the complexity of survivors' health needs must be considered in the planning and development of interdisciplinary health services.

Table 13
Estimated Cancer Prevalence by Sex, Canada, 2004

	Prevalence Count 15 Year			Prevalence Percentage of 2004 Population			Prevalence One in		
	Total	Males	Females	Total	Males	Females	Total	Males	Females
All Cancers	**853,400**	**396,900**	**456,500**	**2.7**	**2.5**	**2.8**	**37**	**40**	**35**
Female Breast	–	–	166,000	–	–	1.0	–	–	97
Prostate	–	127,200	–	–	0.8	–	–	125	–
Colorectal	109,500	54,800	54,700	0.3	0.3	0.3	292	289	295
Lung	38,400	18,200	20,200	0.1	0.1	0.1	833	870	799
Other Cancers	412,300	196,700	215,600	1.3	1.2	1.3	78	81	75

Note: Survival rates are based on Saskatchewan data from 1986 to 2001 with follow-up to 2002. See *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Why examine cancer survival?

Like incidence and mortality rates, population-based survival is an indicator of the burden of cancer. Its unique contribution is as a measure of the severity of disease: 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/her diagnosis. Examined across cancer types and regions, survival estimates can be used to establish priority areas for improving prognosis.[7] Examined over time, and in conjunction with incidence and mortality trends, they represent an important indicator of progress in cancer control.[8] While a population-based survival estimate is a useful "average" indicator,[9] it does not necessarily reflect a specific person's chances of surviving for a given time (e.g., five years) after diagnosis. This is because it is based on the experiences of a group of people with a heterogeneous mix of disease characteristics. Likewise, the confidence intervals around survival estimates do not represent the range of possible prognoses for individual patients, but rather statistical variation.

What are the determinants of survival?

The prognosis of a cancer patient may be influenced by host factors (e.g., age, sex, comorbid conditions, socio-economic status and lifestyle factors), tumour-related factors (e.g., stage of disease, histological subtype) and system factors related to cancer control (e.g., availability and quality of early detection, diagnostic and treatment services). Stage of disease at diagnosis is a very important prognostic indicator but is not yet available in Canada at a population level.

What is the relative survival ratio? (See *Glossary* for details)

The relative survival ratio is the preferred measure for assessing the survival of cancer patients in a population. It is defined as the ratio of the observed survival for a group of cancer patients to the survival expected for people in the same general population.[10] A five-year relative survival ratio of 80% means that people with that cancer had 80% of the likelihood of living for 5 years after diagnosis compared to similar people in the general population. An alternative interpretation is that 20% of people with that cancer died within 5 years of diagnosis as a direct or indirect result of their cancer, or the risk factors that predisposed them to develop cancer.

Estimated relative survival ratios

Estimates included here were produced by Statistics Canada specifically for this publication. Canadian five-year relative survival ratios for the period from 2001 to 2003 are shown in Table 14 and Figure 9. The data are presented for all invasive cancers combined and for selected cancers in descending order of survival for both sexes combined.

The five-year RSR for all cancers combined was 62%. This implies that those diagnosed with cancer from 2001 to 2003 were estimated to be 62% as likely to live for another five years as will comparable members of the general population. The corresponding five-year observed survival (i.e., the proportion of patients actually alive five years after their diagnosis) was 54% (data not shown). Relative survival was better among women (63%) than men (61%).

Five-year RSRs were highest for thyroid (98%) and testicular (96%) cancer. Among men, prostate cancer also had a very favourable prognosis (95% RSR) as did melanoma among women (93% RSR) (Table 14). The lowest RSRs were observed

among those diagnosed with pancreatic cancer (6%) followed by cancers of the esophagus (14%), lung (males 13%, females 18%) and liver (males 17%, females 16%). For most of the cancers examined, survival was similar or superior among women.

Provincial age-standardized relative survival ratios for prostate, breast, colorectal and lung cancers (i.e., the most commonly diagnosed cancer types) are provided in Table 15. While there was little provincial variation for breast cancer, age-standardized RSRs for prostate cancer ranged from a low of 88% in Saskatchewan to a high of 98% in Nova Scotia. The highest provincial age-standardized RSR for colorectal cancer, 63%, was observed in both British Columbia and in Ontario and the lowest in Prince Edward Island (56%) and Nova Scotia (59%). The highest provincial age-standardized RSR for lung cancer was in Manitoba (19%); the lowest occurred in both Alberta and in Prince Edward Island (13%). In interpreting the RSRs associated with Prince Edward Island it should be noted that, due to the relatively small number of cases available for analysis, estimates for this province are less precise than for other provinces.

There are a number of possible explanations for the observed variation between provinces, including differential patterns of use and diffusion of screening and early detection tests; varying patterns of diagnosis and availability and access to specialized cancer treatments; or differences in population attributes. Without data on stage of disease at diagnosis and treatment details, it is difficult to assess which of these might be important.

Five-year relative survival for both breast and prostate cancer was quite favourable for all age groups examined, though reduced somewhat among those diagnosed at relatively very young or very old ages (Table 16). The best prognosis for breast cancer was observed among those diagnosed between the ages of 40 and 79 (88%); for prostate cancer, men aged 50 to 79 faired best at 96%. It is uncertain whether the underlying reasons for the poorer survival among those diagnosed with prostate cancer before the age of 50 are biologically or socially/behaviourally based.[11] For lung cancer, relative survival was highest in the youngest age group, and then generally decreased with increasing age from 39% among those 20 to 39 years at diagnosis to 9% among those aged 80 to 99 at diagnosis. With the exception of those in the oldest group, survival was consistent across age groups for colorectal cancer (64%). Relative survival is generally poorer among those diagnosed with cancer at an older age because they may receive less therapy due to the presence of other diseases or conditions which reduce the body's ability to tolerate and respond to cancer treatments (referred to as 'co-morbidity'); and they may receive less aggressive treatment independently of co-morbidity.[12,13]

Examination of survival estimates can help to identify gaps and establish priorities for systemic change to improve survival. It is critical to expand collection of data on stage of disease for all newly diagnosed cancer patients to enhance interpretation of survival differences.

Table 14

Estimated Five-year Relative Survival Ratio (%) (and 95% Confidence Interval) for the Most Common Cancers by Sex, Canada excluding Quebec*, 2001-2003

	Relative Survival Ratio (%) (and 95% confidence interval)		
	Both Sexes	Males	Females
All Cancers†	**62** (62-62)	**61** (61-61)	**63** (62-63)
Thyroid	98 (97-98)	93 (91-95)	99 (98-99)
Testis	96 (95-97)	96 (95-97)	–
Prostate	95 (94-95)	95 (94-95)	–
Melanoma	90 (89-91)	87 (86-88)	93 (92-94)
Breast	87 (87-88)	85 (79-91)	87 (87-88)
Body of Uterus	86 (85-87)	–	86 (85-87)
Hodgkin Lymphoma	86 (84-87)	85 (83-88)	86 (83-88)
Bladder (including in situ)**	78 (77-80)	79 (77-80)	76 (74-79)
Cervix	74 (73-76)	–	74 (73-76)
Kidney	66 (65-67)	65 (63-67)	67 (65-69)
Larynx	64 (62-67)	64 (62-67)	64 (59-69)
Oral	63 (62-64)	60 (59-62)	68 (66-70)
Colorectal	62 (62-63)	62 (61-63)	63 (62-63)
Non-Hodgkin Lymphoma	60 (59-61)	58 (57-60)	63 (61-64)
Leukemia	50 (48-51)	50 (48-51)	50 (48-52)
Ovary	40 (39-42)	–	40 (39-42)
Multiple myeloma	34 (32-36)	35 (33-38)	33 (30-35)
Stomach	23 (22-24)	22 (20-23)	26 (24-28)
Brain	23 (21-24)	22 (21-24)	23 (21-25)
Liver	17 (15-19)	17 (15-19)	16 (13-19)
Lung	15 (15-16)	13 (13-14)	18 (18-19)
Esophagus	14 (13-16)	14 (13-16)	14 (11-16)
Pancreas	6 (6-7)	6 (6-7)	6 (5-7)

– Not applicable

* Data from Quebec have been excluded, in part because the method of ascertaining the date of cancer diagnosis differs from the method used by other registries and because of issues in correctly ascertaining the vital status of cases.

** Excluding data from Ontario, which does not currently report in situ bladder cases.

† Cancers have been ranked from highest to lowest relative survival.

Note: The differences in cancer definitions with other sections can be found in *Appendix II: Methods*.

Source: Health Statistics Division, Statistics Canada

Table 15

Estimated Age-Standardized Five-year Relative Survival Ratio (%) (and 95% Confidence Interval) Both Sexes Combined by Province* for Selected Cancers, 2001-2003

	Relative Survival Ratio (%) (and 95% confidence interval)			
	Prostate	Breast	Colorectal	Lung
Canada	**94 (94-95)**	**87 (87-88)**	**62 (62-63)**	**15 (15-16)**
P.E.I.**	91 (85-96)	85 (80-90)	56 (49-64)	13 (10-18)
N.S.	98 (95-100)	85 (83-87)	59 (56-62)	15 (14-17)
N.B.	95 (92-97)	87 (85-89)	60 (57-63)	15 (13-17)
Ont.	95 (94-95)	87 (87-88)	63 (62-64)	16 (16-17)
Man.	92 (90-94)	88 (86-90)	62 (59-64)	19 (17-21)
Sask.	88 (86-90)	88 (86-90)	61 (58-64)	15 (13-17)
Alta.	91 (90-92)	87 (86-89)	60 (58-62)	13 (12-14)
B.C.	95 (94-96)	87 (87-88)	63 (62-65)	14 (13-15)

* Newfoundland and Labrador survival ratios are not shown as they are artefactually high. This is most likely because cancers were under-reported as the cancer registry did not receive death certificate information from the vital statistics office. The survival of such cases is generally less favourable.[14] Data from Quebec have been excluded, in part because the method of ascertaining the date of cancer diagnosis differs from the method used by other registries and because of issues in correctly ascertaining the vital status of cases.

** All expected survival proportions for P.E.I. were derived from Canadian life tables as stable estimates for single ages could not be produced for this province because of small population counts. Relative survival estimates for P.E.I. may be biased to the extent and direction that general population expected survival differed between this province and Canada as a whole. Data from the territories are included in the national survival estimates but age-standardized territorial relative survival ratios are not presented because in each case there were too few cases to calculate reliable age-standardized estimates.

Note: The differences in cancer definitions with other sections can be found in *Appendix II: Methods*.

Source: Health Statistics Division, Statistics Canada

Table 16

Estimated Five-year Relative Survival Ratio (%) (and 95% Confidence Interval) by Age Group for Selected Cancers, Canada excluding Quebec, 2001-2003

	Relative Survival Ratio (%) (and 95% confidence interval)					
	20-39	40-49	50-59	60-69	70-79	80-99
Prostate	–	92 (89-94)	96 (95-97)	97 (97-98)	95 (94-96)	83 (81-86)
Breast	81 (80-83)	88 (87-89)	89 (88-89)	89 (88-90)	88 (87-89)	80 (78-83)
Colorectal	64 (61-68)	65 (63-67)	65 (64-67)	64 (63-65)	63 (62-64)	57 (55-58)
Lung	39 (33-44)	22 (20-24)	19 (18-20)	16 (16-17)	14 (13-14)	9 (8-10)

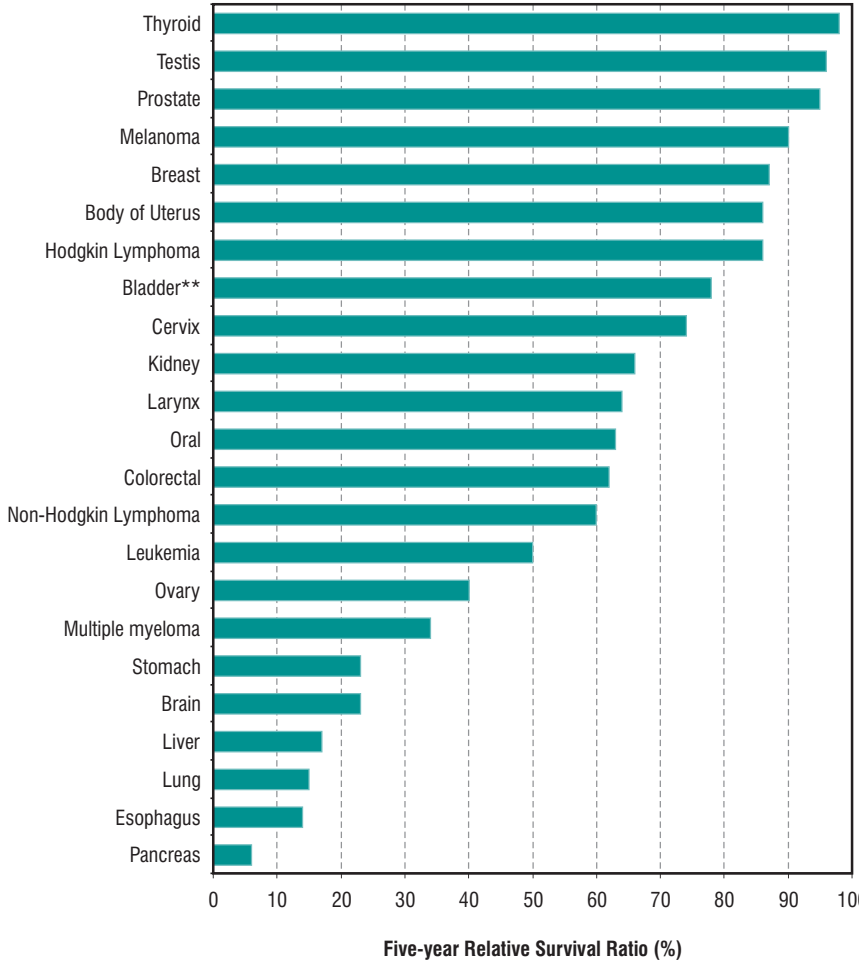
– Estimates were not available due to the very small number of cases.

Note: The differences in cancer definitions with other sections are described in *Appendix II: Methods*.

Source: Health Statistics Division, Statistics Canada

Figure 9

Estimated Five-year Relative Survival Ratio (%) for the Most Common Cancers, Both Sexes Combined, Canada excluding Quebec*, 2001-2003



* Data from Quebec have been excluded, in part because the method of ascertaining the date of cancer diagnosis differs from the method used by other registries and because of issues in correctly ascertaining the vital status of cases. Please refer to *Appendix II: Methods* for further details.

** Excluding data from Ontario, which does not currently report in situ bladder cases.

Source: Health Statistics Division, Statistics Canada

SPECIAL TOPIC: CHILDHOOD CANCER (AGES 0 TO 14)

In Canada close to 850 children (defined as 0 to 14 years of age*) are diagnosed with cancer every year, and around 135 die from their disease (Table 17). In Canadian children over the age of one month, cancer is the leading disease-related cause of death, second only to avoidable injury in overall mortality.[15] While many children with cancer now have the opportunity for cure, a significant proportion of survivors experience life-long adverse effects, as a result either of the cancer itself or of its treatment.[16] Included in these effects are cardiopulmonary, endocrine, renal or pulmonary dysfunction, neurocognitive impairments and the development of second cancers.

Although childhood cancers account for a little over half of one percent of all cancers diagnosed in Canada, they are of significant public health importance. Cancer in children creates a disproportionate impact on health, economic and social welfare systems, as a consequence of the loss of young lives. As well, both child and family are affected by emotional trauma and life-long consequences. Families affected by childhood cancer must often provide care for other young children in the home while attempting, at the same time, to navigate their way through the health and social welfare systems. Parents often work less or stop working altogether, which creates financial stress. Moreover, the impacts of childhood cancer often continue beyond the end of treatment, with both the survivors and their families requiring ongoing emotional, physical and financial support as well as health care.[17]

Cancers in children differ from those occurring in adults in both their site of origin and their behaviour.[18,19] The majority of cancers in adults are carcinomas which start in the glands or tissues that line organs such as the breast, lung, prostate or colon. In children, carcinomas are very rare. Tumours in children have short latency periods, often grow rapidly and are aggressive, invasive and frequently spread to other parts of the body. Relative to adults, cancers in children include a higher proportion of hematopoietic (blood and lymphatic) malignancies, most commonly leukemia. In order to account for the differences in childhood cancers as compared with those in adults, a separate classification scheme of diagnostic groupings has been developed.[20] The International Classification of Childhood Cancers comprises 12 major diagnostic categories, with associated subgroups for additional refinement.

Table 17 presents the number of new cases of childhood cancer with age-standardized incidence rates, and the number of deaths due to cancer with age-standardized mortality rates during 2000-2004. For this period, cancer was diagnosed each year in an average of 850 children aged 0 to 14, and an average of 135 died each year from their disease. Leukemia accounted for 33% of new cases and 27% of deaths due to cancer in children, and remains the most common of the childhood cancers. Cancers of the central nervous system, the second most common group of childhood cancers, constituted approximately 20% of new cases and 30% of deaths, followed by lymphomas, which accounted for 12% of new cases and 5% of deaths.

The overall incidence of childhood cancer has remained relatively stable since 1985, varying from 144 to 159 per 1,000,000 children (Figure 10, all cancers). Estimates of time trends and tests for changes in the trends for age-standardized incidence and mortality rates were conducted using changepoint regression analysis (for details on methods, see *Appendix II: Methods*). The estimated average annual percent change in incidence rates between 1985 and 2004 was not statistically significantly different

* Note: While data in this section are based on children 0 to 14 years of age, most pediatric oncology centres in Canada treat children 0 to 17 years of age.

from zero for all cancers combined or for any of the cancers shown in Figure 10. During the same period, however, there was a dramatic decline in childhood cancer mortality. Linear trends observed statistically significant decreases in the age-standardized mortality rates for all cancers and each of the selected cancers examined ($p<0.05$).

Incidence rates are highest among young children, aged 0 to 4 years (Table 18). Rates are lower and similar for children aged 5 to 9 and 10 to 14. Lymphoma rates increase with age, while rates for neuroblastoma peak prior to age one and become very rare after the age of five. Overall, childhood cancer occurs more commonly in males than in females. For every newly diagnosed female with cancer, there are 1.2 males (Table 19). The largest differences by sex are lymphomas (ratio of male to female new cases, 2.1 to 1) and hepatic tumours (ratio of male to female new cases, 1.4 to 1).

Cancer Control in Children

Cancer control aims not only to prevent and cure cancer, but also to increase both survival and quality of life after diagnosis. Cancer control is strengthened by knowledge gained through research, surveillance, and outcome evaluation, which can then be applied to the development of more effective future strategies and actions.[21] Moreover, all activities that together form the continuum of prevention, early detection, diagnosis, treatment, survivorship, and palliative care are components of cancer control.

Prevention and Screening

Little is known about what causes childhood cancers, thereby limiting opportunities for primary prevention. While many studies have examined possible risk factors, few have been found to be directly related.[22] Certain genetic abnormalities and inherited diseases are associated with a higher risk of childhood cancer (such as Down syndrome). Chemotherapeutic agents, radiotherapy, or maternal (intra-uterine) exposure to diethylstilbestrol (DES) or to ionizing radiation are a few of the better-established risk factors for childhood cancers. However, these risk factors account for only a small percentage of all cases.

Screening for childhood tumours has also proven ineffective, mainly due to short latency periods and cancers that are typically aggressive and fast growing. With the exception of neuroblastoma, no screening methods have been developed to date for childhood cancer. However, screening for neuroblastoma was determined to be ineffective after studies found no decline in mortality related to screening.[23, 24] Moreover, because infant neuroblastoma often regresses naturally, screening resulted in both an increased incidence of the disease and unnecessary treatment.

Diagnosis and Treatment

Currently, the most effective methods of cancer control in children are accurate diagnosis and effective treatment. In Canada, definitive diagnosis and treatment for children with cancer is available at one of 17 specialized pediatric cancer treatment centres (Table 23). In general, for Canadian children with cancer, diagnosis and the start of treatment occur rapidly. During 1995-2000, the median interval between first presentation to a health care professional and start of treatment was 17 days (Figure 11). This interval was shortest for children under 1 year of age (median interval of 9 days), and longest for 10- and 14-year olds where the median interval was 26 days; a pattern that is consistent with the biology of tumours that predominate in each age group. The

main factors that affect the time from the onset of symptoms to diagnosis include the biology of the tumour, the site of occurrence, and the patient's age.[25]

Metastasis, the process by which cancer spreads from one part of the body to another through the bloodstream or lymphatic system, is often an important marker to indicate disease severity. Excluding non-applicable cases (i.e. cancers which are systematic in origin, such as leukemia and lymphoma), the proportion of patients with metastatic disease at diagnosis are shown in Table 20. Metastases were present at diagnosis in approximately one quarter of all cancer cases. Sympathetic nervous system tumours, hepatic and renal tumours were most likely to have metastasized before diagnosis (56, 35 and 31% respectively). The lowest proportion of metastasis was for cases of retinoblastoma (5%), followed by cancers of the central nervous system (13%); these findings are consistent with the known biological behaviour of these diseases.

The role of collaborative clinical trials in therapy for children with cancer has been vital in advancing progress. Randomized clinical trials are studies primarily designed to compare the effectiveness of different treatments, with the ultimate aim of increasing survival while minimizing side effects. Clinical trials typically study the best current standard treatment (based on results of previous clinical trials) and an experimental treatment that includes some modification or addition to the standard treatment. The standard treatment of a randomized clinical trial will often also be used as the basis of treatment for children when a clinical trial is not open, they do not meet eligibility criteria, or when a family declines to participate in the research. In Canada, an estimated 80% of children with cancer are either enrolled in a clinical trial or treated according to the standard treatment developed from clinical trial methodologies (Figure 12). Percentages vary widely by type of cancer, from 95% of children with leukemia receiving treatment in a randomized clinical trial or a standardized treatment protocol to 50% of children with central nervous system neoplasms (since a portion are treated by surgery alone, such cases do not get enrolled in a clinical trial or standard treatment protocol).

Late Effects

Progress in the treatment of cancer in children now means that over 82% of children with cancer survive at least 5 years after diagnosis.[26] This has led to an increase in the number of childhood cancer survivors and the need to monitor survivors of childhood cancer for late effects of therapy. Based on U.S. data, it is estimated that 1 in 1000 people in the developed world are survivors of childhood cancer.[27] Late effects are broadly defined as problems that develop after the completion of cancer treatment.

The importance of examining late effects in survivors of childhood cancer relates primarily to concern for the future wellbeing of survivors. Childhood cancer survivors are known to be at increased risk of physical, neurocognitive and psychological health problems, as a result of both their disease and the therapies they have undergone. Chemotherapy, radiation therapy and surgery can all lead to late effects involving any organ or system in the body. In general, adverse effects from radiation may not be apparent for several years. Chemotherapy problems that develop soon after treatment are often temporary, but some may lead to long-term complications.[28] Due to the poor survival rate of childhood cancer in previous decades, knowledge regarding the long-term effects of treatments on childhood cancer survivors as they age beyond midlife is largely unknown. As treatments change, new research will be required to monitor long-term impacts associated with the disease and its treatment.

Owing to the variable nature of late effects and lack of knowledge, management is often difficult. The emergence of late effects depends on many factors: age, exposure to chemotherapy and radiation during treatment (including both the dose and the part of body that was treated), biological predisposition, and the severity of the original disease. Some late effects may be identified relatively early and resolved without consequence; others may not appear until years later and may influence the progression of other age-related diseases.

An estimated two-thirds of survivors have at least one chronic or late-occurring effect from their cancer therapy, while up to one-third have a major, serious or life threatening complication. Endocrine and metabolic complications are the most prevalent late effects among childhood cancer survivors, followed by sensory problems, neurocognitive impairment, cardiopulmonary dysfunction, gastrointestinal disorders and secondary malignant neoplasms.[29] Survivors are also found to be at an increased risk of early death up to 25 years after diagnosis, owing mainly to a relapse of the primary cancer in the early years following the completion of therapy.[30]

Survival

Observed survival proportions (OSP) estimated for children (aged 0 to 14 years) diagnosed from 1999 to 2003 are presented in Table 21. These estimates were derived using period analysis and exclude data from the province of Quebec (see *Appendix II: Methods*). For all childhood cancers combined the five-year OSP was estimated to be 82%. The corresponding one- and three-year survival proportions were 92% and 85%, respectively. Within specific diagnostic groups, the highest five-year OSPs were observed for retinoblastoma (99%), renal tumours (92%), lymphomas (89%), and germ cell tumours (89%) while the lowest were seen in neuroblastoma (70%) and malignant bone tumours (72%).

Survival for those diagnosed with acute myeloid leukaemia (five-year OSP 67%) was considerably less than for those diagnosed with a lymphoid leukaemia (five-year OSP 90%). The outlook for those diagnosed with Hodgkin lymphoma (93% five-year OSP) was better than those diagnosed with non-Hodgkin lymphoma (84% five-year OSP). Similarly, the five-year prognosis for certain types of brain cancers such as astrocytoma (87%) was found to be higher than intracranial and intraspinal embryonal tumours (60%). Thyroid carcinomas (98% five-year OSP) and malignant melanomas (92% five-year OSP), the two most common subgroups of the other malignant epithelial neoplasms and malignant melanomas diagnostic group, had better survival than the diagnostic group as a whole (86%). Similarly, survival for malignant gonadal germ cell tumour cases (95% five-year OSP) was better than within its diagnostic group as a whole (89%).

Progress in cancer survival among children in Canada over the last decade or longer is difficult to quantify due to the lack of previously published results. Such information is, however, available for those aged 0 to 19 years at diagnosis. A 2007 study[26] found that the most current estimate (1999-2003) of the overall five-year OSP for children and adolescents in Canada of 82% was 11% higher than the 71% that was reported previously using cases diagnosed from 1985 to 1988.[31] Among diagnostic groups, the largest survival increases were observed for hepatic tumours (20%), leukaemias (15%), and central nervous system neoplasms (14%). There were also substantial improvements in survival in most subgroups studied. Improvements in five-year OSPs in the range of 12% to 14% were observed for lymphoid leukaemias, non-Hodgkin lymphomas, and astrocytomas.

SPECIAL TOPIC: CHILDHOOD CANCER (AGES 0 TO 14)

Tumours of the central nervous system are the leading cause of death due to childhood cancer (Table 17). These tumours have historically been very difficult to treat due to their location in vital structures. Chemotherapy has had disappointing results in the majority of central nervous system tumours, while the use of radiation therapy is avoided in young children due to the significant risks of intellectual impairments caused by radiating the developing brain. Other tumour groups that have disappointing survival rates include metastatic solid tumours such as Ewing's sarcoma, rhabdomyosarcoma, osteosarcoma, and neuroblastoma.

Palliative Care

While the majority of children with cancer become long-term survivors, significant numbers continue to die from the disease. Results from a Canadian study that examined cases in eight dedicated pediatric palliative care programs in 2002 found variability in disease referrals, with cancer diagnosis accounting for 22% of all referrals.[32] While care at the end of life is a key component of comprehensive cancer control for children, knowledge about palliative care in pediatric oncology, as well as how such care is to be monitored, remains underdeveloped.[33]

Progress and Application of Research in Childhood Cancer

Significant progress has been achieved through research in childhood cancers, most notably in the decline in mortality rates. Understanding the biology of cancers in children and the overall ability of children to tolerate more intense treatments than adults are also significant factors in this success. The coordination of successive cooperative clinical trials across North America since the 1950s is also a fundamental component in the progress against childhood cancers (see Table 22). Early research, first supported by the U.S. National Cancer Institute, allowed several hospitals to cooperate in clinical trials to study new drugs which had been developed to treat acute leukemia. The success of this early research demonstrated the benefits of a collaborative multi-centre approach, as the organization of cooperative research groups provided sufficient numbers of cases to conduct clinical trials and achieve results in a timely fashion.

Advances in treatment through cooperative group clinical trials eventually led to the identification of chemotherapy drugs that could eliminate leukemia cells from blood and bone marrow. The achievements of this early cooperative group investigating leukemia subsequently lead to the development and support of multi-disciplinary teams for the treatment of solid tumours in children. Other successes came when it was determined that the combined use of different therapies, such as radiation, surgery and chemotherapy, could provide successful treatments. After fifty years of cooperative research groups the treatment of children with cancer using treatment protocols derived from cooperative, multi-disciplinary clinical trials, has become the standard of care.[34]

Ongoing research in children has yielded an increased understanding of the basic biology of cancer, particularly in the role of genetics and tumour suppressor genes. Studies on children have assisted with advances in treatments (such as chemotherapy), the development of team management in patient care, and the demonstration of the significant advantages of multi-centred cooperative clinical research.

Currently, the majority of pediatric clinical trials in North America are operated through the Children's Oncology Group (COG). COG represents the largest multi-centre trial group for childhood cancer in the world. All 17 Canadian pediatric

oncology centres belong to COG. As such, each individual pediatric oncology centre has access to the clinical trials, biology and late- effects studies in order to enroll patients and gather information on children in these research studies. Efforts to obtain national data have been through the Canadian Childhood Cancer Surveillance and Control Program, which aims to monitor trends in diagnosis, treatment, and outcomes.[35]

Several years ago, directors of the 17 pediatric cancer centres in Canada formally established the Council of Canadian Pediatric Hematology/Oncology Directors or C^{17} Council through support from the Childhood Cancer Foundation – Candlelighters Canada. The C^{17} Council's aim is to promote excellence in clinical care, education and research for children and adolescents with cancer and serious disorders of the blood, as well as to advocate on behalf of such children and their families at the national level. The research arm of the Council, the C^{17} Research Network was created in 2004, and has enabled two to four pan-Canadian studies a year to be funded in order to undertake multi-disciplinary and multi-centre research projects in pediatric hematology, oncology and hematopoietic stem cell transplantation.

Although childhood cancer is rare, it remains of significant public health importance.

Table 17

New Cases and Deaths and Average Annual Age-Standardized Cancer Incidence and Mortality Rates by Diagnostic Group, Ages 0-14, Canada, 2000-2004*

Diagnostic Group and Subgroup	New cases	ASIR (per 1,000,000) per year	Deaths	ASMR (per 1,000,000) per year
I. Leukemia	**1,380**	**49.3**	**184**	**6.4**
a. Lymphoid	1,091	39.0	71	2.4
b. Acute myeloid	176	6.3	51	1.8
III. Central Nervous System	**828**	**28.9**	**201**	**6.9**
a. Ependymoma	88	3.2	19	0.7
b. Astrocytoma	365	12.5	41	1.4
c. Intracranial & intraspinal embryonal	207	7.3	57	2.0
II. Lymphoma	**506**	**16.9**	**32**	**1.1**
a. Hodgkin lymphoma	172	5.5	4	0.1
b. Non-Hodgkin lymphoma	155	5.2	10	0.3
c. Burkitt lymphoma	93	3.1	8	0.3
IV. Neuroblastoma & Other PNC	**295**	**11.4**	**82**	**2.9**
a. Neuroblastoma	292	11.3	82	2.9
IX. Soft Tissue	**262**	**9.0**	**45**	**1.5**
a. Rhabdomyosarcoma	135	4.7	28	1.0
VI. Renal Tumours	**230**	**8.5**	**34**	**1.2**
a. Nephroblastoma	214	7.9	27	0.9
XI. Other Malignant Epithelial	**184**	**6.1**	**9**	**0.3**
b. Thyroid	63	2.0	0	0.0
d. Malignant Melanoma	45	1.5	1	0.0
VIII. Malignant Bone Tumours	**183**	**6.0**	**47**	**1.5**
a. Osteosarcoma	88	2.8	16	0.5
c. Ewing's sarcoma	79	2.6	28	0.9
X. Germ Cell and Other Gonadal	**137**	**4.7**	**10**	**0.3**
c. Malignant gonadal germ cell	53	1.8	2	0.1
V. Retinoblastoma	**100**	**3.9**	**2**	**0.1**
VII. Hepatic Tumours	**68**	**2.6**	**12**	**0.4**
XII. Other and unspecified Cancers	**57**	**2.1**	**9**	**0.3**
Total (5 years)**	**4,242**	**149.8**	**676**	**23.3**
Average Per Year	**848**		**135**	

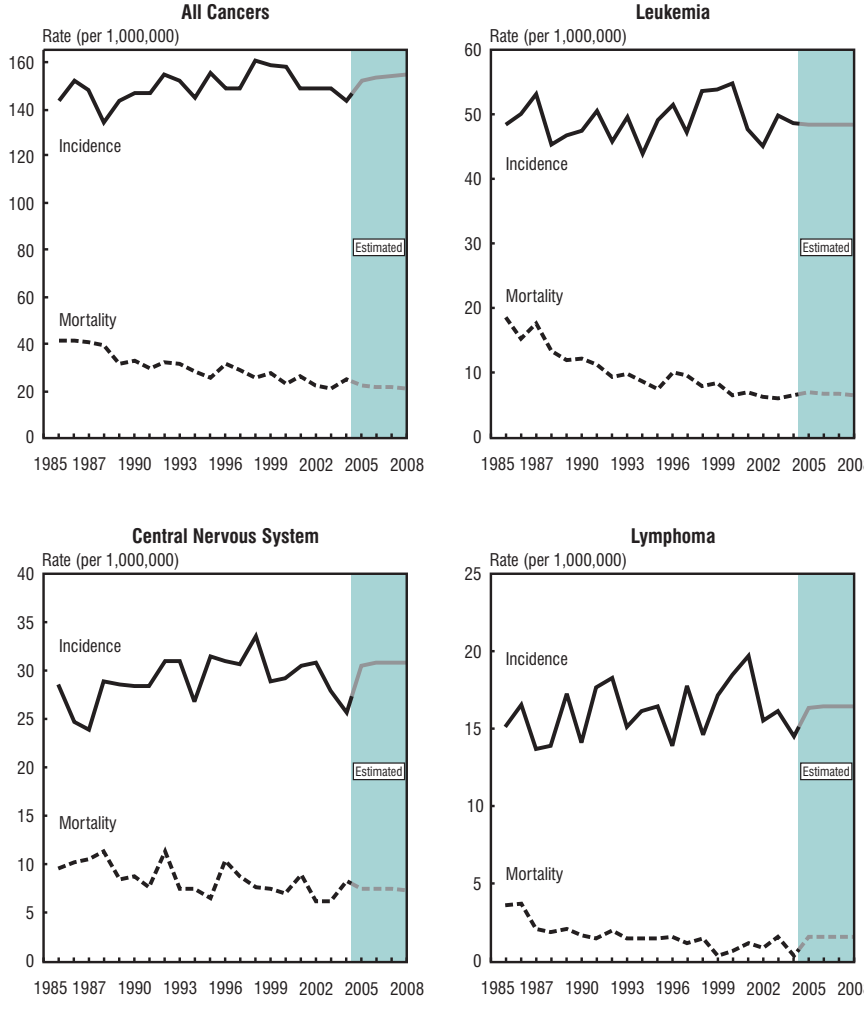
* Rates are age-standardized to the 1991 Canadian population and are expressed per million per year due to disease rarity. Diagnostic groups are listed according to frequency of occurrence. Cases were classified according to the third edition of the International Classification of Childhood Cancer.[20] Non-malignant intracranial and intraspinal tumours were excluded. Only selected subgroups within each diagnostic group are listed. PNC denotes peripheral nervous cell tumours.

** Total includes 12 malignant new cases and 9 deaths which were unclassifiable.

Source: Health Statistics Division, Statistics Canada

Figure 10

Age-Standardized Incidence and Mortality Rates for Selected Cancers for Children and Youth Ages 0-14, Canada, 1985-2008



Note: Cases and deaths were classified according to the groupings found in the *Glossary*. The range of rate scales differ widely between the cancers. Incidence figures exclude non-melanoma skin cancer (basal and squamous). Actual incidence data are available to 2005 except for Quebec, Ontario, Manitoba and Alberta where 2005 incidence is estimated. Please refer to *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 18

Age-specific Average Annual Incidence Rates by Diagnostic Group, Canada, 2000-2004*

Diagnostic Group and Subgroup	Cases per 1,000,000 per year			
	< 1 year	1-4 years	5-9 years	10-14 years
All Diagnostic Groups**	**226.3**	**213.9**	**115.0**	**116.5**
I. Leukemias, Myeloproliferative Diseases and Myelodysplastic Diseases	**48.6**	**90.6**	**39.6**	**25.7**
a. Lymphoid leukaemias	17.4	78.5	32.7	17.7
b. Acute myeloid leukaemias	16.2	7.3	4.6	5.0
II. Lymphomas and Reticuloendothelial Neoplasms	**7.8**	**11.1**	**14.8**	**25.6**
a. Hodgkin lymphomas	–	–	3.0	13.2
b. Non-Hodgkin lymphomas (except Burkitt lymphoma)	3.0	4.8	4.6	6.7
c. Burkitt lymphoma	–	2.0	4.3	3.4
III. CNS and Miscellaneous Intracranial and Intraspinal Neoplasms	**22.2**	**38.5**	**29.4**	**21.7**
a. Ependymoma	6.6	5.7	1.5	2.1
b. Astrocytomas	6.6	13.8	13.7	11.5
c. Intracranial and intraspinal embryonal tumours	7.2	11.2	8.2	3.3
IV. Neuroblastoma and Other Peripheral Nervous Cell Tumours	**58.8**	**21.9**	**3.2**	**1.0**
a. Neuroblastoma	58.8	21.8	3.1	1.0
V. Retinoblastoma	**16.8**	**9.4**	**0.5**	**–**
VI. Renal Tumours	**16.2**	**17.8**	**6.5**	**1.3**
a. Nephroblastoma and other non-epithelial renal tumours	15.6	17.2	6.1	0.7
VII. Hepatic Tumours	**12.0**	**5.1**	**0.7**	**0.5**
VIII. Malignant Bone Tumours	**–**	**2.3**	**4.6**	**11.4**
a. Osteosarcomas	–	0.9	2.0	5.9
c. Ewing tumour and related sarcomas of bone	–	1.0	2.2	4.8
IX. Soft-tissue and Other Extraosseous Sarcomas	**12.0**	**8.4**	**7.5**	**10.4**
a. Rhabdomyosarcomas	4.2	6.5	4.8	3.2
X. Germ Cell Tumours, Trophoblastic Tumours, and Neoplasms of Gonads	**13.2**	**3.3**	**2.6**	**6.3**
c. Malignant gonadal germ cell tumours	–	1.0	1.5	2.6
XI. Other Malignant Epithelial Neoplasms and Malignant Melanomas	**10.2**	**1.8**	**4.1**	**10.8**
b. Thyroid carcinomas	–	–	2.0	4.0
d. Malignant melanomas	–	–	1.1	2.6
XII. Other and Unspecified Malignant Neoplasms	**6.0**	**3.0**	**1.1**	**1.4**

– Rates based on fewer than five cases were suppressed.

* Cases were classified and itemized according to the third edition of the International Classification of Childhood Cancer.[20] Non-malignant intracranial and intraspinal tumours were excluded. Only selected subgroups within each diagnostic group are listed. CNS denotes central nervous system.

** All diagnostic groups combined includes 12 malignant new cases which were unclassifiable.

Source: Health Statistics Division, Statistics Canada

Table 19

Average Annual Incidence Rates by Sex and Diagnostic Group, Ages 0-14, Canada, 2000-2004*

Diagnostic Group and Subgroup	Cases per 1,000,000 per year		Ratio of new cases (male to female)†
	Males	Females	
All Diagnostic Groups**	**156.3**	**134.8**	**1.2**
I. Leukemias, Myeloproliferative Diseases and Myelodysplastic Diseases	**51.7**	**43.0**	**1.3**
a. Lymphoid leukaemias	42.6	32.2	1.4
b. Acute myeloid leukaemias	5.2	6.9	0.8
II. Lymphomas and Reticuloendothelial Neoplasms	**23.0**	**11.5**	**2.1**
a. Hodgkin lymphomas	6.3	5.5	1.2
b. Non-Hodgkin lymphomas (except Burkitt lymphoma)	7.6	3.0	2.7
c. Burkitt lymphoma	5.2	1.1	4.8
III. CNS and Miscellaneous Intracranial and Intraspinal Neoplasms	**30.4**	**26.4**	**1.2**
a. Ependymoma	3.4	2.6	1.4
b. Astrocytomas	12.0	13.1	1.0
c. Intracranial and intraspinal embryonal tumours	8.9	5.3	1.8
IV. Neuroblastoma and Other Peripheral Nervous Cell Tumours	**10.9**	**9.4**	**1.2**
a. Neuroblastoma	10.7	9.3	1.2
V. Retinoblastoma	**3.5**	**3.4**	**1.1**
VI. Renal Tumours	**6.8**	**9.1**	**0.8**
a. Nephroblastoma and other non-epithelial renal tumours	6.2	8.6	0.8
VII. Hepatic Tumours	**2.7**	**2.0**	**1.4**
VIII. Malignant Bone Tumours	**6.0**	**6.6**	**0.9**
a. Osteosarcomas	2.8	3.2	0.9
c. Ewing tumour and related sarcomas of bone	2.5	3.0	0.9
IX. Soft-tissue and Other Extraosseous Sarcomas	**9.6**	**8.4**	**1.2**
a. Rhabdomyosarcomas	5.0	4.3	1.2
X. Germ Cell Tumours, Trophoblastic Tumours, and Neoplasms of Gonads	**4.4**	**5.0**	**0.9**
c. Malignant gonadal germ cell tumours	1.1	2.5	0.5
XI. Other Malignant Epithelial Neoplasms and Malignant Melanomas	**5.2**	**7.5**	**0.7**
b. Thyroid carcinomas	1.1	3.2	0.4
d. Malignant melanomas	1.5	1.6	1.0
XII. Other and Unspecified Malignant Neoplasms	**1.7**	**2.2**	**0.8**

* Cases were classified and itemized according to the third edition of the International Classification of Childhood Cancer.[20] Non-malignant intracranial and intraspinal tumours were excluded. Only selected subgroups within each diagnostic group are listed. CNS denotes central nervous system.

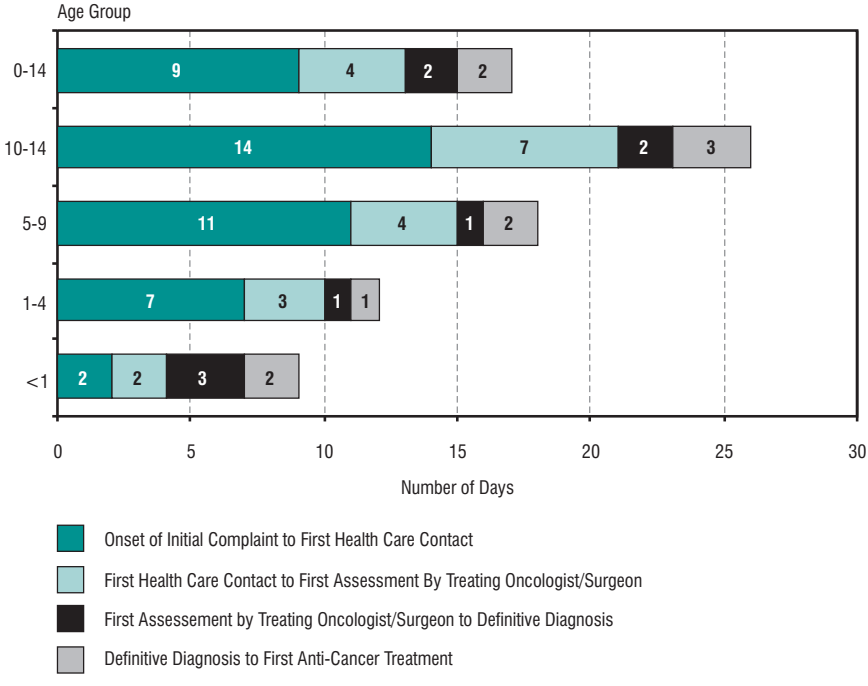
** All diagnostic groups combined includes 12 malignant new cases which were unclassifiable.

† Ratio is derived using the number of new cases.

Source: Health Statistics Division, Statistics Canada

Figure 11

Median Time Between Consecutive Events to Diagnosis and Initiation of Treatment by Age Group, Canada, 1995-2000



Note: Cases were classified according to the second edition of the International Classification of Childhood Cancer.[36] Data presented are for consenting patients and patients with information available on each specific date. Ontario cases were excluded (due to differences in data collection processes) except for results involving the time from diagnosis to initiation of treatment.

Source: The Canadian Childhood Cancer Surveillance and Control Program, Public Health Agency of Canada

The dramatic improvement in childhood cancer has been ascribed to several factors: better diagnostic procedures, the development of multi-modal therapies, and the centralization of care and support services.

Table 20

Percentage of Patients with Metastasis Present at Time of Diagnosis by Cancer*, Ages 0-14, Canada, 1995-2000

Diagnostic Group*	Number of cases	Presence of metastasis at diagnosis, %
III. CNS and miscellaneous intracranial and intraspinal neoplasms	852	12.9
IV. Sympathetic nervous system tumours	315	55.6
V. Retinoblastoma	100	5.0
VI. Renal tumours	280	31.1
VII. Hepatic tumours	65	35.4
VIII. Malignant bone tumours	173	16.8
IX. Soft-tissue sarcomas	233	27.0
X. Germ cell, trophoblastic and other gonadal neoplasms	138	21.7
XI. Carcinomas and other malignant epithelial neoplasms	69	30.4
XII. Other and unspecified malignant neoplasms	39	28.2
All Cancers	2,264	24.5

* Leukemia, lymphomas and reticuloendothelial neoplasms, Langerhans cell histiocytosis and myelodysplastic syndrome have been excluded.

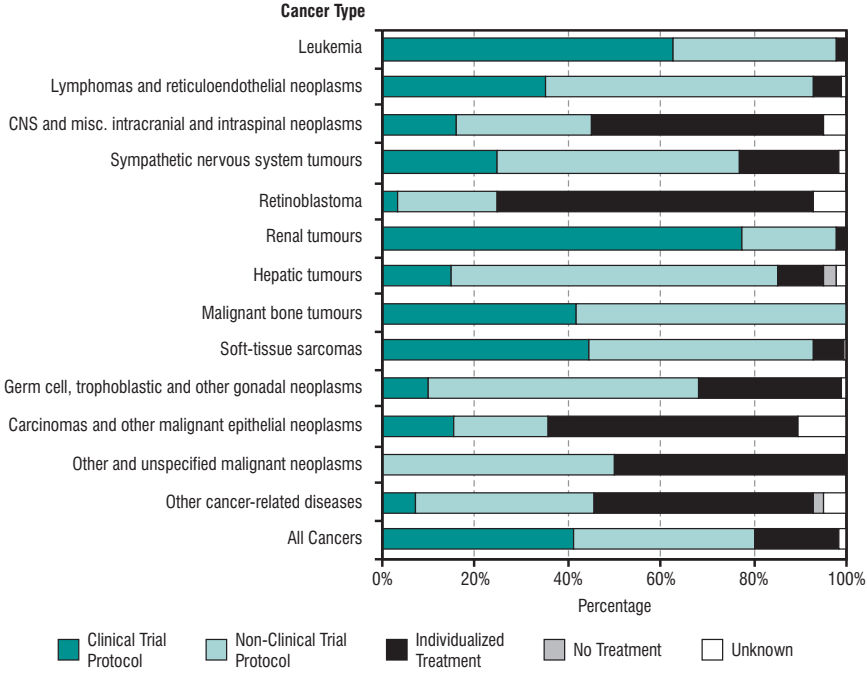
Note: Cases were classified according to the second edition of the International Classification of Childhood Cancer.[36] Data excludes the non-consenting cases and cases with missing information. CNS denotes central nervous system.

Source: The Canadian Childhood Cancer Surveillance and Control Program, Public Health Agency of Canada

Improving survival in childhood cancer (now at 82%), places increasing need for long term follow-up of late effects.

Figure 12

Percent Distribution of Initial Treatment by Cancer Type, Children Ages 0-14, Canada*, 1995-2000



* Excludes Ontario cases due to differences in data collection.

Note: Cases were classified according to the second edition of the International Classification of Childhood Cancer.[36] Data excludes non-consenting and cases with missing information. CNS denotes central nervous system.

Source: The Canadian Childhood Cancer Surveillance and Control Program, Public Health Agency of Canada

In Canada, nearly 80% of children with cancer are either enrolled in a clinical trial or treated according to a registered protocol established by a clinical trial.

Table 21

Observed Survival Proportion (OSP) estimates (%) (and 95% Confidence Intervals (CI)) by Diagnostic Group and Survival Duration, Ages 0-14, Canada excluding Quebec, 1999-2003

Diagnostic Group and Subgroup	Survival duration 1-year OSP (95% CI)	3-year OSP (95% CI)	5-year OSP (95% CI)
All Diagnostic Groups	92 (91-93)	85 (83-85)	82 (81-83)
I. Leukemias, Myeloproliferative Diseases, and Myelodysplastic Diseases	93 (91-94)	88 (86-89)	85 (83-87)
a. Lymphoid leukaemias	96 (95-97)	92 (90-94)	90 (88-91)
b. Acute myeloid leukaemias	79 (71-84)	69 (61-76)	67 (59-74)
II. Lymphomas and Reticuloendothelial Neoplasms	94 (91-96)	89 (86-92)	89 (85-92)
a. Hodgkin lymphomas	99 (95-100)	94 (89-97)	93 (88-96)
b. Non-Hodgkin lymphomas (except Burkitt lymphoma)	93 (87-96)	84 (77-90)	84 (77-90)
III. CNS and Miscellaneous Intracranial and Intraspinal Neoplasms	87 (84-89)	78 (75-80)	75 (72-78)
b. Astrocytomas	93 (89-95)	88 (84-91)	87 (82-90)
c. Intracranial and intraspinal embryonal tumours	84 (77-88)	67 (59-73)	60 (52-67)
IV. Neuroblastoma and Other Peripheral Nervous Cell Tumours	92 (88-95)	77 (71-82)	70 (64-75)
V. Retinoblastoma	100 (. - .)	99 (92-100)	99 (92-100)
VI. Renal Tumours	97 (94-99)	93 (88-95)	92 (87-95)
a. Nephroblastoma and other non-epithelial renal tumours	98 (95-99)	93 (89-96)	92 (88-95)
VII. Hepatic Tumours	81 (69-89)	76 (62-85)	76 (62-85)
VIII. Malignant Bone Tumours	93 (88-96)	78 (71-83)	72 (65-78)
a. Osteosarcomas	93 (85-97)	75 (65-83)	70 (59-79)
c. Ewing tumour and related sarcomas of bone	93 (83-97)	79 (68-87)	71 (59-81)
IX. Soft-tissue and Other Extraosseous Sarcomas	94 (90-97)	81 (75-86)	77 (71-83)
a. Rhabdomyosarcomas	95 (89-98)	82 (73-88)	77 (68-84)
X. Germ Cell Tumours, Trophoblastic Tumours, and Neoplasms of Gonads	94 (87-97)	91 (84-95)	89 (81-93)
c. Malignant gonadal germ cell tumours	100 (. - .)	98 (85-100)	95 (83-99)
XI. Other Malignant Epithelial Neoplasms and Malignant Melanomas	94 (88-97)	89 (82-94)	86 (79-91)
b. Thyroid carcinomas	100 (. - .)	98 (84-100)	98 (84-100)
d. Malignant melanomas	96 (75-99)	96 (75-99)	92 (72-98)
XII. Other and Unspecified Malignant Neoplasms	94 (84-98)	94 (84-98)	90 (79-96)

* Cases were classified and itemized according to the third edition of the International Classification of Childhood Cancer[20] and include non-malignant intracranial and intraspinal tumours.[26] Observed survival proportions were derived excluding cases diagnosed in Quebec (see Observed and Realtive Survival in *Appendix II: Methods*). Only selected subgroups within each diagnostic group are listed. CNS denotes central nervous system.

(. - .) = confidence interval is undefined.

Source: Health Statistics Division, Statistics Canada

Table 22
Significant Advances in the History of Childhood Cancer Research

Event	Implication(s)
Multi-Institution Cooperation in Clinical Trials (1955)	Formation of the first group of hospitals that agreed to cooperate in clinical trials of new drugs.
Leukemia Chemotherapy	Introduction of new agents, which were effective in the treatment of acute leukemia.
Treatment of Solid Tumours in Children	Introduction of other medical disciplines to study effects of surgery, radiation and pathology on diagnosis and treatment of solid tumours.
Multi-Disciplinary Team Care	Introduction of multi-modal therapies, conducted through large-scale multi-centre clinical trials.
Laboratory and Translational Research	Knowledge of how cancer cells are affected by improved diagnostic evaluation and treatments.
Concept of Total Cure (1980s)	Incorporation of quality of life determinants as an overall goal for childhood cancer survivors.

Source: CureSearch (Children's Oncology Group) www.curesearch.org

Table 23
Pediatric Oncology Centres in Canada

Alberta Children's Hospital, Calgary, AB	www.calgaryhealthregion.ca
Allan Blair Cancer Centre, Regina, SK	www.saskcancer.ca
British Columbia Children's Hospital, Vancouver, BC	www.bcchildrens.ca
CancerCare Manitoba, Winnipeg, MB	www.cancercare.mb.ca
Children's Hospital of Eastern Ontario, Ottawa, ON	www.cheo.on.ca
Children's Hospital of Western Ontario, London, ON	www.chwo.org
Centre Hospitalier Universitaire de Québec, Québec, QC	www.chuq.qc.ca
Centre Hospitalier Universitaire de Sherbrooke, Sherbrooke, QC	www.chus.qc.ca
Hôpital Sainte-Justine, Montréal, QC	www.chu-sainte-justine.org
IWK Health Centre, Halifax, NS	www.iwk.nshealth.ca
Janeway Children's Health and Rehabilitation Centre, St. John's, NFLD	www.easternhealth.ca
Kingston General Hospital, Kingston, ON	www.kgh.on.ca
McMaster Children's Hospital, Hamilton, ON	www.mcmasterchildrenshospital.ca
The Hospital for Sick Children, Toronto, ON	www.sickkids.ca
The Montreal Children's Hospital, Montreal, QC	www.thechildren.com
Saskatoon Cancer Centre, Saskatoon, SK	www.saskatoonhealthregion.ca
Stollery Children's Hospital, Edmonton, AB	www.stollerykids.com

Age — The age of the patient (in completed years) at the time of diagnosis or death.

ICDO-3 — International Classification of Diseases for Oncology, Third Edition.[37]

ICD-10 — International Statistical Classification of Diseases and Related Health Problems, Tenth Revision.[38]

Incidence — The number of new cases of a given type of cancer diagnosed during the year. The basic unit of reporting is a new case of cancer rather than an individual patient.

Mortality — The number of deaths attributed to a particular type of cancer that occurred during the year. Included are deaths of patients whose cancer was diagnosed in earlier years, people with a new diagnosis during the year, and patients for whom a diagnosis of cancer is made only after death.

Observed survival proportion — The proportion of patients alive after a given length of time (e.g., five years) since diagnosis.

Province/Territory — For cancer incidence and mortality data, this is the province/territory of the patient's permanent residence at the time of diagnosis or death, which may or may not correspond to the province/territory in which the new case of cancer or the cancer death was registered.

Relative survival ratio — The ratio of the observed survival for a group of cancer patients 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 factors affecting patient survival (e.g., sex, age, area of residence) as the cancer patients. Estimates of the relative survival ratio greater than 100% are possible and indicate that the observed survival of the cancer patients is better than that expected from the general population.

Age-standardized relative survival ratio — The all ages survival estimate that would have occurred if the age distribution of the patient group under study had been the same as that of the standard population (i.e., all patients who were diagnosed with that cancer in Canada between 1992 and 2001).

GLOSSARY

Incidence, Mortality and Prevalence Rates

Crude rate

The number of new cases of cancer or cancer deaths during the year, expressed as a rate per 100,000 persons in the population.

Age-specific rate

The number of new cases of cancer or cancer deaths during the year, expressed as a rate per 100,000 persons in a given age group.

Age-standardized rate

The number of new cases of cancer or cancer deaths per 100,000 that would have occurred in the standard population (1991 Canadian population) if the actual age-specific rates observed in a given population had prevailed in the standard population.

Index of age-standardized rates

The age-standardized rate of the base year, 1979, is set at 1. Index values for subsequent years are derived by dividing the age-standardized rate for that year by the 1979 rate.

Prevalence

The proportion of a population that is affected by disease at a given point in time is referred to as complete prevalence. In this document our estimate is more accurately described as limited-duration prevalence, and the duration is 15 years. By this we mean the prevalence of cases diagnosed within 15 years before the point in time for which the estimate is calculated. This estimate should always be an underestimate of complete prevalence, and the magnitude of the under-estimate is dependent on cancer site.[39]

1991 Canadian Population/World Standard Population

The population used to standardize rates had the following age distribution:

	Population			Population			Population	
Age Group	Canadian	World Standard	Age Group	Canadian	World Standard	Age Group	Canadian	World Standard
0-4	6,946.4	12,000	30-34	9,240.0	6,000	60-64	4,232.6	4,000
5-9	6,945.4	10,000	35-39	8,338.8	6,000	65-69	3,857.0	3,000
10-14	6,803.4	9,000	40-44	7,606.3	6,000	70-74	2,965.9	2,000
15-19	6,849.5	9,000	45-49	5,953.6	6,000	75-79	2,212.7	1,000
20-24	7,501.6	8,000	50-54	4,764.9	5,000	80-84	1,359.5	500
25-29	8,994.4	8,000	55-59	4,404.1	4,000	85+	1,023.7	500
							TOTAL	100,000

Source: The Canadian population distribution is based on the final post-censal estimates of the July 1, 1991 Canadian population, adjusted for census undercoverage. The World Standard Population is used in *Cancer Incidence in Five Continents*.

Cancer Definitions

Cancer data presented in this monograph are classified according to the following groupings, except where otherwise noted.

Cancer	ICDO-3 Site/Type[1] (Incidence)	ICD-10 (Mortality)
Oral	C00-C14	C00-C14
Esophagus	C15	C15
Stomach	C16	C16
Colorectal	C18-C21,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[1]	Type 9650-9667	C81
Non-Hodgkin Lymphoma[1]	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[1]	Type 9731,9732,9734	C90.0, C90.2
Leukemia[1]	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
All Cancers excluding Lung	C00-C97 excluding C34	C00-C97 excluding C34
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

[1] Histology types 9590-9989 (leukemia, lymphoma and multiple myeloma), 9050-9055 (mesothelioma) are excluded from other specific organ sites.

Note: ICDO-3 refers to the Third Edition of the International Classification of Diseases for Oncology. Figures are for invasive sites including in situ bladder and excluding non-melanoma skin cancer.

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

The focus of this publication is current year estimates that are obtained by analyzing actual data and making short-term projections using statistical techniques (see *Appendix II*). For users who require *actual data* rather than current year *estimates*, the Tables in this Appendix provide a summary of actual incidence and mortality statistics based on the most recently available data for the nation. These data represent the most recent year in the long series of data used to derive the current year estimates. Tables A1 and A2 list the actual number of new cases (2004) and deaths (2004) that occurred in Canada, and specify the ICDO-3 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 Appendix Tables A1 and A2 list a larger number of cancer types than the previous Tables. Tables A3 to A6 list actual values for incidence and mortality counts and rates for major cancer types, by province and territory.

In addition to the explanations and discussion provided earlier in the report, several other points are helpful to note. As noted in Tables A3-A6, because of the small populations of the territories, only summaries are given (five-year average) for the most common cancers. The Appendix Tables also indicate that among provinces/territories there was some variation in the years for which data were available (as of August 2007 when these analyses began). Furthermore, the data sources are dynamic files that are routinely updated as new data become available. Users who require more current, actual data for Canada may contact the Centre for Chronic Disease Prevention and Control at the Public Health Agency of Canada, or the Health Statistics Division at Statistics Canada. The most up-to-date data for individual provinces/territories can be obtained by contacting the provincial cancer registries (see section *For Further Information*).

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

Table A1

Actual Data for New Cases of Cancer, Canada, 2004

Cancer	ICDO-3 Site/Type[1]	Total	Males	Females
All Cancers	**All invasive sites**	**148,183**	**77,513**	**70,670**
Oral (Buccal Cavity and Pharynx)	**C00-C14**	**3,230**	**2,201**	**1,029**
Lip	C00	362	267	95
Tongue	C01-C02	753	517	236
Salivary Gland	C07-C08	379	223	156
Mouth	C03-C06	638	381	257
Nasopharynx	C11	231	153	78
Oropharynx	C10	114	84	30
Other and Unspecified	C09,C12-C14	753	576	177
Digestive Organs	**C15-C26,C48**	**31,143**	**17,265**	**13,878**
Esophagus	C15	1,386	1,025	361
Stomach	C16	2,971	1,899	1,072
Small Intestine	C17	534	298	236
Large Intestine	C18,C26.0	12,845	6,426	6,419
Rectum and Anus	C19-C21	6,804	4,145	2,659
Liver	C22.0	1,200	906	294
Gallbladder	C23	417	140	277
Pancreas	C25	3,543	1,753	1,790
Other and Unspecified	C22.1,C24,C26.1-.9,C48	1,443	673	770
Respiratory System	**C30-C36,C38.1-.9,C39**	**22,568**	**12,983**	**9,585**
Larynx	C32	1,101	907	194
Lung	C34	21,136	11,872	9,264
Other and Unspecified	C30-31,C33,C35-36,C38.1-.9,C39	331	204	127
Bone	**C40-C41**	**299**	**168**	**131**
Soft Tissue (including Heart)	**C38.0,C47,C49**	**884**	**463**	**421**
Skin (Melanoma)	**Type 8720-8790**	**4,096**	**2,155**	**1,941**
Breast	**C50**	**19,488**	**153**	**19,335**
Genital Organs	**C51-C63**	**29,538**	**21,427**	**8,111**
Cervix	C53	1,322	–	1,322
Body of Uterus	C54	3,779	–	3,779
Uterus, Part Unspecified	C55	96	–	96
Ovary	C56	2,230	–	2,230
Prostate	C61	20,443	20,443	–
Testis	C62	806	806	–
Other and Unspecified	C51-52,C57,C58,C60,C63	862	178	684
Urinary Organs	**C64-C68**	**10,768**	**7,456**	**3,312**
Bladder	C67	6,370	4,748	1,622
Kidney	C64-C65	3,953	2,405	1,548
Other Urinary	C66,C68	445	303	142
Eye	**C69**	**229**	**127**	**102**
Brain and Central Nervous System	**C70-C72**	**2,218**	**1,275**	**943**
Endocrine Glands	**C37,C73-C75**	**3,493**	**797**	**2,696**
Thyroid	C73	3,237	673	2,564
Other Endocrine	C37,C74-C75	256	124	132
Hodgkin Lymphoma[1]	**Type 9650-9667**	**891**	**500**	**391**
Non-Hodgkin Lymphoma[1]	**See Glossary**	**6,220**	**3,327**	**2,893**
Multiple Myeloma[1]	**Type 9731,9732,9734**	**1,892**	**1,027**	**865**
Leukemia[1]	**See Glossary**	**4,137**	**2,400**	**1,737**
Mesothelioma[1]	**Type 9050-9055**	**406**	**351**	**55**
All Other and Unspecified Cancers	**See Glossary**	**6,683**	**3,438**	**3,245**

– Not applicable

[1] Histology types 9590-9989 (leukemia, lymphoma and multiple myeloma), and 9050-9055 (mesothelioma) are excluded from other specific organ sites.

Note: ICDO-3 refers to the Third Edition of the International Classification of Diseases for Oncology. Figures are for invasive sites including in situ bladder and exclude non-melanoma skin cancer. Further information is available at: www.phac-aspc.gc.ca/dsol-smed/index.html.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table A2

Actual Data for Cancer Deaths, Canada, 2004

Cancer	ICD-10	Total	Males	Females
All Cancers	**C00-C97**	**66,947**	**35,156**	**31,791**
Oral (Buccal Cavity and Pharynx)	**C00-C14**	**1,067**	**699**	**368**
Lip	C00	19	13	6
Tongue	C01-C02	279	178	101
Salivary Gland	C07-C08	90	55	35
Mouth	C03-C06	207	112	95
Nasopharynx	C11	104	73	31
Oropharynx	C10	85	57	28
Other and Unspecified	C09,C12-C14	283	211	72
Digestive Organs	**C15-C25,C26.0,C26.2-.9,C48**	**17,883**	**9,859**	**8,024**
Esophagus	C15	1,488	1,112	376
Stomach	C16	1,919	1,163	756
Small Intestine	C17	150	92	58
Large Intestine	C18,C26.0	6,724	3,449	3,275
Rectum and Anus	C19-C21	1,677	983	694
Liver	C22.0,C22.2-.7	596	453	143
Gallbladder	C23	266	99	167
Pancreas	C25	3,577	1,751	1,826
Other and Unspecified	C22.1,C22.9,C24,C26.2-.9,C48	1,486	757	729
Respiratory System	**C30-C36,C38.1-.9,C39**	**18,208**	**10,566**	**7,642**
Larynx	C32	446	360	86
Lung	C34	17,642	10,129	7,513
Other and Unspecified	C30-31,C33,C35-36,C38.1-.9,C39	120	77	43
Bone	**C40-C41**	**127**	**74**	**53**
Soft Tissue (including Heart)	**C38.0,C47,C49**	**390**	**191**	**199**
Skin (Melanoma)	**C43**	**790**	**489**	**301**
Breast	**C50**	**4,998**	**34**	**4,964**
Genital Organs	**C51-C63**	**6,638**	**3,756**	**2,882**
Cervix	C53	388	–	388
Body of Uterus	C54	371	–	371
Uterus, Part Unspecified	C55	363	–	363
Ovary	C56	1,590	–	1,590
Prostate	C61	3,685	3,685	–
Testis	C62	46	46	–
Other and Unspecified	C51-52,C57,C58,C60,C63	195	25	170
Urinary Organs	**C64-C68**	**3,207**	**2,112**	**1,095**
Bladder	C67	1,634	1,131	503
Kidney	C64-C65	1,486	937	549
Other Urinary	C66,C68	87	44	43
Eye	**C69**	**27**	**15**	**12**
Brain and Central Nervous System	**C70-C72**	**1,609**	**925**	**684**
Endocrine Glands	**C37,C73-C75**	**270**	**108**	**162**
Thyroid	C73	174	69	105
Other Endocrine	C37,C74-C75	96	39	57
Hodgkin Lymphoma	**C81**	**127**	**73**	**54**
Non-Hodgkin Lymphoma	**C82-C85,C96.3**	**2,650**	**1,394**	**1,256**
Multiple Myeloma	**C90.0, C90.2**	**1,178**	**631**	**547**
Leukemia	**C91-C95, C90.1**	**2,262**	**1,310**	**952**
Mesothelioma	**C45**	**340**	**284**	**56**
All Other and Unspecified Cancers	**See Glossary**	**5,176**	**2,636**	**2,540**

– Not applicable

Note: ICD-10 refers to the Tenth Revision of the International Classification of Diseases.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of 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, Most Recent Year[1], Canada

	New Cases													
	Canada	NL*	PE	NS	NB	QC*	ON	MB	SK	AB	BC	YT	NT	NU
Males														
All Cancers	**77,500**	**1,250**	**410**	**2,800**	**2,200**	**19,500**	**29,500**	**2,800**	**2,600**	**6,800**	**9,800**	**50**	**40**	**30**
Prostate	20,400	290	110	720	620	4100*	8,500	690	830	2,000	2,600	10	10	–
Lung	11,900	180	60	470	340	3,900	3,900	420	350	830	1,350	5	5	10
Colorectal	10,600	240	50	390	280	2,700	4,000	390	370	860	1,350	5	10	5
Bladder**	4,700	70	20	180	140	1,500	1,400	170	140	440	660	5	–	–
Non-Hodgkin Lymphoma	3,300	45	20	95	85	760	1,300	110	95	300	490	–	–	–
Kidney	2,400	40	20	110	80	700	790	130	80	220	220	–	–	–
Leukemia	2,400	20	15	65	55	560	990	85	90	200	260	–	–	–
Oral	2,200	35	15	65	65	560	870	90	60	160	280	–	5	–
Melanoma	2,200	30	15	80	80	280	980	70	75	230	350	–	–	–
Stomach	1,900	55	5	65	55	490	710	80	50	140	240	–	–	–
Pancreas	1,750	20	10	60	45	520	570	80	50	140	230	–	–	–
Brain	1,300	30	10	55	30	340	480	35	35	120	160	–	–	–
Multiple Myeloma	1,050	5	10	30	30	220	430	40	30	100	130	–	–	–
Esophagus	1,050	20	5	45	35	220	410	25	30	85	140	–	–	–
Liver	910	5	5	10	5	250	340	25	15	95	140	–	–	–
Females														
All Cancers	**70,700**	**1,100**	**340**	**2,500**	**1,800**	**18,000**	**27,500**	**2,700**	**2,100**	**6,100**	**8,900**	**45**	**45**	**25**
Breast	19,300	320	80	660	520	4,900	7,500	720	570	1,750	2,600	15	20	5
Lung	9,300	130	45	350	270	2,700	3,200	380	280	730	1,200	5	5	10
Colorectal	9,100	200	60	370	230	2,400	3,400	350	280	680	1,150	5	10	5
Body of Uterus	3,900	60	10	130	90	870	1,600	180	110	350	530	–	–	–
Non-Hodgkin Lymphoma	2,900	25	15	110	85	720	1,200	130	90	220	370	–	–	–
Thyroid	2,600	50	5	70	90	550	1,300	65	55	260	170	–	–	–
Ovary	2,200	20	10	70	55	550	910	100	65	180	310	–	–	–
Melanoma	1,950	35	20	90	50	230	880	55	55	220	310	–	–	–
Pancreas	1,800	10	10	70	50	470	620	70	70	170	220	–	–	–
Leukemia	1,750	10	10	50	30	430	740	55	65	130	180	–	–	–
Bladder**	1,600	35	10	55	50	540	500	65	50	130	200	–	–	–
Kidney	1,550	30	10	70	45	450	580	60	40	140	140	–	–	–
Cervix	1,300	10	5	45	30	280	520	50	35	150	140	–	–	–
Stomach	1,050	25	5	30	25	280	420	40	25	85	120	–	–	–
Oral	1,050	15	5	25	20	240	410	50	20	90	150	–	–	–
Brain	940	20	5	25	25	240	380	35	30	70	110	–	–	–

– Fewer than 3 cases

* An underestimate of the number of cases.

** Inter-provincial variation. Ontario does not report in situ bladder cases. It is estimated including in situ cases for Ontario would result in 2,200 bladder cancer cases among men and 800 among women.

[1] 2004 for Canada, Quebec, Ontario, Manitoba, Alberta; 2005 for Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, Saskatchewan, British Columbia; 2001-2005 average for Yukon, Northwest Territories, Nunavut.

Note: Total of rounded numbers may not equal rounded total number and an average is used for the territories. Numbers exclude cases of non-melanoma skin cancer (basal and squamous). See *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table A4

Actual Age-Standardized Incidence Rates for the Most Common Cancers by Sex and Geographic Region, Most Recent Year[1], Canada

	Rate per 100,000													
	Canada	NL*	PE	NS	NB	QC*	ON	MB	SK	AB	BC	YT	NT	NU
Males														
All Cancers	**459**	**425**	**520**	**511**	**502**	**481**	**459**	**447**	**457**	**460**	**399**	**409**	**341**	**535**
Prostate	121	96	135	132	144	100*	133	112	148	138	108	106	76	–
Lung	70	61	77	87	80	95	62	68	61	58	54	61	53	251
Colorectal	62	82	65	71	65	66	62	62	65	59	55	61	89	94
Bladder**	28	26	28	33	33	38	22	27	24	31	27	24	–	–
Non-Hodgkin Lymphoma	19	16	23	18	20	18	20	18	16	20	20	–	–	–
Leukemia	15	6	22	12	13	15	15	14	16	13	11	–	–	–
Kidney	14	14	25	20	18	17	12	20	15	14	9	–	–	–
Oral	13	12	17	12	15	13	13	14	11	10	11	–	17	–
Melanoma	13	10	15	15	19	7	15	12	13	15	14	–	–	–
Stomach	11	19	7	12	13	12	11	13	9	10	10	–	–	–
Pancreas	10	7	11	11	10	13	9	13	9	9	9	–	–	–
Brain	8	10	16	10	7	8	7	6	6	7	7	–	–	–
Multiple Myeloma	6	2	13	6	7	6	7	6	5	7	5	–	–	–
Esophagus	6	8	7	8	7	5	6	4	5	6	6	–	–	–
Liver	5	2	4	2	1	6	5	4	2	6	6	–	–	–
Females														
All Cancers	**349**	**321**	**357**	**379**	**355**	**352**	**359**	**358**	**321**	**357**	**318**	**325**	**329**	**622**
Breast	96	91	83	102	99	96	98	99	91	101	93	98	118	52
Lung	46	37	51	54	53	52	42	50	44	44	43	30	48	274
Colorectal	43	55	58	52	42	44	43	43	40	39	38	57	68	119
Body of Uterus	19	17	11	20	18	17	21	25	17	21	19	–	–	–
Thyroid	15	16	9	13	20	13	20	11	10	16	7	–	–	–
Non-Hodgkin Lymphoma	14	7	13	16	16	14	15	17	14	13	13	–	–	–
Ovary	11	6	11	11	11	11	12	14	10	11	11	–	–	–
Melanoma	10	12	21	14	10	5	12	7	8	13	12	–	–	–
Leukemia	9	4	12	8	7	9	10	7	10	8	7	–	–	–
Pancreas	8	3	8	10	9	9	8	9	9	9	7	–	–	–
Kidney	8	9	8	10	9	9	7	8	6	9	5	–	–	–
Bladder**	8	10	9	8	9	10	6	8	7	8	7	–	–	–
Cervix	8	4	7	9	7	6	8	8	7	9	6	–	–	–
Brain	5	7	6	5	6	5	5	5	5	4	4	–	–	–
Oral	5	4	3	4	3	5	5	7	4	5	5	–	–	–
Stomach	5	7	7	4	4	5	5	4	3	5	4	–	–	–

– Age-standardized incidence rate is based on less than 3 cases per year.

* An underestimate of the number of cases.

** Interprovincial variation. Ontario does not report in situ bladder cases. It is estimated that including in situ cases for Ontario would result in a rate per 100,000 of 34 among men and 10 among women.

[1] 2004 for Canada, Quebec, Ontario, Manitoba, Alberta; 2005 for Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, Saskatchewan, British Columbia; 2001-2005 average for Yukon, Northwest Territories, Nunavut.

Note: Rates exclude non-melanoma skin cancer (basal and squamous) and are adjusted to the age distribution of the 1991 Canadian population. See *Appendix II: Methods* for further details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

Table A5

Actual Data for Deaths for the Most Common Cancers by Sex and Geographic Region, Canada, 2004[1]

	Deaths												
	Canada	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC	YT	NT	NU
Males														
All Cancers	**35,200**	**630**	**180**	**1,300**	**940**	**9,500**	**12,800**	**1,400**	**1,200**	**2,700**	**4,400**	**25**	**25**	**15**
Lung	10,100	170	55	400	310	3,300	3,400	350	280	710	1,150	10	5	10
Colorectal	4,400	130	20	190	110	1,150	1,600	200	150	350	510	5	5	–
Prostate	3,700	75	30	130	90	730	1,400	180	220	330	520	–	–	–
Pancreas	1,750	25	10	65	60	460	630	70	60	130	250	–	–	–
Non-Hodgkin Lymphoma	1,400	15	5	60	30	310	560	55	55	110	200	–	–	–
Leukemia	1,300	15	5	45	20	300	520	50	55	100	190	–	–	–
Stomach	1,150	30	5	35	35	330	430	40	40	85	130	–	–	–
Bladder	1,150	15	5	40	30	270	420	50	40	85	170	–	–	–
Esophagus	1,100	15	5	50	30	220	470	40	30	80	170	–	–	–
Kidney	940	20	5	40	25	260	320	40	35	80	110	–	–	–
Brain	930	10	5	30	25	260	330	25	25	85	130	–	–	–
Oral	700	10	5	25	10	190	280	30	15	40	95	–	–	–
Multiple Myeloma	630	10	5	20	15	150	240	20	25	60	85	–	–	–
Melanoma	490	5	–	15	15	80	210	20	15	45	80	–	–	–
Liver	450	5	–	10	5	120	180	10	5	45	70	–	–	–
Females														
All Cancers	**31,800**	**500**	**160**	**1,150**	**780**	**8,400**	**11,900**	**1,350**	**1,000**	**2,500**	**4,000**	**20**	**20**	**15**
Lung	7,500	110	35	270	190	2,200	2,600	310	230	570	1,050	5	5	5
Breast	5,000	65	25	160	120	1,300	1,950	230	160	360	610	5	5	–
Colorectal	4,000	100	25	150	80	1,100	1,500	160	140	300	450	–	5	–
Pancreas	1,850	20	5	75	50	480	650	80	45	180	250	–	–	–
Ovary	1,600	20	5	65	35	360	600	85	55	150	220	–	–	–
Non-Hodgkin Lymphoma	1,250	15	5	45	35	340	480	65	45	90	150	–	–	–
Leukemia	950	5	5	40	20	210	390	35	35	90	120	–	–	–
Stomach	760	30	5	30	15	190	290	35	25	60	90	–	–	–
Body of Uterus	730	10	–	30	20	170	300	30	25	60	90	–	–	–
Brain	680	5	10	25	15	180	250	20	15	75	85	–	–	–
Kidney	550	15	–	15	20	170	180	25	15	55	60	–	–	–
Bladder	500	5	5	15	10	130	220	15	10	30	60	–	–	–
Cervix	390	10	5	25	10	70	170	15	10	30	50	–	–	–
Oral	370	5	5	10	5	95	150	10	5	25	55	–	–	–
Melanoma	300	–	–	15	5	50	140	10	10	25	50	–	–	–

– Fewer than 3 deaths

[1] 2000-2004 average for Yukon, Northwest Territories, Nunavut

Note: Total of rounded numbers may not equal rounded total number and an average is used for the territories.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table A6

Actual Age-Standardized Mortality Rates for the Most Common Cancers by Sex and Geographic Region, Canada, 2004[1]

	Rate per 100,000													
	Canada	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC	YT	NT	NU
Males														
All Cancers	**212**	**230**	**231**	**246**	**228**	**239**	**203**	**218**	**206**	**194**	**185**	**268**	**238**	**326**
Lung	61	62	70	75	76	82	53	56	49	50	49	104	71	180
Colorectal	27	46	29	35	27	30	26	31	26	25	21	38	55	–
Prostate	23	30	38	24	22	20	23	28	34	26	22	–	–	–
Pancreas	10	9	9	12	14	11	10	11	10	9	10	–	–	–
Non-Hodgkin Lymphoma	8	5	5	11	6	8	9	9	9	7	8	–	–	–
Leukemia	8	6	9	9	5	8	8	8	10	7	8	–	–	–
Stomach	7	10	6	7	9	8	7	6	7	6	6	–	–	–
Bladder	7	5	6	7	7	7	7	8	6	6	7	–	–	–
Esophagus	7	4	8	9	7	5	7	7	5	6	7	–	–	–
Kidney	6	8	5	7	6	6	5	6	6	6	5	–	–	–
Brain	5	4	6	6	6	6	5	4	5	5	5	–	–	–
Oral	4	3	4	4	3	5	4	5	3	2	4	–	–	–
Multiple Myeloma	4	3	6	4	3	4	4	3	4	4	4	–	–	–
Melanoma	3	2	4	3	3	2	3	3	2	3	3	–	–	–
Liver	3	2	2	2	1	3	3	2	1	3	3	–	–	–
Females														
All Cancers	**147**	**146**	**158**	**163**	**138**	**154**	**145**	**159**	**138**	**143**	**138**	**180**	**196**	**437**
Lung	36	31	36	42	36	41	33	39	34	34	36	45	52	249
Breast	23	19	24	21	20	24	24	28	22	20	21	29	30	–
Colorectal	17	29	23	20	13	18	17	16	17	16	14	–	31	–
Pancreas	8	6	4	10	9	9	8	9	6	10	8	–	–	–
Ovary	7	6	6	9	7	7	7	11	8	9	8	–	–	–
Non-Hodgkin Lymphoma	6	4	7	6	6	6	6	7	6	5	5	–	–	–
Leukemia	4	2	4	6	4	4	5	4	5	5	4	–	–	–
Brain	3	2	11	4	3	4	3	3	2	4	3	–	–	–
Body of Uterus	3	2	2	4	4	3	4	4	3	3	3	–	–	–
Stomach	3	8	3	4	3	3	3	4	3	3	3	–	–	–
Kidney	3	4	3	2	3	3	2	3	2	3	2	–	–	–
Bladder	2	1	3	2	2	2	2	1	1	2	2	–	–	–
Cervix	2	4	4	4	2	1	2	2	2	2	2	–	–	–
Oral	2	1	2	1	1	2	2	1	1	2	2	–	–	–
Melanoma	1	1	1	3	1	1	2	1	2	1	2	–	–	–

– Age-standardized mortality rate is based on less than 3 cases per year

[1] 2000-2004 average for Yukon, Northwest Territories, Nunavut

Note: Rates are adjusted to the age distribution of the 1991 Canadian population.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

APPENDIX II: METHODS

Data Sources and Processing

The actual cancer incidence and mortality data used in this report were obtained from three sources: mortality data files (1950-2004),[40] the National Cancer Incidence Reporting System (NCIRS, 1969-1991) and the Canadian Cancer Registry (CCR, 1992-2005).[41] The Health Statistics Division at Statistics Canada maintains all these databases.

Actual mortality data were available at the Public Health Agency of Canada for all the provinces and territories for the period 1969 to 2004. Incidence data for 2005 were not available from the province of Quebec because their data were not submitted to the CCR in a timely manner; the corresponding data from the provinces of Manitoba and Alberta were deemed too provisional for use in this publication. For 2003 and 2004 Ontario "death certificate only" cases (the only source of information about the case was a death certificate), numbers were obtained directly from the Ontario Cancer Registry as these were not available in the CCR for the June 2007 release. Ontario 2005 actual data do not include death certificate (DCO) only cases. As a result, estimated numbers of DCO cases, based on 2004 data, were added to actual numbers for purposes of projections.

Records from each province were extracted and then classified by sex, age group and selected cancer as defined in the *Glossary*. Canada totals for selected sites were then determined as the sum of the 10 provinces and three territories.

It should be noted that the definitions for some cancers have changed over the years. In this edition, definitions have changed for lung (C33-C34 changed to C34), kidney (C64-C66, C68 to C64-C65), multiple myeloma (mortality: C90 to C90.0, C90.2) and leukemia (mortality: C91-C95 to C91-C95, C90.1). In-situ bladder cancers were included in the bladder and all cancer totals from the 2006 publication (*Glossary*) except for Ontario since Ontario does not report in-situ bladder cancer. A history of these and other changes in definitions over the years is in the chart below. Because of these changes, any comparisons of these cancers with previous editions of *Canadian Cancer Statistics* should be done with caution.

Cancer definition changes since 2004

Cancer	Definition in 2004	Changes since 2004
Bladder (Incidence)	ICDO-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.
Kidney (Incidence and mortality)	ICDO-3/ICD-10 C64-C66, C68	2008: C64-C65
Leukemia (Mortality)	ICDO-10 C91-C95	2008: C91-C95, C90.1
Lung (Incidence and mortality)	ICDO-3/ICD-10 C33-C34	2006: C34 2007: C33-C34 2008: C34
Ovary (Incidence and mortality)	ICDO-3/ICD-10 C56, C57.0-C57.4	2006: C56
Multiple Myeloma (Mortality)	ICD-10 C88, C90	2007: C90 2008: C90.0, C90.2
All other and unspecified cancers (Mortality)	ICD-10 C44, C46, C76-C80, C96.0-C96.2, C96.7-C96.9, C97	2007: C88 added.

Note: Under ICDO-3 cancer incidence for bladder, lung, kidney, and ovary excludes histology types 9590-9989 (leukemia, lymphoma, and multiple myeloma) and histology 9050-9055 (mesothelioma).

Population figures for Canada, the provinces and the territories were taken from intercensal estimates for the period 1971 to 2000[42] and from postcensal estimates for the **period 2001 to 2006**[42] and from the Statistics Canada publication, "Population Projections for Canada, Provinces and Territories" 'Scenario 3' population projections for **2007 to 2008**.[2] The population estimates from **1971 to 2006** and the population projections include non-permanent residents as part of the population. In addition, adjustments are made for net census under-coverage and returning Canadians, and the reference date for the annual estimates is July 1 instead of June 1. The population projections incorporate assumptions of natural increase, immigration and internal migration, which closely reflect the Canadian reality. These assumptions are regularly updated to take into account the most recent changes.

Incidence and mortality estimates for 2008 were extrapolated from models that were fitted to a subset of the data described above. The data series were selected so that they begin in 1986 for both incidence and mortality. This allows consistency between the mortality and incidence estimates and ensures that the estimates accurately account for current trends. For mortality estimates, data from 1986 to 2004 were used. For incidence estimates, data from 1986 to the latest year of available data were used.

Actual incidence and mortality rates for each province/territory, sex, site and year were computed by dividing the number of cases by the corresponding provincial/territorial population figures. In previous editions, these rates were computed for the "under 45" and the "45 and over" age groups separately. In order to study the age distributions of all cancers and of the leading types of cancer (lung, colorectal, prostate and breast), age-specific rates were computed for the age groups 0-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80 years and over. Starting with the 2003 edition, rates were computed and analyzed by five-year age groups 0-4, 5-9, 10-14, up to 80-84, and 85 years of age and older.

Age-standardized incidence and mortality rates for each site were calculated using the age distribution of the 1991 Canadian population. The World Standard Population[43] was used in publications before 1995. It was replaced because it is much younger than the 1991 Canadian population. Consequently, estimates of age-standardized rates before 1995 are not comparable with later estimates.

Commencing with the 2000 edition of *Canadian Cancer Statistics*, the Northwest Territories represent a different geographic area than in the past. Its geographic boundaries were redrawn, reducing the land area representing the Northwest Territories, and a new territory named Nunavut was incorporated.[44]

For all cancers, even those with poor survival such as pancreas and lung, the annual number of incident cases is expected to be similar to, or larger than, the number of deaths. However, there are situations in which the number of deaths, either observed or projected, is larger than the corresponding number of new cases. In the case of Newfoundland and Labrador, this is caused by the Registry not receiving information on death certificates that mention cancer. The limitation of not having access to death certificates is greater for cancers with a poor prognosis. This results in an underestimate of the number of cases for the years used to generate the estimates. Once the Newfoundland and Labrador Registry begins receiving information in order to register these cases the difference will disappear. Cases diagnosed only through the use of death certificates have not been reported to the Canadian Cancer Registry by the

province of Quebec since 2000 and were very likely underreported in years prior to that. For example, because of the registry's dependence on hospital data, the numbers of microscopically confirmed prostate, melanoma and bladder cases have been estimated to be underreported by 32%, 35% and 14% respectively.[1]

Incidence Estimates (New Cases) for 2008

The number of new cases was estimated for each age group, cancer site and sex by fitting Poisson regression models to the provincial and territorial yearly values. The assumption underlying Poisson regression is that the annual incidence numbers are independent Poisson random variables with a mean equal to the product of the population size for a particular year and the (true) annual incidence rate.

A modification to the projection methodology was implemented for the 2003 edition. In editions before 2003, for each province/territory, age group, sex and site, a separate model for crude incidence rates was used, with year as the only independent variable. The latest projection methodology includes age as a factor with 18 levels, and the inclusion of trend terms was evaluated by the stepwise selection algorithm available in S-plus 2000. The predicted numbers of cancer cases in 2008 were calculated by multiplying the extrapolated crude incidence rates by the demographic projections for the same year. Since longer data series for some provinces were available, estimates for Canada were computed as the sum of the estimates for the provinces and territories.

The estimates for 2008 were also calculated based on a five-year average of the most recent data. This method produces age-specific rate estimates. The predicted numbers of new cases were then obtained by multiplying the age-specific rates by the corresponding projected age-specific population sizes.

The estimates from the Poisson method and five-year average were compared by calculating an absolute value of the relative difference between the predicted numbers of cases from the two methods. If there is significant curvature in the incidence trend, a considerable difference may be observed. For the cancer sites with a relative difference more than 10%, their estimates were determined through consultation with the provinces/territories and consideration of the rules below:

- The Poisson estimate is the default.
- Using the five-year average for the count estimates is not accepted for stomach, colorectal, liver, cervix, testis, or thyroid cancers because of strong pre-existing trends.
- For territories, the five-year average estimates are used for all cancers combined because of small sample sizes.

Table A7 lists the cancers for which numbers of new cases in 2008 were estimated by the five-year average method.

Prostate cancer incidence projection methodology was modified for the 2003 edition, as the anticipated decline in age-standardized rates from a peak in 1993 was observed until 1995, at which point a new and increasing trend was established. This observation in the summary rates does not apply to the age-specific rates. Since 1981, the age-specific rates for Canada among men under 40 have revealed little change and shown no trend; among men aged 40-59 a steeply increasing trend started around 1991 and has yet to change course; among men aged 60-74 the rates follow the trends

in the age-standardized rates from 1991 on; and among men over 75 years of age the brief spike in rates in the early to mid-1990s was followed by a steep decline to levels at or below the 1981 levels. Consequently, age-specific rate projections based on a Poisson regression model fit to data between 1981 and 1989 were abandoned in favour of Poisson regression models fit to data from 1991 to the most recent year of incidence data available (2004 for Quebec, Manitoba, Alberta and elsewhere 2005). This method was applied for all provinces except for Prince Edward Island, New Brunswick and Saskatchewan where the five-year average method was used. In previous years, the five-year average method was used to project prostate cancer in most of the jurisdictions; but the estimates from the Poisson model are now a more accurate representation of recent trends. Therefore, a disparity in the estimates of prostate cancer cases and resulting rates may be seen in some provinces compared to previously published statistics.

The estimates of incidence counts for "all cancers" were computed as the sum of the estimated prostate cancer cases plus the estimate of "all cancers less prostate" using the standard linear model (based on data from 1986 onwards). Starting with the 2004 edition, the incidence classification uses ICDO-3 for the data from 1992 onwards. This results in an additional 1,200 cases per year as compared with the number obtained previously using the ICD-9 definition in the other cancers category and the all cancers total.

An additional consequence of implementing the ICDO-3 classification for the 2004 edition is an apparent drop compared with the previous edition of about 100 ovarian cancer cases to 2,184 cases for Canada in 2000. However, the ICDO-3 classification no longer considers borderline ovarian cancer as malignant. Based on the ICDO-3 definition for both 1998 and 2000 there were actually about 50 additional ovarian cancer cases in 2000.

Mortality Estimates (Deaths) for 2008

The number of deaths was estimated for each age group, site and sex using a method similar to that used for incidence. For each province and territory, a linear model was used for death rates, with an 18-level age group factor and trend terms selected by a stepwise algorithm. The estimates for the 2008 were also calculated based on a five-year average of the most recent data. The estimates from the Poisson method and five-year average were compared by calculating a relative difference in the numbers of deaths between the two methods. For the cancer sites with a relative difference more than 10%, their estimates were determined through consultation with the provinces/territories and consideration of the rules described in the Incidence Estimates section. Table A7 lists the cancer sites for which the numbers of deaths for 2008 were estimated by the five-year average method. Mortality numbers by cancer site for Canada were obtained from the estimates of the provincial and territorial numbers.

In the versions of this booklet published before 2003, mortality due to colorectal cancer was based on 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 cases were included in the definition of colorectal cancer. As a consequence, mortality figures for colorectal cancer have increased quite dramatically from those published before this change.

APPENDIX II: METHODS

Estimated Age-Standardized Incidence Rates (ASIRs) and Mortality Rates (ASMRs) for 2008

Starting with the 2003 edition, projected age-standardized rates were computed directly from the age-specific rate projections. This change eliminated the need to employ a separate projection methodology for age-specific and age-standardized rates. Additionally the new procedure guarantees the definition that age-standardized rates are a weighted average of the age-specific rates. In editions of this publication before 2003, incidence and mortality rates were generally estimated using weighted least squares regression, with some exceptions. Weights were taken as the inverse of the estimated variances of the actual age-standardized rates. Variances were calculated under the assumption that the age-specific counts used in the computation of the age-standardized rates follow independent Poisson distributions. Regressions were performed for Canada and each province or territory for each site and sex using a linear model, with year as the only independent variable.

When the original data show large fluctuations, it has been impossible to obtain from the model results of satisfactory precision. For this reason and to maintain consistency between the age-specific and age-standardized estimates, annual age-standardized incidence rates for 2008 were estimated by actual age-standardized incidence rates calculated over a five-year period for each of those cases cited in the Incidence Estimates section and listed in Table A7. Similarly, annual age-standardized mortality rates for 2008 were estimated by actual age-standardized mortality rates calculated over a five-year period for each of the areas and site combinations addressed in the Mortality Estimates section and listed in Table A7.

Prostate cancer incidence projection methodology was modified, starting with the 2003 edition, as the anticipated decline in age-standardized rates from a peak in 1993 was observed until 1995, at which point a new and increasing trend was established. However, this new trend has not aligned with the level that was projected on the basis of a linear model fit to the 1981-1989 data. Several options were explored, and we believe the most accurate projections were obtained by simply computing the age-standardized rate from the projected age-specific counts (discussed earlier) starting with 1991 data.

Accuracy and Precision of Estimates

The accuracy of an estimate relates to the question of bias: whether or not an estimate is targeting the value of interest. The precision of an estimate refers to the fact that any estimate has certain variability to it; one cannot *know* an estimate exactly, and therefore the estimate serves only to provide insight into the real, unknown value of interest.

The standard error and coefficient of variation as well as the confidence interval are calculated to evaluate the precision of each estimate. The standard error is an estimate of the extent to which an estimate will vary, while the coefficient of variation relates this variation to the actual size of the quantity being estimated. Confidence intervals use the standard error to create a range of plausible values for the quantity being estimated. These values are available upon request from the Chronic Disease Surveillance Division, Centre for Chronic Disease Prevention and Control, Public Health Agency of Canada. Together, these quality measures assess the precision (or imprecision) of a particular estimate but not the accuracy of the estimate. Note that any estimates are subject to error, and the degree of precision depends primarily on the number of

observed cases and the population size for each site-sex-province combination, whereas the accuracy is related to the adequacy of the model used in the estimation process.

Estimates of incidence and mortality 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 and numbers greater or equal to 2,000 to the nearest 100. Percentages, age-standardized and age-specific rates were rounded to the nearest tenth except in Tables 4 and 6 and Appendix Tables A4 and A6, where space restrictions forced rounding to the nearest whole number. Age- and sex-specific numbers/rates are combined before rounding, so it is possible that the totals in the tables do not add up. However, any of these discrepancies must be within the precision of the rounding units described above.

Average Annual Percent Change (AAPC) in Cancer Incidence and Mortality

The AAPC values were calculated for each site by fitting a model that assumed a constant rate of change in the ASIRs or ASMRs, that is, a linear model applied to the ASIRs and ASMRs after logarithmic transformation. The estimated slope resulting from that fit was then transformed back to represent a percentage increase or decrease. Changepoint analysis was applied to search for the most recent linear trend using ASIR or ASMR data points from 1986 to 2004 (for *Special Topic: Childhood Cancer*, from 1985 to 2004) for both incidence and mortality rates. A minimum of five data points were required to identify a new trend, so the latest year that a new trend could be detected would be starting in 2000. Data from 1995 to 2004 were used for both incidence and mortality unless the changepoint analysis detected a new trend starting later than 1995 in which case the latest linear trend was used to estimate the AAPC.

Estimates of Non-Melanoma Skin Cancer for 2008 in Canada

For 2008 non-melanoma skin cancer estimates were the average of estimates obtained by applying British Columbia, Manitoba and New Brunswick rates to the Canadian population. The pathology laboratories in British Columbia send all diagnostic reports of non-melanoma (basal cell and squamous cell) skin cancer to the provincial registry. It is assumed that non-melanoma skin cancer is under-reported to some extent. The age- and sex-specific incidence rates in British Columbia for 2003 has been projected to the current year and applied to the Canadian population estimates to generate a minimal estimate of the number of cases for Canada as a whole. For Manitoba summary counts of new basal and squamous cell cases 1986 to 2005 by age group were provided by the Cancer Registry and rates were projected using linear regression to 2008. For New Brunswick, summary counts of new basal and squamous cell cases 1989 to 2006 by age group were provided by the Cancer Registry and rates were projected using linear regression to 2008.

Probability of Developing/Dying from Cancer

Probabilities of developing cancer were calculated according to the age- and sex-specific cancer incidence and mortality rates for Canada in 2004 and life tables based on 2002-2004 all-cause mortality rates. The methodology used was that of Zdeb[45] and Seidman et al.[46] The life table procedures used assumed that the rate of cancer incidence for various age groups in a given chronological period will prevail throughout the future lifetime of a person as he/she advances in age. Since these may not be the rates that will prevail at the time a given age is attained, the probabilities should be regarded only as approximations of the actual ones.

APPENDIX II: METHODS

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 2004. The indicator was calculated 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.

The Total Number of New Cases or Deaths, Showing the Contribution of Change in Cancer Risk, Population Growth and Change in Population Age-Structure

Figures 3.1 and 3.2 display the determinants of increases in incidence and mortality for males and females respectively. All three series plotted on each graph refer to data from 1979 as the baseline. The uppermost series is a plot of the annual Canadian cancer cases/deaths observed or projected. The next to upper most series is an estimate of the cancer events expected if the age distribution of the 1979 population were held constant through time. The next to baseline series is an estimate of the expected number of cases/deaths assuming a population constant in both magnitude and distribution from 1979 to the current year.

In preparation of a more rigorous presentation of how these series were computed, let $P_{i,t}$ represent the sex-specific total population in Canada for year t, where i = M for males or i = F for females. That is, $P_{F,1979}$ represents the total 1979 Canadian female population. Next let $ASR_{i,t}$ denote the all-cancers, sex-specific, age-standardized incidence/mortality rate with the reference population being the 1979 Canadian population of the sex corresponding to i, which is either i = M for males or i = F for females. For example, $ASR_{F,2001}$ is the age-standardized rate for Canadian females in the year 2001.

Uppermost series: the annual number of Canadian cancer cases/deaths of sex i for a given year, say t.

Next to uppermost: total population for year t times the age-standardized rate for year t or, in symbols, $P_{i,t}\ ASR_{i,t}$.

Next to baseline: total 1979 population times the age-standardized rate for year t or, in symbols, $P_{i,1979}\ ASR_{i,t}$.

Baseline: the observed number of Canadian cancer cases/deaths for sex i that occurred in 1979.

Prevalence

The prevalence of cancer cases in the Canadian population was estimated by cancer site based on diagnoses within 15 years of the target year. Cancer incidence data were obtained from the National Cancer Incidence Reporting System (before 1992) and the Canadian Cancer Registry (1992-2004), and survival data were obtained from the Information Management Division, Saskatchewan Cancer Agency. For each cancer site, data were stratified by month of diagnosis, age at diagnosis and sex. Expected prevalence was then calculated as the product of the age-specific crude survival rate and the number of incident cases. The stratum-specific estimates were aggregated by cancer site.

Survival rates were based on data from the Saskatchewan Cancer Registry. Data were first stratified by cancer site, sex and age groups 0-34, 35-64 and 65 or older, then monthly survival was calculated using the life table method as implemented in SAS version 8.02 (right censoring was adjusted for in the standard way). These estimates were based on cases diagnosed from the beginning of 1986 to the end of 2001, with follow-up to the end of 2002.

Annual national cancer incidence counts were stratified by year of diagnosis, cancer site, sex and age groups 0-1, 2-4, 5-9, 10-14 and so on by five-year age groups to age 85 and older. These data were then uniformly distributed to each month throughout the year by dividing the number of cases in each stratum by 12. Prevalence for 2004, allowing a maximum of 15 years of survival, was estimated within each stratum as the product of the crude survival rate and the corresponding case count. Estimates were limited to a maximum of 15 year survival, which corresponds closely with lifetime prevalence, and used survival estimates up to the limit of their reliability.

Relative survival

Cancer cases were classified according to the International Classification of Diseases for Oncology, Third Edition.[37] Surveillance, Epidemiology, and End Results (SEER) groups, with mesothelioma and Kaposi sarcoma as separate groupings, were used to define cancer type.[27] There are some differences compared to the cancer definitions in the *Glossary* (see reference 26).

Analyses were restricted to first primary tumours only. In order to identify persons in the CCR who had been diagnosed with cancer prior to 1992, the CCR was linked with its predecessor, the National Cancer Incidence Reporting System, a fixed, tumour-oriented database containing cases diagnosed as far back as 1969. Supplementary information available on the CCR for the data from the province of Ontario was also used. Cases diagnosed in the province of Quebec were not included, 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[47] and because of issues in correctly ascertaining the vital status of cases. Persons whose diagnosis was established through either death certificate only or autopsy only were excluded.

Follow-up for vital status was determined through record linkage to the Canadian Mortality Data Base, and from information reported by provincial/territorial cancer registries.[48] For deaths reported by a registry but not confirmed by record linkage with the national data base, it was assumed that the individual died on the date submitted by the reporting province/territory. At the time of the analysis, registration of new cases and follow-up for vital status were complete through 31 December 2003.

Survival analyses were conducted using period analysis.[49] A period analysis is defined by the survival experience of people in a recent time interval; in this case it was 2001-2003 for adults and 1999-2003 for children and adolescents. For example, survival estimates for adults were obtained by left truncation of follow-up for vital status on 1 January 2001 and right censoring on the fifth anniversary of the date of diagnosis or 31 December 2003 – whichever came first. The survival probability during the first year after diagnosis was estimated from the person-time at risk and events (death or censoring) of persons diagnosed from 2000 to 2003 only, whose first year after diagnosis included some part of the period from 2001 to 2003. Similarly, the conditional probability in the second, third, fourth, and fifth year after diagnosis was

estimated from the survival experience in 2001-2003 only, of persons diagnosed from 1999 to 2002, 1998 to 2001, 1997 to 2000, and 1996 to 1999, respectively. The rationale for this approach is analogous to that of the use of period life tables to estimate current life expectancy.

Period analysis was introduced as a new method in cancer survival analysis in order to generate more up-to-date estimates of long-term survival than traditional cohort based methods.[49] It has been empirically evaluated favourably in this context.[50] Using data from the CCR, period analysis has previously been employed to predict the long-term survival of adult cancer cases diagnosed in 2002[13] and childhood and adolescent cancer cases diagnosed from 1999 to 2003.[26]

The survival analyses were based on an algorithm written by Paul Dickman[51] with some minor adaptations. Relative survival ratios were estimated as the ratio of the observed survival of persons with cancer to the expected survival for the general population of the same age, sex, province of residence, and time period. Expected survival proportions were derived, using the Ederer II approach,[52] from sex-specific complete provincial life tables produced by Statistics Canada. All expected survival proportions for Prince Edward Island and the territories were derived from Canadian life tables as stable estimates for single ages could not be produced for these areas because of small population counts. As relative survival ratios were determined to be virtually the same as observed survival proportions for those under the age of 20 years, the latter measure was presented for this age group.

Age-specific and all ages (i.e., 15-99) survival estimates provide information on the actual survival experience, of the patient group. For comparison purposes, age-standardized survival estimates have been provided. Age-standardized estimates were calculated using the direct method; specifically by weighting age-specific estimates for a given cancer to the age distribution of persons diagnosed with that cancer from 1992 to 2001. Age-standardized survival estimates are interpretable as the overall survival estimate that would have occurred, if the age distribution of the patient group under study had been the same as that of the standard population. Unless they have been age-standardized to the same population, survival estimates from other sources should not be compared with those presented in this analysis.

Table A7
Use of Five-Year Average Method for Projection by Cancer

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

Rules applied:
- Poisson estimate is the default
- Adjustments are not accepted for stomach, colorectal, liver, cervix, testis, or thyroid because of strong pre-existing trends
- Adjustments are only considered for cancers with a greater than 10% difference between the Poisson and five-year average estimates
- For territories, five-year average method is used for all cancers combined because of small numbers

Note: I – Incidence, M (before /) – Mortality, M (after /) – Males, and F – Females

Table A7 *(continued)*

Use of Five-Year Average Method for Projection by Cancer

Cancer	SK	AB	BC	YK	NWT	NU
All Cancers				I/M+F, M/M+F	I/M+F, M/M+F	I/M+F, M/M+F
Oral						
Esophagus	M/M					
Stomach						
Colorectal						
Liver						
Pancreas	I/F					
Larynx	M/M		M/M			
Lung	I/F, M/F					
Melanoma		I/M+F				
Breast						
Cervix						
Body of Uterus						
Ovary						
Prostate	I, M					
Testis						
Bladder	I/F, M/F					
Kidney						
Brain						
Thyroid						
Hodgkin Lymphoma	I/F					
Non-Hodgkin Lymphoma			M/M			
Multiple Myeloma						
Leukemia						

Rules applied:

- Poisson estimate is the default
- Adjustments are not accepted for stomach, colorectal, liver, cervix, testis, or thyroid because of strong pre-existing trends
- Adjustments are only considered for cancers with a greater than 10% difference between the Poisson and five-year average estimates
- For territories, five-year average method is used for all cancers combined because of small numbers

Note: I – Incidence, M (before /) – Mortality, M (after /) – Males, and F – Females

APPENDIX III: PREVIOUS SPECIAL TOPICS

In past years, other Special Topics included:

- breast cancer (2007);
- progress in cancer control: screening (2006);
- progress in cancer prevention: modifiable risk factors (2005);
- international variation in cancer incidence, 1993-1997 (2004);
- economic burden of cancer in Canada, 1998 (2004);
- non-Hodgkin's lymphoma (2003);
- cancer incidence in young adults (2002);
- survival rates (2002, 1995, 1991-1993);
- colorectal cancer (2001, 1995);
- progress in cancer control (2000);
- relative impact of population growth and aging on cancer incidence in Canada (1999);
- cancer surveillance in Canada (1999);
- international comparisons (1998);
- 10-year review of Canadian cancer statistics (1997);
- evaluation of the accuracy of estimates (1996);
- prostate cancer (1996);
- economic burden of cancer (1996, 1990);
- prevalence estimates (1995);
- breast cancer (1993);
- smoking prevalence and lung cancer (1991);
- cancer in Aboriginal populations (1991);
- age-specific trends among women (1990);
- cancer rates by income level (1990).

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FOR FURTHER INFORMATION

Additional information related to this publication can be found in other sources, including reports from provincial and territorial cancer registries; *Cancer Incidence in Canada*,[41] *Cancer Survival Statistics*[53] and *Health Reports*, published by Statistics Canada; *Chronic Diseases in Canada* and the *Canadian Cancer Incidence Atlas*,[54] published by Health Canada/Public Health Agency of Canada; a collaborative monograph entitled *Cancer in North America, 2000-2004,*[55] published by the North American Association of Central Cancer Registries; and *Cancer Incidence in Five Continents*,[56] published by the International Agency for Research on Cancer.

For information regarding cancer research sponsored by the **National Cancer Institute of Canada (NCIC)**, with funds provided by the Canadian Cancer Society and The Terry Fox Foundation, contact the NCIC at the address provided on page 106.

For Information from Public Health Agency of Canada:
More detailed information on methodology is available from the Surveillance Division, Public Health Agency of Canada, 120 Colonnade Road, Ottawa, Ontario, K1A 0K9. Tel. (613) 952-3335, Fax. (613) 941-2057.

Cancer Surveillance On-Line is an interactive, online tool for easy access to cancer surveillance data. It allows the user to generate data according to a choice of parameters, such as cancer site, geographic area and period of time, and a choice of presentation mode, such as tables, charts and maps. See the Public Health Agency of Canada website noted below for the website.

For Information from Statistics Canada:
Detailed standard tables are available on the Statistics Canada website listed below. 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; Health Statistics Division: (613) 952-5176. Analytical articles appear regularly in Health Reports, Statistics Canada, Catalogue 82-003, quarterly.

For Information from the Provincial/Territorial Cancer Registries:
Cancer incidence data are supplied to Statistics Canada by provincial/territorial cancer registries. Detailed information regarding the statistics for each province or territory is available from the relevant registry. (See pages 104-105 for addresses, telephone/fax numbers and websites.)

Data contained in this document and additional information is available from:

- Canadian Cancer Society (CCS)
  www.cancer.ca
- National Cancer Institute of Canada (NCIC)
  www.ncic.cancer.ca
- Public Health Agency of Canada
  www.phac-aspc.gc.ca/ (select surveillance)
- Statistics Canada
  www.statcan.ca/cgi-bin/downpub/freepub.cgi (select Health)
- Canadian Association of Provincial Cancer Agencies (CAPCA)
  www.capca.ca
- Progress Report on Cancer Control in Canada
  www.phac-aspc.gc.ca/publicat/prccc-relccc/index.html

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