Alberta Health Services

Report on Cancer Statistics in Alberta

Cancer in Alberta

November 2009

Surveillance - Cancer Bureau
Health Promotion, Disease and Injury Prevention

Purpose of the Report

The Surveillance Department-Cancer Bureau; Health Promotion, Disease and Injury Prevention; Alberta Health Services is dedicated to Alberta Health Services' strategic plan of quality (responsive to communities and improving population health), access (supporting research commitments) and sustainability. Specifically, the Surveillance Department contributes to the common goal of reducing the burden of cancer by conducting cancer ***surveillance*** through the collection, integration, analysis and dissemination of cancer related information.

This report is designed to provide comprehensive and detailed information regarding cancer in Alberta. This document will help support health professionals, researchers and policy makers in the planning, monitoring and evaluation of cancer-related health programs. It will also be a useful education tool for the general public and media.

Navigating the Report

This document provides information on cancer statistics in Alberta. Details about individual cancer types are available within separate documents. The words highlighted in ***dark blue*** are terms described in detail within the **Glossary**.

Data Clarifications

In this document, the term "cancer" refers to ***invasive cancers*** unless otherwise specified. It is important to note that this document contains both actual and estimated data; distinctions are made where applicable. The numbers published in this report should be considered provisional, as a few cases and deaths may be registered in subsequent years. The data in this report reflect the state of the Alberta Cancer Registry as of June 1, 2009.

Incidence ***rates*** presented in this document exclude non-melanoma skin cancer (NMSC) cases. Although approximately 30% of the ***malignant*** cancers diagnosed among Albertans each year are NMSC, these ***tumours*** are generally not life-threatening and are usually reported and coded inconsistently across registries; therefore NMSC are rarely included in cancer registry reports.

For detailed descriptions about data sources and how they affect data presented in this report, please see the **Data Sources and Quality** section.

Summary

- In 2006, there were **13,539** new cancer cases diagnosed in Alberta and **5,472** Albertans died from the disease.
- Cancer is the leading cause of death in Alberta, accounting for **29%** of deaths in the province for all ages in 2006. It accounts for **37%** of deaths in the 35-64 age group which is more than cardiovascular disease, stroke, infectious diseases and accidental injuries combined.
- In 2006, cancer was the leading contributor to potential years of life lost (PYLL) for men and women, representing **28%** of the PYLL resulting from all causes of death in Alberta.
- Approximately **1 in 2** Albertans will develop cancer in their lifetime and **1 in 4** will die from cancer.
- As of December 31, 2006, approximately **93,500** Albertans were alive who had previously been diagnosed with cancer.
- The most common cancers in Alberta in 2006 were prostrate, breast, lung and colorectal. These four cancers accounted for **55%** of new cancer cases and about half of cancer deaths.

Cancer in Alberta

Cancer is a group of more than 200 different diseases that are characterized by abnormal cells in the body that divide and spread without control.[1]

Cancer is a significant health issue that affects a large number of people in Alberta. In 2006 there were 13,539 cancer cases diagnosed in Alberta and 5,472 Albertans died from the disease. According to the most recent statistics available from the Government of Alberta, 29% of all deaths in Alberta in 2006 were attributable to cancer.[2] For those 35-64 years of age, 37% of deaths were due to cancer; more than heart disease, injury, suicide and motor vehicle accidents combined.

In order to develop a clear understanding of the effect of cancer on the population in the province, it is important to understand how many people and the characteristics of people that may be impacted by the disease. This can be done through an assessment of the burden of cancer on our population (New Cancer Cases, Cancer Deaths, Lifetime Probability of Developing or Dying from Cancer) as well as through an examination of the size and structure of the Alberta population (Demography). It is also important to evaluate the extent to which various types of cancers contribute to the overall cancer burden (New Cancer Cases by Site, Cancer Deaths by Site, Potential Years of Life Lost and Cancer Prevalence).

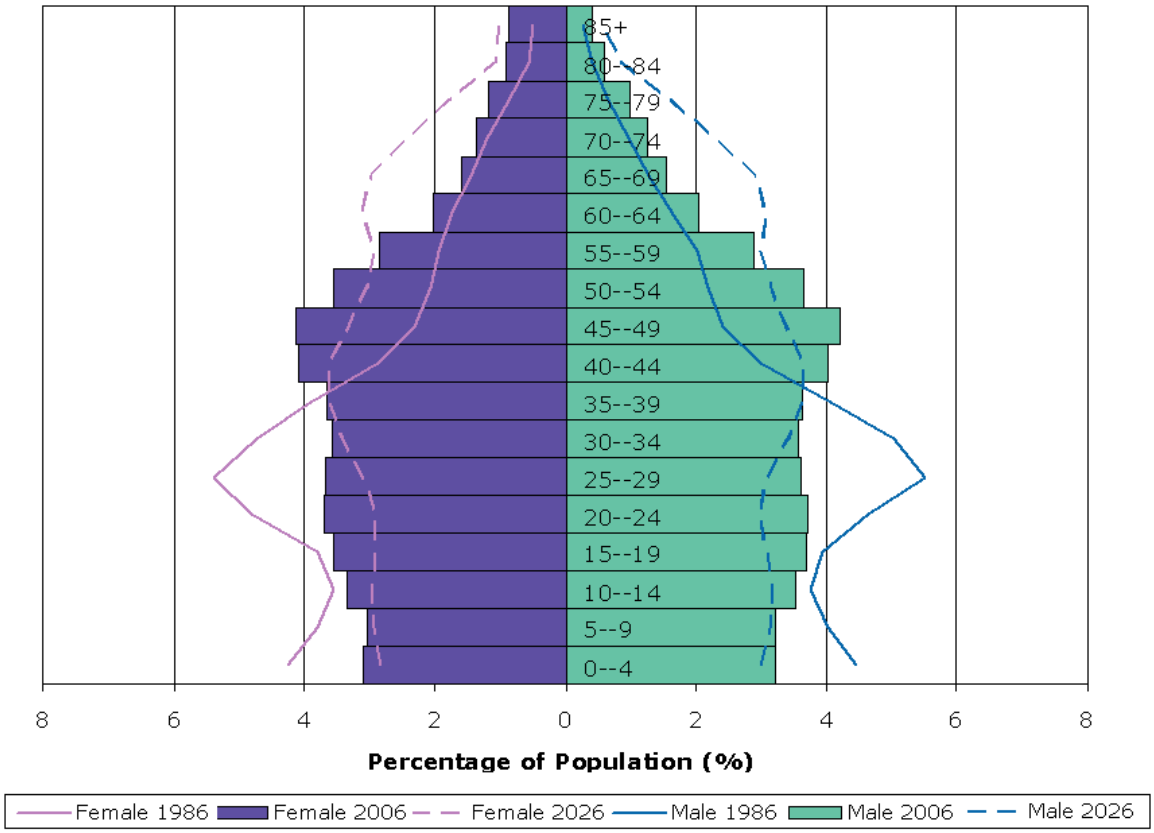
Provincial cancer statistical information helps health professionals develop screening, prevention and treatment programs that can lessen the effect of cancer on the population (Incidence and Mortality Trends, Cancer Projections, Relative Survival and Incidence of Select Cancer Sites by former Regional Health Authorities).

The following sections will outline all of these points in detail.

Demography of the Alberta Population

Demography is the study of population characteristics including population size, distribution, structure and change. Estimation of changes in the size and age structure of a population over time can help predict trends in the number of cancer diagnoses over time. Even if cancer rates remained constant, as the population of Alberta increases due to immigration and population growth, a rise in the total number of people diagnosed with cancer would be expected. Higher overall cancer incidence counts would also be expected as the proportion of the population within older age groups increases because many cancers occur more frequently in older age groups.

Figure 2-1: Historical (1986), Actual (2006) and Projected (2026) Population Structure by Age Group and Sex, Alberta



Comparing population estimates in 1986 and 2006 with projections for 2026[3] shows that the population of Alberta is aging (**Figure 2-1**).

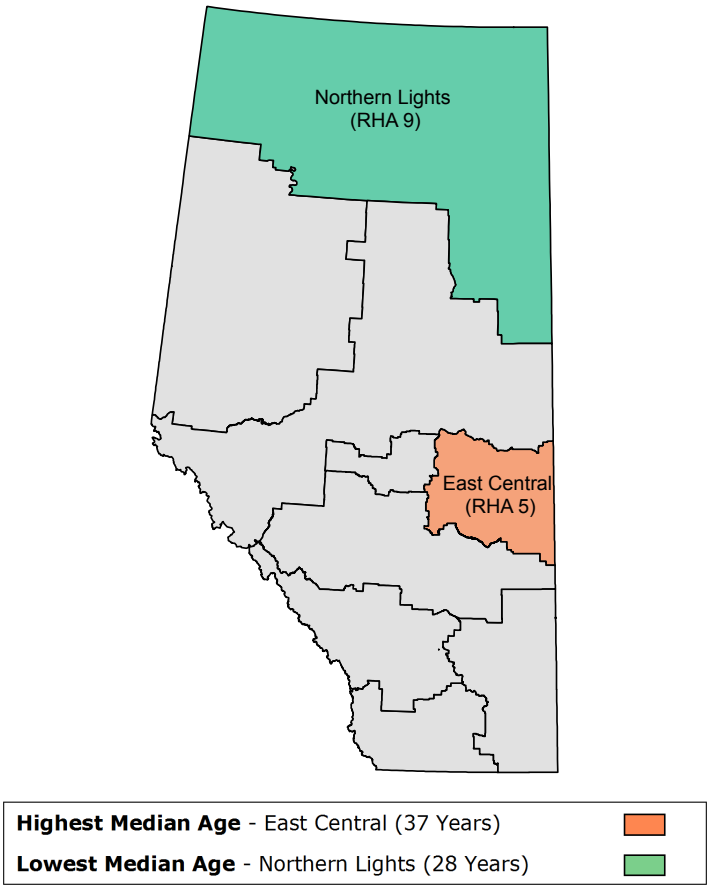
Population size

The population of Alberta has increased 39% over the past 20 years from 2.3 million in 1987 to 3.2 million in 2006. This growth is expected to continue over the next two decades and by 2026, the population is expected to increase an additional 33% to approximately 4.3 million.[3]

Population structure

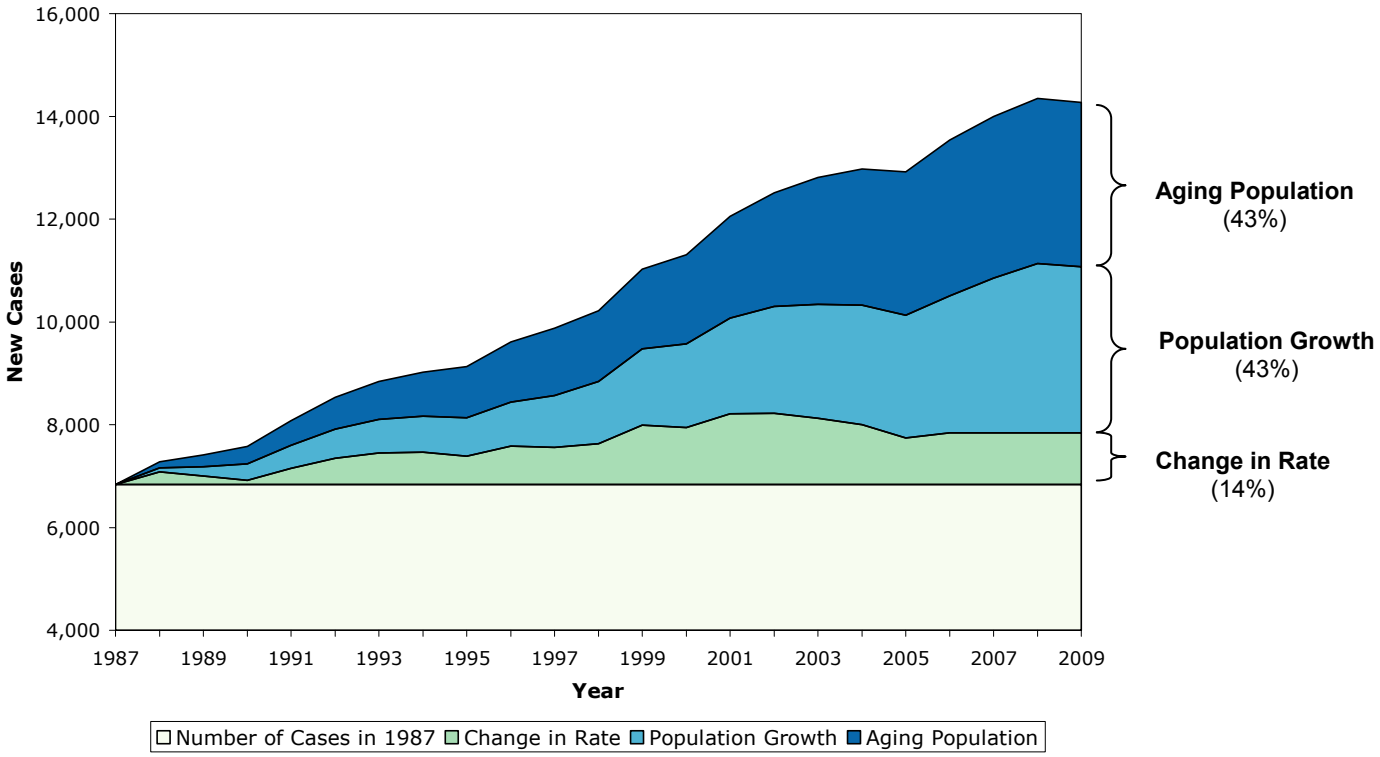
The percentage of the population aged 65 and over has increased from 8% in 1986 to 11% in 2006. This older adult age group is expected to increase to 17% of the total population in 2026. The proportion of the Alberta population aged 35-64 has increased in the last twenty years; in 1986, 35-64 year olds made up 30% of the population and in 2006 they made up 41% of the total population. The proportion of the population in this age group is expected to remain fairly constant over the next 20 years.

Figure 2-2: Former Regional Health Authorities in Alberta with the Highest and Lowest Median Ages



In 1986, the ***median age*** of the population was 29 years. The median age of the population rose to 36 years in 2006 and is expected to increase to 40 years by 2026. In 2006 the median age was the lowest in the former Northern Lights Health Region 9 (28 years), and the highest in the former East Central Health Region 5 (37 years) (**Figure 2-2**).

Figure 2-3: Trends in New Cases Attributed to Aging Population, Population Growth and Cancer Rate, Both Sexes, Alberta, 1987-2006



The actual variability in cancer rate is minor compared to changes in demography as shown by the inter-relationship between population growth, aging population, and the number of new cancer cases in Alberta (**Figure 2-3**).

The horizontal black line indicating 6,839 new cases in **Figure 2-3** represents the number of cancer cases that occurred in 1987. The line at the top of the graph represents the number of new cases that actually occurred between 2006. Between these two lines, the three coloured areas reflect the increase in cases due to the impact of aging population, population growth and rate change.

The light green shaded area (lower) represents the total number of new cases that would have occurred each year if the cancer incidence rates alone had changed but the population had remained the same as in 1987.

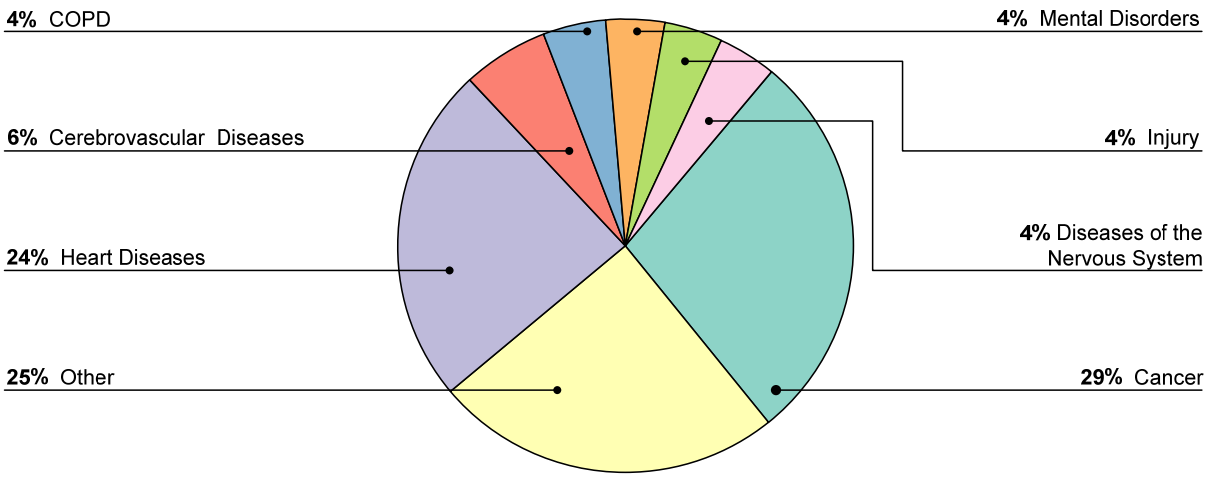
The light blue shaded area (middle) represents the number of new cases that would have occurred each year if the population alone had grown larger but the population age distribution had remained the same as in 1987. This accounts for 43% of the total increase in new cancer cases.

The dark blue shaded area (top) represents the number of new cases attributed to increases in the older adult population; the aging population. This accounts for 43% of the total increase in new cancer cases.

Causes of Death in Alberta

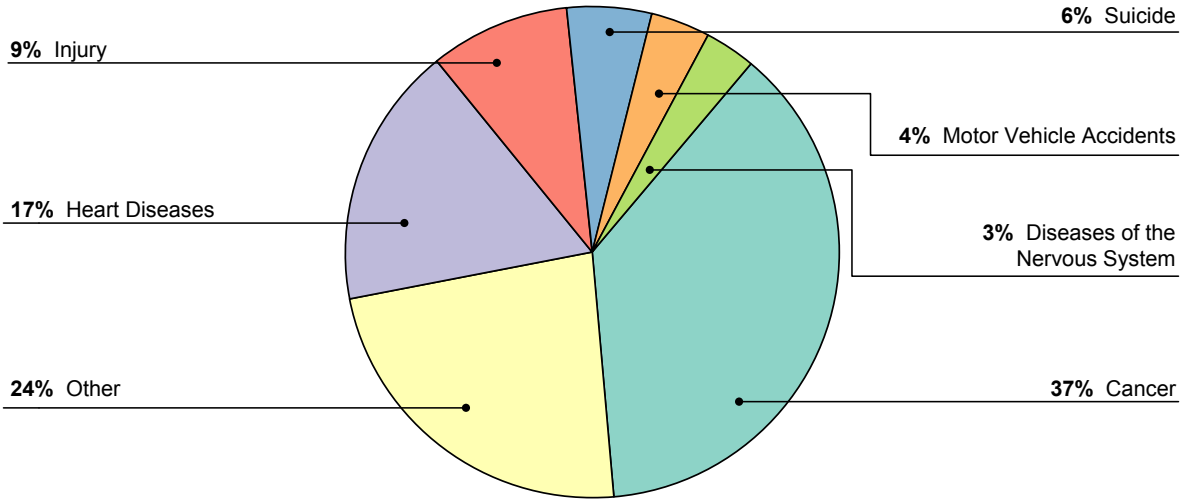
Cancer is a leading cause of premature death in Alberta; almost a third of deaths in the province in 2006 were due to cancer. The following two figures compare cancer-related deaths and deaths from other causes in Alberta.

Figure 2-4: Causes of Death in Alberta, All Ages, Both Sexes, Alberta, 2006



According to the most recent statistics available from the Government of Alberta[2] (**Figure 2-4**), 29% of deaths in Alberta for all ages in 2006 were attributable to cancer, 24% were attributable to heart disease and 6% to cerebrovascular diseases. All other causes combined accounted for the remaining 41% of all deaths.

Figure 2-5: Causes of Death, Ages 35-64, Both Sexes, Alberta, 2006

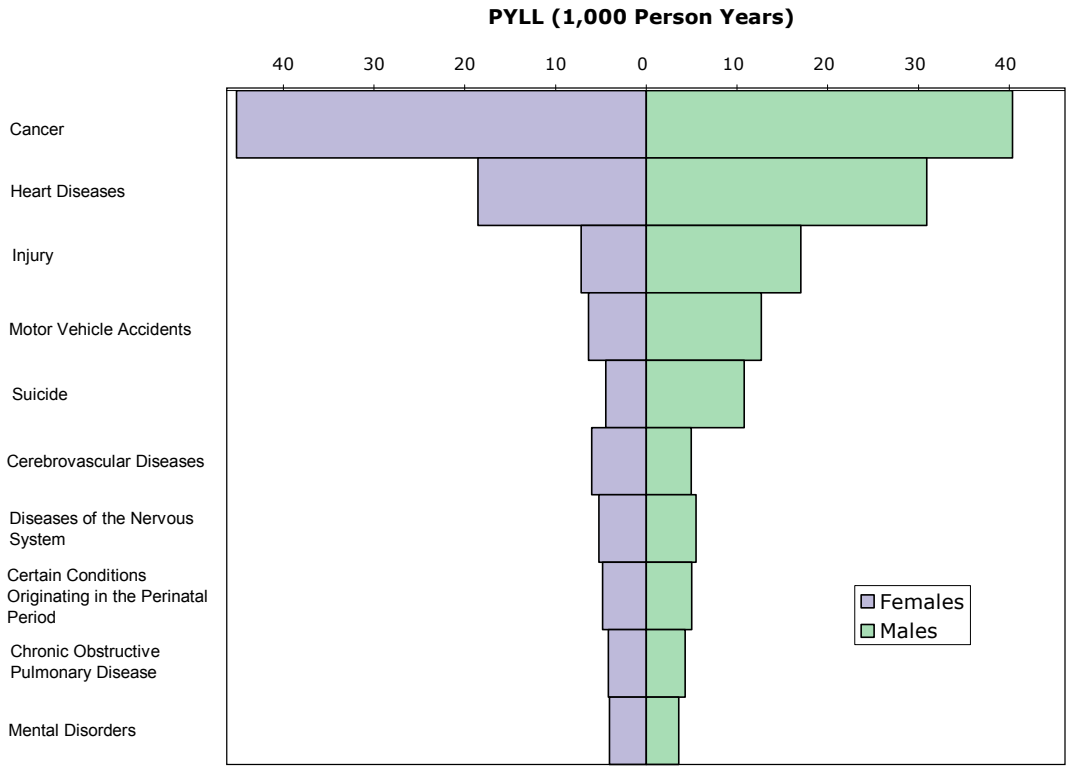


Although cancer is associated with aging, it is important to note that, for the 35–64 age group (**Figure 2-5**) cancer is the leading cause of death, accounting for 37% of all deaths.

Potential Years of Life Lost

One frequently used measure of premature death is ***potential years of life lost (PYLL)***. PYLL due to cancer is an estimate of the number of years that people would have lived had they not died from cancer. PYLL was calculated by obtaining the number of deaths and the mean life expectancy of each age group. The results are a reflection of how many people died, their ages at death, and life expectancy. Life expectancy is calculated by determining the age to which an individual would have been expected to live had they not died from cancer. PYLL is one way to measure the impact, or burden, of a disease on a population.

Figure 2-6: Selected Causes of Potential Years of Life Lost (PYLL) by Sex, Alberta, 2006[2]



The top 10 causes of premature death in Alberta in 2006 are represented by potential years of life lost (PYLL) and are ranked in order of total PYLL for both males and females combined, the computation of which is based on life expectancy at time of death (**Figure 2-6)**.

Cancer was the leading contributor to PYLL for males and females, representing 28% of the PYLL resulting from all causes of death in Alberta. Diseases of the heart were the second leading cause, representing 17% of the total PYLL in the province.

Table 2-1: Potential Years of Life Lost by Cancer Site and Sex, Alberta, 2006

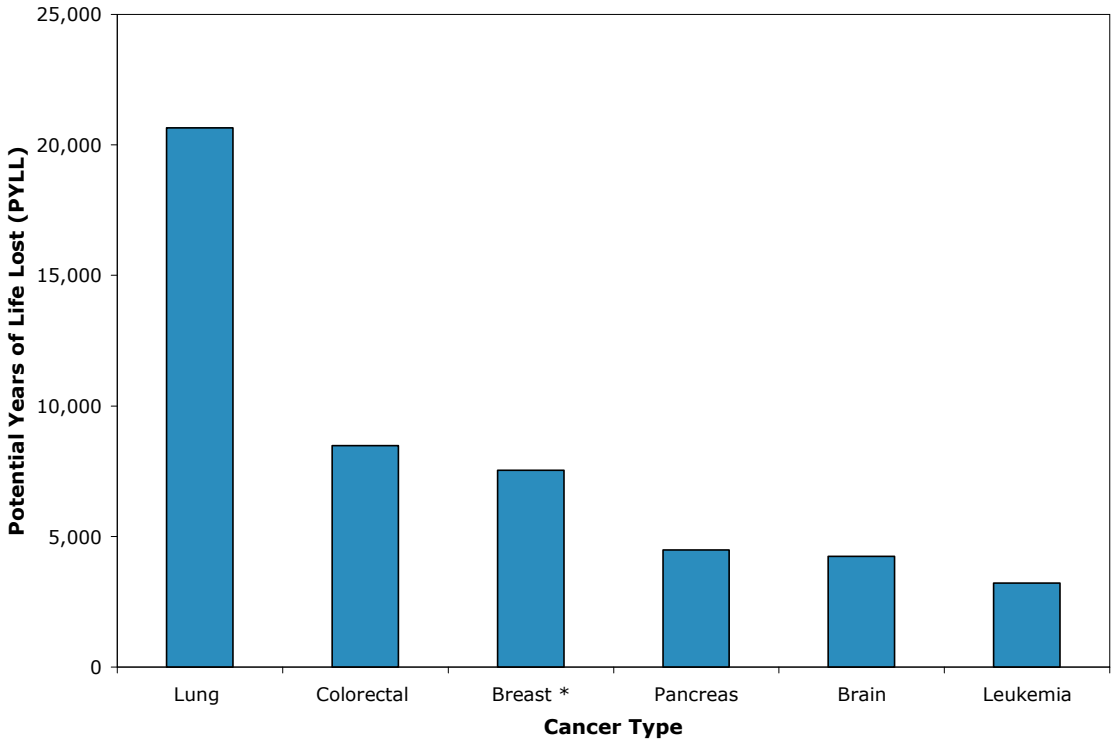
Cancer Type	Total		Female		Male	
	Years	%	Years	%	Years	%
All Sites	85,065	**100.0**	44,843	**100.0**	40,222	**100.0**
Bronchus/Lung	20,650	**24.3**	10,822	**24.1**	9,828	**24.4**
Colorectal	8,481	**10.0**	4,129	**9.2**	4,352	**10.8**
Breast	7,538	**8.9**	7,485	**16.7**	53	**0.1**
Pancreas	4,488	**5.3**	2,520	**5.6**	1,968	**4.9**
Brain	4,232	**5.0**	1,822	**4.1**	2,410	**6.0**
Leukemia	3,213	**3.8**	1,333	**3.0**	1,880	**4.7**
Prostate Gland	3,043	**3.6**	-	**-**	3,043	**7.6**
Non-Hodgkin Lymphoma	2,807	**3.3**	1,139	**2.5**	1,668	**4.1**
Unknown Primary	2,780	**3.3**	1,536	**3.4**	1,244	**3.1**
Stomach	2,660	**3.1**	779	**1.7**	1,881	**4.7**
Ovary	2,528	**3.0**	2,528	**5.6**	-	**-**
Liver and Intraphatic Bile Ducts	1,769	**2.1**	604	**1.3**	1,165	**2.9**
Bladder	1,765	**2.1**	523	**1.2**	1,242	**3.1**
Esophagus	1,741	**2.0**	358	**0.8**	1,383	**3.4**
Kidney	1,713	**2.0**	731	**1.6**	982	**2.4**
Melanoma of Skin	1,490	**1.8**	813	**1.8**	677	**1.7**
Multiple Myeloma and Plasmacytoma	1,402	**1.6**	658	**1.5**	744	**1.8**
Cervix Uteri	1,283	**1.5**	1,283	**2.9**	-	**-**
Endometrium	972	**1.1**	972	**2.2**	-	**-**
Retroperitoneum and Peritoneum	824	**1.0**	648	**1.4**	176	**0.4**
Biliary Tract, Other & Unspecified	758	**0.9**	298	**0.7**	460	**1.1**

Note: Count and percentage totals may not add up due to rounding and to the exclusion of other sites.

The PYLL for cancer sites shown in **Table 2-1** are ranked in decreasing order of total PYLL for both sexes combined and are calculated based on life expectancy at time of diagnosis.

The following two figures compare PYLL due to each of the top six cancer sites outlined in **Table 2-1** (**Figure 2-7**) and between the PYLL for these sites for males and females (**Figure 2-8**).

Figure 2-7: Potential Years of Life Lost by Cancer Site, Both Sexes, Alberta, 2006



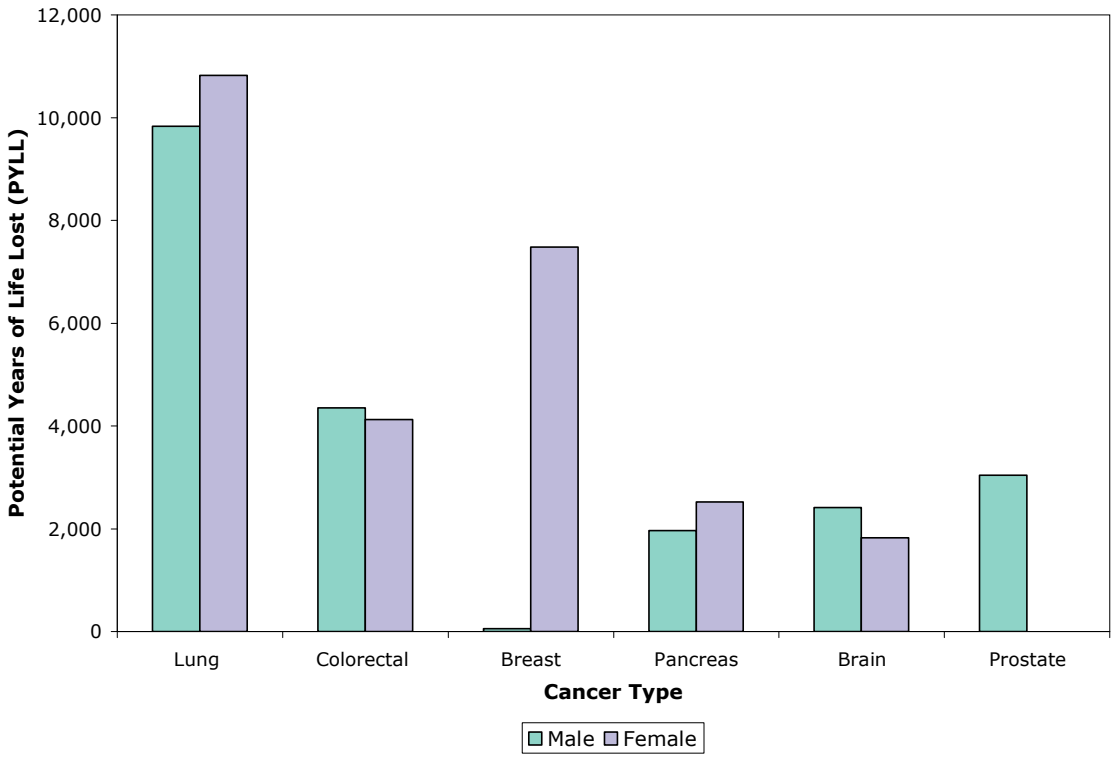
* Female only

The top six cancer sites in terms of potential years of life lost (PYLL) for both sexes in decreasing order are lung, colorectal, breast, pancreas, brain and leukemia (**Figure 2-7**). Deaths due to all cancers resulted in 85,065 potential years of life lost in Alberta in 2006 (**Table 2-1**).

More years of life are lost due to cancers that are more common, have an earlier age of onset and a more rapid progression to mortality.

The PYLL due to the six types of cancer shown in **Figure 2-7** account for 57.3% of the total potential years of life lost due to cancer. Lung cancer alone was responsible for 20,650 PYLL, which represents 24.3% of premature mortality caused by cancer.

Figure 2-8: Potential Years of Life Lost by Cancer Site and Sex, Alberta, 2006



PYLL due to specific cancer types show that lung, colorectal and prostate were the top three cancers in males responsible for PYLL, accounting for 42.8% of the total PYLL in males due to cancer (**Figure 2-8**). Although prostate cancer is more common than lung cancer among men, the PYLL due to lung cancer is 3.2 times higher than for prostate cancer, reflecting higher mortality rates for lung cancer and the younger age at which males develop and die from this disease.

Among women, the top three cancers responsible for PYLL are lung, breast and colorectal, accounting for 50.0% of the total PYLL in females due to cancer (**Figure 2-8**).

Probability of Developing and Dying from Cancer

The ***probability of developing or dying of cancer*** measures the risk of an individual in a given age range developing or dying of cancer, and is conditional on the person being cancer-free prior to the beginning of that age range.

It is important to note that the probabilities of developing and dying of cancer represent all of Alberta's population on average and should be interpreted with caution at the individual level. In addition, someone diagnosed with cancer has a higher probability of developing another cancer in the future.[4]

Table 2-2: Lifetime Probability of Developing Cancer by Sex, Alberta, 2006

Cancer Type	Males	Females
All Cancer	**1 in 2**	**1 in 2**
Prostate Gland	**1 in 6**	**---**
Bronchus/Lung	**1 in 13**	**1 in 15**
Colorectal	**1 in 14**	**1 in 17**
Breast	**1 in 1,328**	**1 in 9**
Non-Hodgkin Lymphoma	**1 in 45**	**1 in 52**
Leukemia	**1 in 59**	**1 in 64**
Melanoma of Skin	**1 in 60**	**1 in 74**
Bladder	**1 in 45**	**1 in 136**
Pancreas	**1 in 79**	**1 in 61**
Kidney	**1 in 60**	**1 in 93**
Unknown Primary	**1 in 83**	**1 in 75**
Endometrium	**---**	**1 in 41**
Stomach	**1 in 77**	**1 in 139**
Multiple Myeloma & Plasmacytoma	**1 in 143**	**1 in 163**
Liver & Intrahepatic Bile Ducts	**1 in 125**	**1 in 208**
Brain	**1 in 146**	**1 in 212**
Ovary	**---**	**1 in 88**
Esophagus	**1 in 128**	**1 in 355**
Cervix Uteri	**---**	**1 in 127**
Biliary Tract, other & unspecified	**1 in 384**	**1 in 388**
Retroperitoneum & Peritoneum	**1 in 1,225**	**1 in 415**

--- Not applicable

At birth, the probability of an Albertan developing cancer within his or her lifetime is approximately 1 in 2 (**Table 2-2**).

The ***probability of developing cancer*** differs by cancer site. A female born in Alberta is more likely to develop breast cancer (1 in 9) than lung cancer (1 in 15), while a male is more likely to develop prostate cancer (1 in 6) than lung cancer (1 in 13). Some cancers affect one sex more than another, for example males are more likely to develop bladder cancer (1 in 45) than females (1 in 136).

Table 2-3: Lifetime Probability of Dying from Cancer by Sex, Alberta, 2006

Cancer Type	Males	Females
All Cancer	**1 in 4**	**1 in 4**
Bronchus/Lung	**1 in 15**	**1 in 18**
Colorectal	**1 in 34**	**1 in 37**
Prostate Gland	**1 in 26**	**---**
Breast	**1 in 2,000**	**1 in 32**
Pancreas	**1 in 78**	**1 in 65**
Unknown Primary	**1 in 94**	**1 in 77**
Nonhodgkin Lymphoma	**1 in 93**	**1 in 124**
Leukemia	**1 in 104**	**1 in 146**
Bladder	**1 in 89**	**1 in 212**
Stomach	**1 in 95**	**1 in 209**
Liver & Intrahepatic Bile Ducts	**1 in 159**	**1 in 219**
Multiple Myeloma & Plasmacytoma	**1 in 172**	**1 in 203**
Brain	**1 in 169**	**1 in 222**
Kidney	**1 in 184**	**1 in 232**
Ovary	**---**	**1 in 106**
Esophagus	**1 in 159**	**1 in 533**
Biliary Tract, other & unspecified	**1 in 270**	**1 in 419**
Melanoma of Skin	**1 in 325**	**1 in 409**
Endometrium	**---**	**1 in 211**
Retroperitoneum & Peritoneum	**1 in 1,859**	**1 in 468**
Cervix Uteri	**---**	**1 in 394**

--- Not applicable

Approximately 1 in 4 Albertans will die of cancer in their lifetime **(Table 2-3)**.

Cancer site and sex affect the ***probability of dying*** from cancer (**Table 2-3**). A female born in Alberta today has a higher chance of dying from lung cancer (1 in 18) than dying from breast cancer (1 in 32). A male has a higher chance of dying from kidney cancer (1 in 184) than a female (1 in 232).

It should be noted that common cancers do not necessarily have higher mortality rates. Even though a female is more likely to develop breast cancer, breast cancer survival is higher than that of lung cancer.

Cancer Prevalence

The ***prevalence*** of a disease is defined as the number of people currently living with that disease. In this section of the report, the cancer prevalence presented describes the number of people alive as of December 31, 2006 who had ever been diagnosed with cancer.

Prevalence is a useful indicator of the impact of cancer on individuals, the healthcare system and the community as a whole. Although many cancer survivors lead healthy and productive lives, the experience can have a strong impact on the physical and emotional well-being of individuals and their families. The cancer experience can also result in the continued use of the healthcare system through rehabilitation or support services, as well as loss of work productivity that can affect the whole community.

As of December 31, 2006, approximately **93,500** Albertans were alive who had previously been diagnosed with cancer.

Incidence and Mortality

Incidence counts are the number of new cancer cases diagnosed during a specific time period in a specific population. In this section of the report, incidence counts refer to the number of new cancer diagnoses in Alberta in a calendar year. Incidence rates are the number of new cancer cases diagnosed per 100,000 population in a specific time period.

Mortality counts describe the number of deaths attributed to cancer during a specific period of time in a specific population. In this section of the report, mortality refers to the number of deaths due to cancer in Alberta in a calendar year, regardless of date of diagnosis. Mortality rates are the number of deaths per 100,000 population in a specific time period.

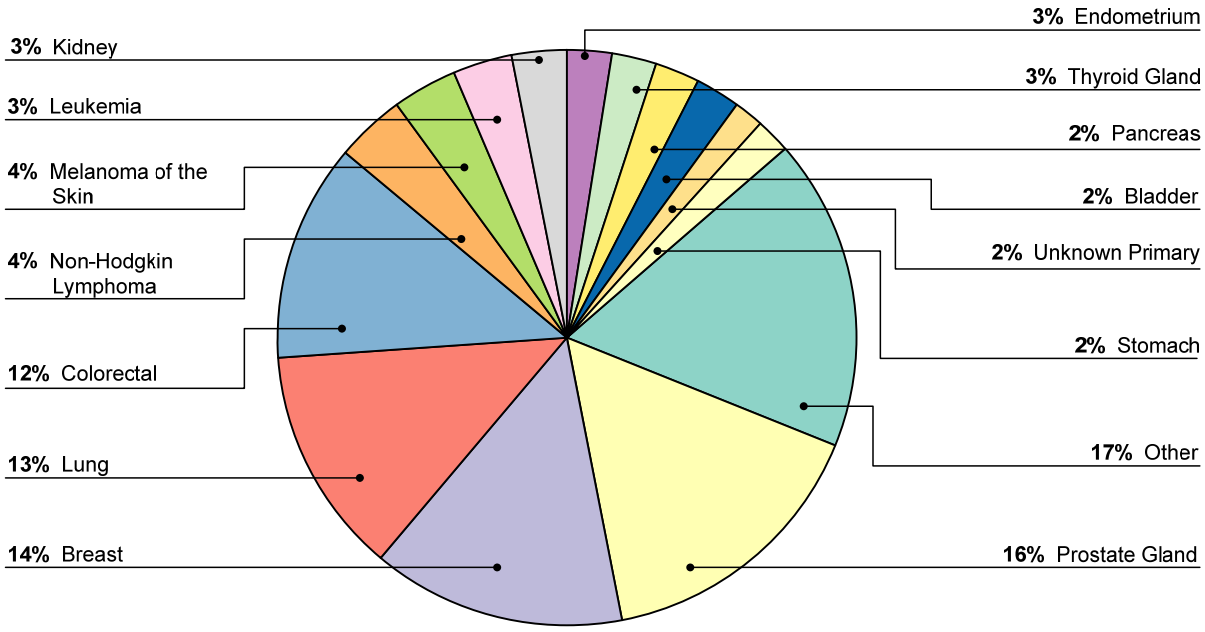
In order to compare cancer incidence or cancer mortality over time or between populations, ***age-standardized incidence rates (ASIRs)*** or ***age-standardized mortality rates (ASMRs)*** are presented. These are weighted averages of ***age-specific rates*** using a standard population. These rates are useful because they are adjusted for differences in age distributions in a population over time, which permit comparisons of cancer incidence or mortality between populations that differ in size, structure or time period. ASIRs and ASMRs give the overall incidence and mortality rates that would have occurred if the population of Alberta had been the same as the standard population. In this report the Canadian 1991 population is used as the standard population.

Three-year moving averages are used to smooth out year-to-year fluctuations so that the underlying trend may be more easily observed. They are calculated based on aggregating three years of data. Age-standardized incidence rates (ASIRs) and age-standardized mortality rates (ASMRs) are presented as three-year moving averages. This smoothing of trends is especially important when the number of cancer cases per year is relatively small, where year-to-year variability can be quite large.

Incidence and mortality can be affected by the implementation of public health prevention or screening strategies that either prevent disease or find cancer in its early ***stages*** when treatment is generally more successful, the development of cancer treatment programs that may impact chances of survival and research innovations.

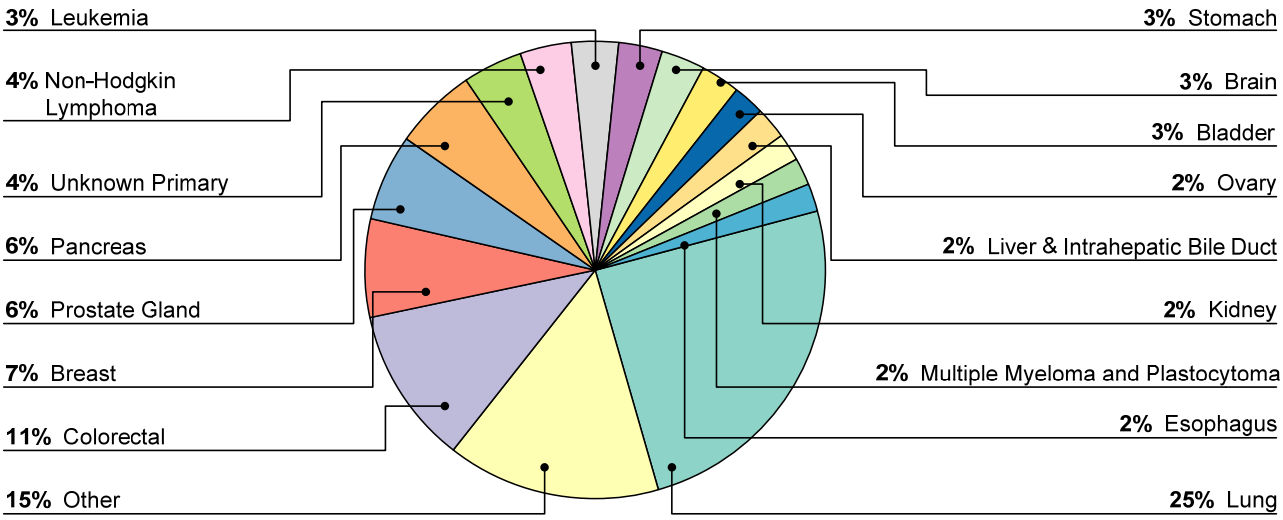
The following figures show incidence and mortality trends in Alberta. Separate analyses for both incidence and mortality are shown in subsequent sections. Significant increases or decreases were detected using JoinPoint[5] and are described in the text accompanying each graph. JoinPoint models are based on yearly rates; hence there may be slight differences in the rates presented in the text (from JoinPoint model) and the graphs (where ASIRs and ASMRs are shown as three-year moving averages).

Figure 2-9: New Cancers by Site (Percentage), Both Sexes, Alberta, 2006



Prostate, breast, lung and colorectal cancers were the most frequently diagnosed cancers in 2006 in Alberta, comprising 55% of all cancers diagnosed (**Figure 2-9**).

Figure 2-10: Cancer Deaths by Site (Percentage), Both Sexes, Alberta, 2006



Lung, colorectal, breast and prostate cancers were responsible for 49% of cancer deaths in 2006 in Alberta (**Fig 2-10**). Some cancers are not very common but, due to their poor ***prognosis***, make a relatively large contribution to mortality such as stomach, brain and pancreatic cancers. These three cancers combined were responsible for 12% of the cancer deaths in 2006 but less than 6% of newly diagnosed cases. Lung cancer also has a poor prognosis than other cancers: it accounts for 13% of new cases but 25% of cancer deaths.

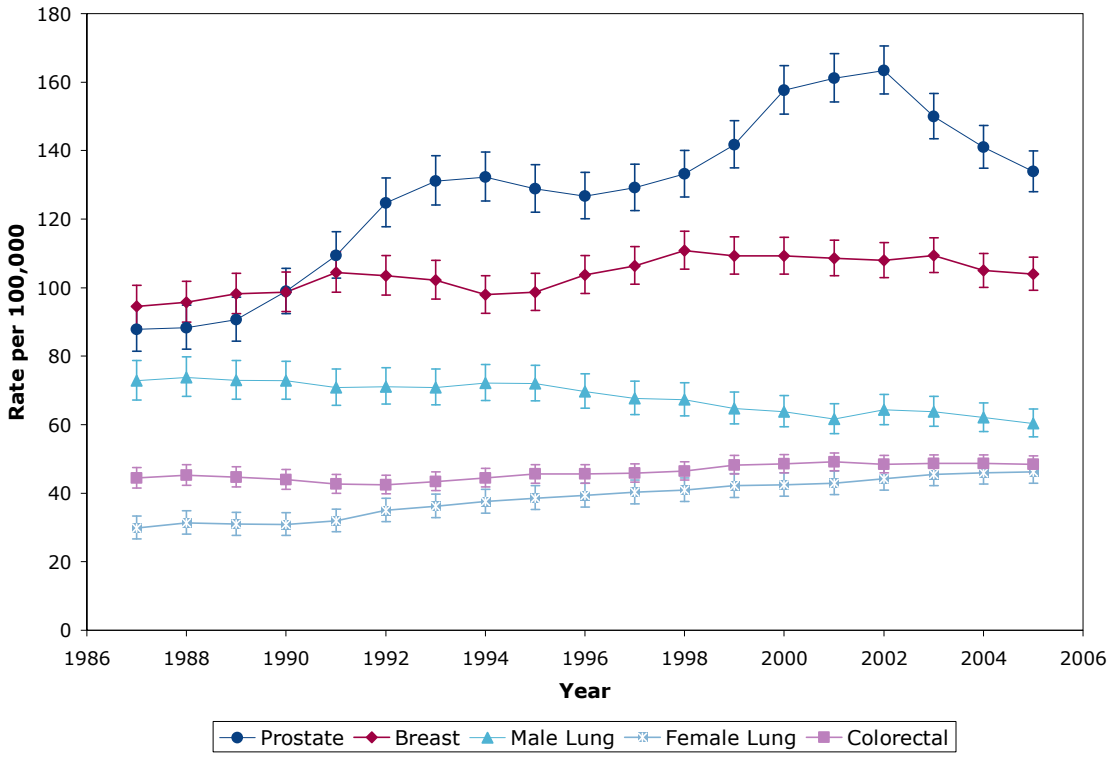
Table 2-4: Incidence and Mortality Counts by Cancer Site, Both Sexes, Alberta, 2006

	Incidence Counts			Mortality Counts		
Cancer type	***Both sexes***	***Males***	***Females***	***Both sexes***	***Males***	***Females***
All cancers†	13,539	7,027	6,512	5,472	2,868	2,604
Bronchus/Lung	1,751	935	816	1,357	726	631
Prostate Gland	2,114	2,114	---	337	337	---
Breast	1,914	12	1,902	386	5	381
Colorectal	1,636	916	720	605	321	284
Non-Hodgkin Lymphoma	552	302	250	200	116	84
Pancreas	329	153	176	312	144	168
Leukemia	446	239	207	184	111	73
Melanoma of Skin	482	255	227	70	36	34
Kidney	401	250	151	109	63	46
Bladder	322	249	73	153	108	45
Stomach	252	166	86	172	122	50
Endometrium	357	---	357	56	---	56
Thyroid Gland	341	89	252	17	9	8
Brain	184	108	76	158	94	64
Liver and Intraphatic Bile Ducts	165	113	52	122	76	46
Other Hematopoietic & Reticuloendothelial	214	111	103	68	41	27
Ovary	157	---	157	124	---	124
Multiple Myeloma & Plasmacytoma	155	82	73	108	58	50
Esophagus	136	105	31	103	82	21
Cervix Uteri	157	---	157	43	---	43
Biliary Tract, Other and Unspecified	57	30	27	63	39	24

† Incidence counts exclude non-melanoma skin cancer (NMSC)
--- Not Applicable

In Alberta, there were 13,539 cancer cases (excluding non-melanoma skin cancer) diagnosed in 2006 and 5,472 people died from cancer in that year. (**Table 2-4**). Lung cancer was the leading cause of cancer deaths among both males and women. Prostate cancer was the most commonly diagnosed cancer among males and breast cancer was the most commonly diagnosed cancer among women. Deaths that occurred in 2006 include cancers diagnosed in 2006 or earlier.

Figure 2-11: Age-Standardized Incidence Rates (ASIRs)*† for Lung Cancer (Male, Female), Colorectal Cancer, Prostate Cancer (Male), Breast Cancer (Female), Alberta, 1986-2006



* Three-year moving average.
† Standardized to 1991 Canadian population.

Generally, cancer incidence rates for the four most common cancers in Alberta have increased in the past 20 years except for male lung cancer (**Figure 2-11**).

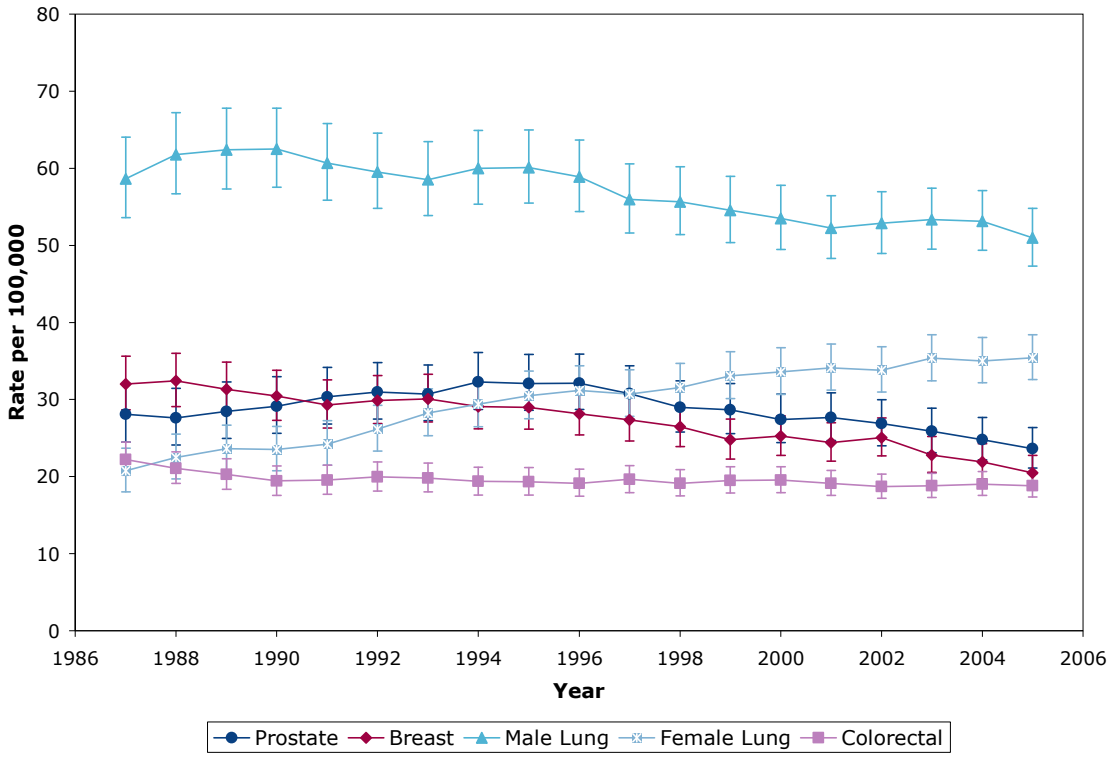
Prostate cancer ASIRs have two peaks and two significant trends over time since 1986. The peaks for prostate cancer incidence occur in 1993 and 2001. Over the time period 1986 to 1993, prostate cancer ASIRs increased by 65% from 79.1 to 130.2 per 100,000 corresponding to an average annual increase of 7.4%. However, from 2001 to 2006 prostate cancer ASIRs decreased by 25% from 170.9 to 127.7 per 100,000, an average annual decrease of 5.7%. The first peak in incidence (1993) may be attributed to the introduction of prostate specific antigen (PSA) testing for prostate cancer that occurred in the early 1990s.[6] It has also been speculated that the second peak was the result of increased PSA screening test activity after the Federal Minister of Health, Allan Rock, was diagnosed with prostate cancer in 2001.[7,8]

Over the time period 1986 to 2006 breast cancer ASIRs (females only) increased 13% from 97.0 to 109.3 per 100,000, corresponding to an annual increase 0.6%.

Male lung cancer ASIRs decreased by 19% from 75.6 to 61.0 per 100,000, an annual decrease of 1.1% between 1986 and 2006. Female lung cancer ASIRs increased between 1986 and 2006 by 64% from 29.7 to 48.6 per 100,000, corresponding to an annual increase of 2.5%.

Finally, colorectal cancer ASIRs increased from 1986 to 2006 by 14% from 43.2 to 49.2 per 100,000, an average annual percent increase of 0.7%.

Figure 2-12: Age-Standardized Mortality Rates (ASMRs)*† for Lung Cancer (Male, Female), Colorectal Cancer, Prostate Cancer (Male), Breast Cancer (Female), Alberta, 1986-2006.



* Three-year moving average.
† Standardized to 1991 Canadian population.

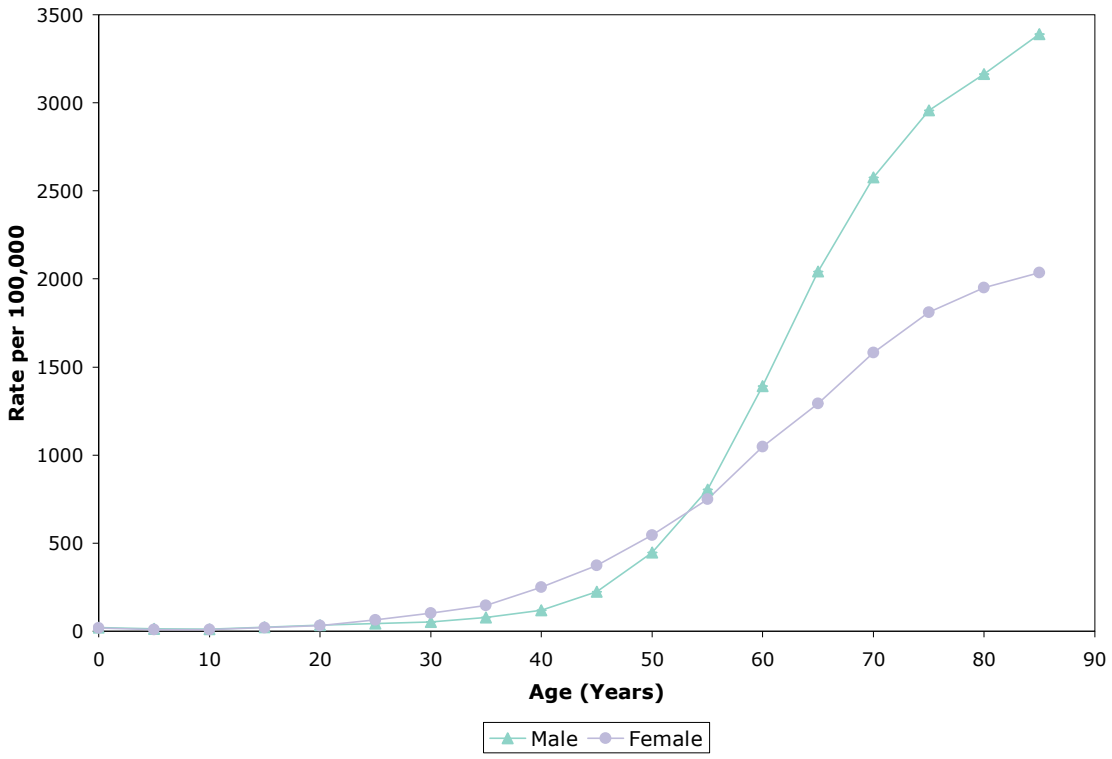
Over the time period 1986 to 1995, prostate cancer ASMRs increased by 21% from 27.1 to 32.7 per 100,000, an average annual percent increase of 2.0%. However, from 1995 to 2006, prostate cancer ASMRs decreased by 29% from 32.7 to 23.3, an average annual percent decrease of 3.0%.

Breast cancer ASMRs (females only) decreased significantly since 1986. Between 1986 and 2006 breast cancer ASMRs decreased by 36% from 33.9 to 21.6 per 100,000. This corresponds to an annual reduction in breast cancer mortality rates of 2.2% between 1986 and 2006.

Male lung cancer ASMRs did not change significantly between 1986 and 1988 (**Figure 2-12**). However, between 1988 and 2006 male lung cancer ASMRs decreased by 21% from 63.6 to 50.3 per 100,000. This corresponds to an annual reduction in male lung cancer mortality rates of 1.3% between 1988 and 2006. Over the period 1986 to 1996, female lung cancer ASMRs increased by 59% from 19.9 to 31.6, corresponding to an annual increase of 4.7%. Female lung cancer ASMRs also increased significantly since 1996. Between 1996 and 2006 female lung cancer ASMRs increased by 14% from 31.6 to 35.9 per 100,000, an annual increase in lung cancer mortality rates of 1.3% between 1986 and 2006.

Over the period 1986 to 2006, colorectal cancer ASMRs decreased by 14% from 21.2 to 18.3 per 100,000, an average annual percent decrease of 0.7%.

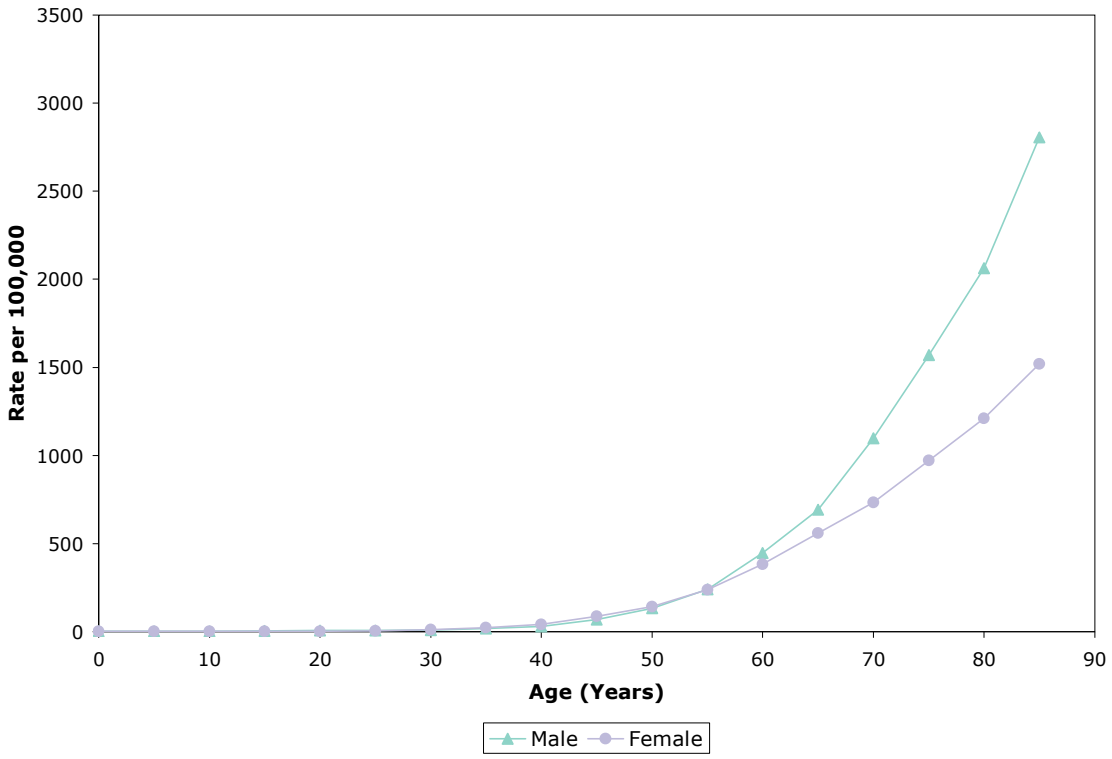
Figure 2-13: Age-Specific Incidence Rates for All Cancers by Sex, Alberta, 2002-2006*



* Non-melanoma skin cancer is excluded

Cancer rates increase with age (**Figure 2-13**). In women, cancer rates remain very low until about the age of 25 when they begin to increase. At about the age of 50, female cancer rates increase more rapidly where the oldest age groups have the highest cancer rates. In men, cancer rates remain low until the age of 40, at which point they begin increasing rapidly. In men, like in women, the highest cancer incidence rates occur in the oldest age groups.

Figure 2-14: Age-Specific Mortality Rates for All Cancers by Sex, Alberta, 2002-2006*



* Non-melanoma skin cancer is excluded

For both males and women, cancer mortality rates remain very low until the age of 45, at which point they begin increasing rapidly (**Figure 2-14**). After the age of 60, females have lower cancer mortality rates than men. The highest cancer mortality rates occur in the oldest age groups.

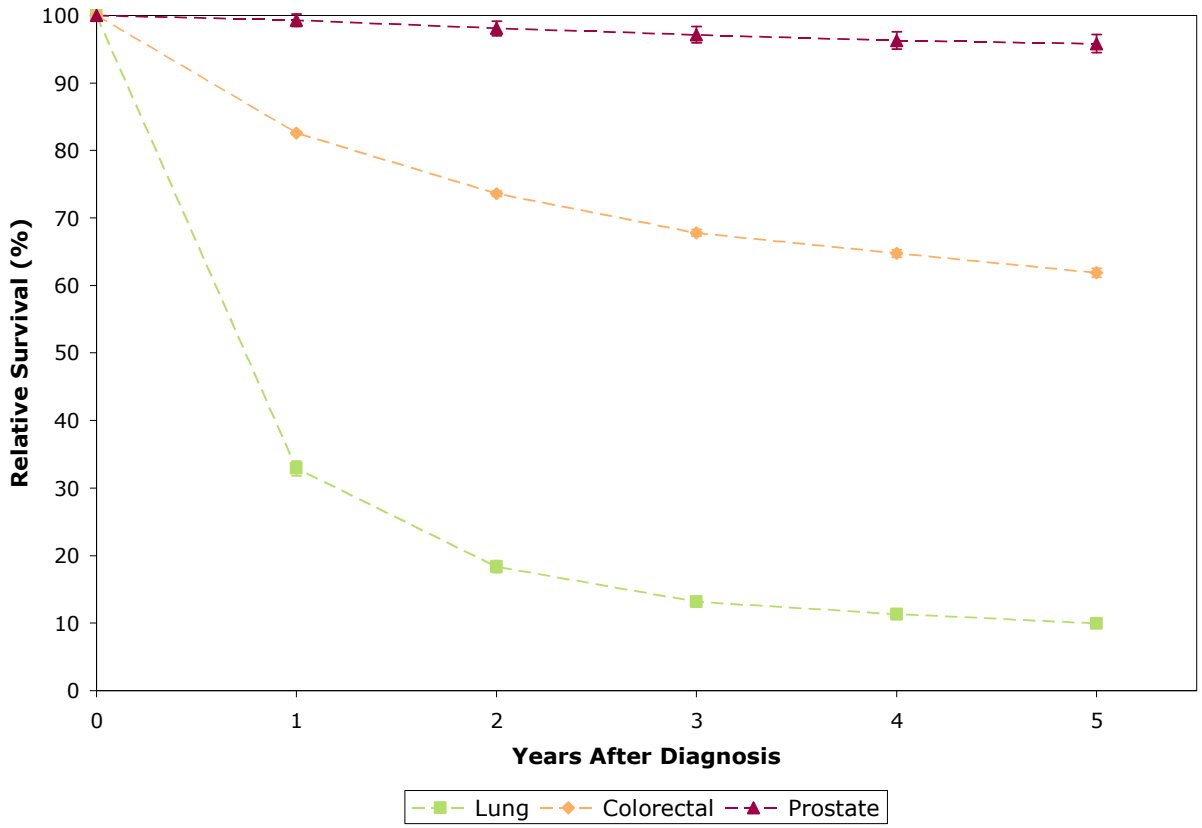
Cancer Survival

Cancer survival ratios indicate the proportion of people who will be alive at a given time after they have been diagnosed with cancer. Survival is an important outcome measure and is used for evaluating the effectiveness of cancer control programs.

Survival depends on several factors including the cancer type (most importantly site, ***stage*** and morphology at diagnosis), sex, age at diagnosis, health status and available treatments for that cancer. While ***relative survival ratios*** give a general expectation of survival over the whole province, these ratios may not apply to individual cases. Individual survival outcomes depend on the stage of diagnosis, treatment and other individual circumstances.

Relative survival ratios are estimated by comparing the survival of cancer patients with that expected in the general population of Albertans of the same age, sex and in the same calendar year. Ratios are estimated by ***period method*** (dashed line) where complete follow-up data (e.g., at least five years of follow-up to estimate five-year rate) after diagnosis are not available. Relative survival ratio is usually expressed as a percentage (%) and the closer the value is to 100%, the more similar the survival pattern is to the general population.

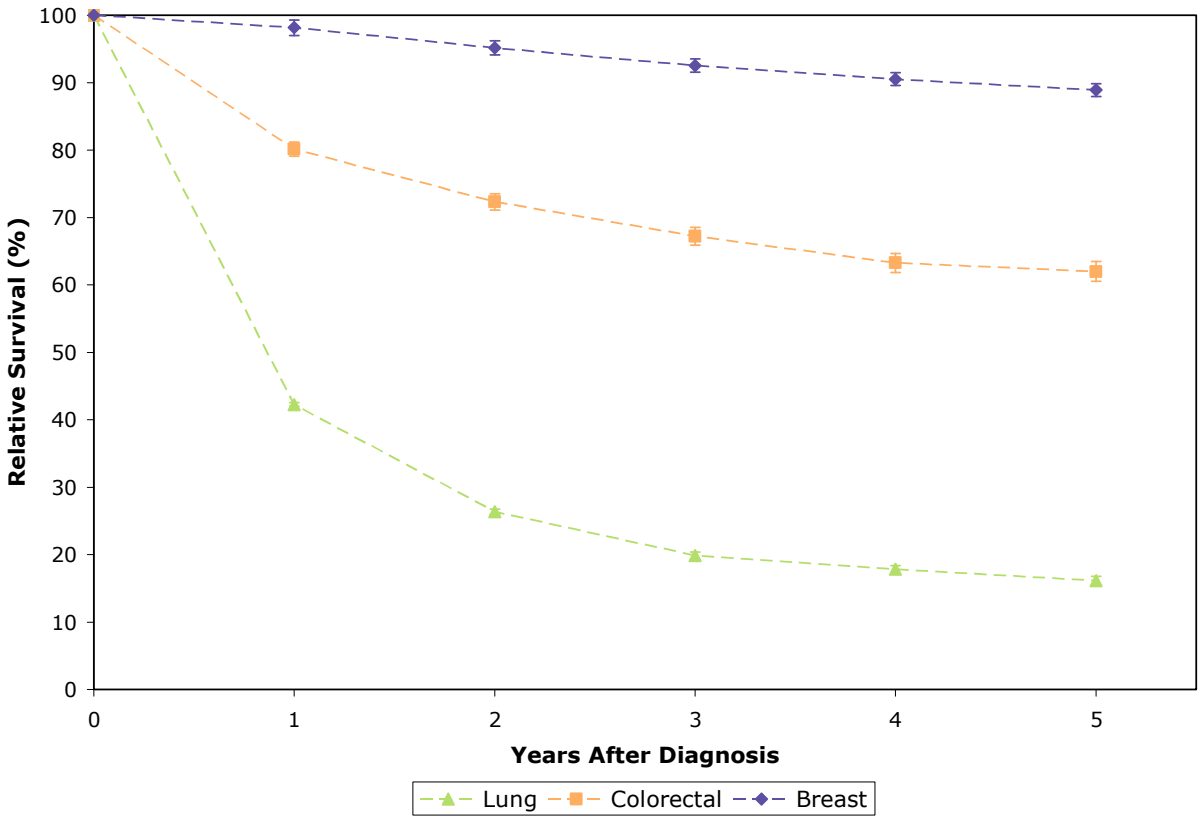
Figure 2-15: Relative Survival Trends* for Lung, Colorectal and Prostate Cancers, Males, Alberta, 2004-2006



----- (dashed line): Ratios calculated by period method, where complete follow-up data are not available

The five-year relative survival ratios for males diagnosed with lung, colorectal and prostate cancers from 2004 to 2006 are 10%, 62% and 96%, respectively (**Figure 2-15**). This means that out of all males diagnosed with this cancer between 2004 and 2006, around 96% are as likely to be alive five years after diagnosis as males from the general Alberta population.

Figure 2-16: Relative Survival Trends for Lung, Colorectal and Breast Cancer in Females, Alberta, 2004-2006



----- (dashed line) Ratios calculated by period method, where complete follow-up data are not available

The five-year relative survival ratios for females diagnosed with lung, colorectal and breast cancers are 16%, 62% and 89%, respectively (**Figure 2-16**). This means that females diagnosed with breast cancer in 2004-2006 are about 89% as likely to be alive for the following five years as women from the general population. Females have a better five-year relative survival ratio (16%) for lung cancer than males (10%). Survival in females diagnosed with lung cancer is still very low (16%).

Table 2-5: One-, Three- and Five-Year Relative Survival Ratios (%) and 95% Confidence Intervals (CIs) for Selected Cancers Diagnosed Between 2004 and 2006 by Sex, Alberta

Cancer type	1-year Relative Survival Ratio (95% CI)		3-year Relative Survival Ratio (95% CI)		5-year Relative Survival Ratio (95% CI)	
	Male	*Female*	*Male*	*Female*	*Male*	*Female*
All types excluding Non-Melanoma Skin	**77** (76, 77)	**79** (78, 79)	**66** (65, 67)	**68** (67, 69)	**62** (61, 63)	**64** (63, 65)
Esophagus	**39** (32, 45)	**33** (21, 46)	**18** (13, 23)	**20** (9, 30)	**15** (10, 21)	**14** (3, 24)
Stomach	**46** (41, 52)	**47** (40, 54)	**27** (22, 32)	**35** (28, 42)	**21** (16, 26)	**30** (23, 38)
Colorectal	**83** (81, 84)	**80** (78, 82)	**68** (65, 70)	**67** (65, 70)	**62** (59, 65)	**62** (59, 65)
Liver & Intrahepatic Bile Ducts	**38** (32, 44)	**30** (22, 39)	**20** (15, 25)	**11** (5, 17)	**15** (10, 20)	**8** (3, 13)
Pancreas	**17** (13, 20)	**15** (12, 19)	**5** (3, 8)	**5** (3, 7)	**3** (1, 5)	**3** (1, 5)
Lung	**33** (31, 35)	**42** (40, 45)	**13** (12, 15)	**20** (18, 22)	**10** (8, 11)	**16** (14, 18)
Melanoma of Skin	**95** (93, 97)	**98** (96, 99)	**88** (85, 92)	**94** (92, 97)	**87** (83, 91)	**92** (89, 95)
Breast	---	**98** (98, 99)	---	**93** (92, 93)	---	**89** (87, 90)
Cervix Uteri	---	**91** (88, 94)	---	**78** (74, 82)	---	**75** (71, 79)
Endometrium	---	**95** (94, 97)	---	**91** (89, 93)	---	**89** (86, 92)
Ovary	---	**74** (70, 79)	---	**51** (46, 56)	---	**40** (35, 45)
Prostate Gland	**99** (99, 100)	---	**97** (96, 98)	---	**96** (94, 97)	---
Testis	**98** (97, 100)	---	**95** (92, 98)	---	**94** (91, 97)	---
Kidney	**80** (76, 83)	**80** (75, 85)	**69** (65, 74)	**73** (67, 78)	**67** (62, 72)	**68** (62, 74)
Bladder	**78** (74, 82)	**68** (60, 77)	**59** (53, 64)	**51** (42, 61)	**53** (47, 59)	**48** (37, 58)
Brain	**51** (45, 57)	**44** (37, 51)	**27** (22, 33)	**26** (20, 33)	**22** (16, 27)	**24** (17, 30)
Thyroid Gland	**96** (92, 99)	**99** (98, 100)	**97** (93, 100)	**99** (98, 100)	**95** (90, 100)	**99** (98, 100)
Non-Hodgkin Lymphoma	**80** (77, 83)	**81** (78, 85)	**69** (65, 73)	**73** (69, 77)	**62** (58, 67)	**69** (65, 74)
Hodgkin Lymphoma	**95** (91, 99)	**97** (93, 100)	**91** (85, 96)	**95** (91, 100)	**88** (82, 95)	**95** (89, 100)
Leukemia	**80** (77, 84)	**77** (72, 81)	**70** (66, 75)	**68** (63, 74)	**65** (60, 70)	**64** (59, 70)
Multiple Myeloma & Plasmacytoma	**70** (64, 76)	**76** (69, 82)	**47** (40, 54)	**52** (44, 60)	**34** (27, 41)	**31** (23, 39)
Other Hematopoietic & Reticuloendothelial	**84** (79, 89)	**90** (86, 95)	**64** (58, 71)	**79** (73, 85)	**58** (51, 66)	**72** (64, 79)
Unknown Primary	**15** (11, 19)	**12** (9, 16)	**8** (5, 11)	**6** (4, 9)	**7** (4, 10)	**5** (2, 7)

Survival ratios vary by type of cancers and sex (**Table 2-5**). Pancreatic cancer patients have the lowest survival ratio whereas those diagnosed with prostate and breast cancers have very high survival ratios. Survival is greater in males than females for liver and intrahepatic bile duct and bladder cancers. Survival is greater in females than males for stomach, lung, melanoma of the skin, thyroid, non-Hodgkin and Hodgkin lymphoma.

Table 2-6: One-, Two- and Three-Year Relative Survival Ratios (%) for Colorectal, Lung, Breast and Prostate Cancers by Stage and Sex, Alberta, 2004-2006.

Cancer Type[a]	Stage	# of Cases		One-Year Survival Ratio (95% CI)		Two-Year Survival Ratio (95% CI)		Three-Year Survival Ratio (95% CI)	
		Male	*Female*	*Male*	*Female*	*Male*	*Female*	*Male*	*Female*
Colorectal	I	**388**	**291**	**99** (97, 100)	**100**	**99** (95, 100)	**99** (95, 100)	**94** (86, 100)	**100**
	II	**557**	**475**	**96** (93, 98)	**97** (95, 100)	**94** (90, 98)	**95** (91, 99)	**91** (84, 97)	**98** (93, 100)
	III	**534**	**434**	**93** (91, 96)	**89** (86, 93)	**85** (80, 90)	**79** (74, 85)	**79** (71, 88)	**74** (65, 82)
	IV	**542**	**409**	**47** (42, 52)	**43** (37, 48)	**24** (19, 29)	**25** (20, 31)	**13** (7, 19)	**14** (7, 20)
Lung	I	**282**	**331**	**84** (79, 89)	**92** (89, 96)	**70** (63, 78)	**78** (72, 85)	**52** (39, 65)	**67** (57, 78)
	II[b]	**83**	**72**	**80** (69, 90)	**83** (73, 93)	**52** (36, 68)	**69** (55, 84)	**31** (9, 53)	**60** (38, 83)
	III	**554**	**460**	**47** (42, 51)	**54** (49, 59)	**20** (16, 25)	**24** (19, 29)	**13** (8, 19)	**11** (5, 17)
	IV	**1117**	**993**	**14** (11, 16)	**21** (18, 23)	**4** (2, 5)	**6** (4, 9)	**1** (0, 3)	**5** (3, 8)
Breast	I	---	**2107**	---	**100**	---	**100**	---	**100**
	II	---	**1588**	---	**100**	---	**98** (96, 100)	---	**95** (92, 98)
	III	---	**661**	---	**95** (93, 97)	---	**88** (85, 92)	---	**87** (82, 91)
	IV	---	**222**	---	**73** (66, 80)	---	**55** (46, 64)	---	**33** (19, 46)
Prostate[c]	I	**7**	---	---	---	---	---	---	---
	II	**2856**	---	**100**	---	**100**	---	---	---
	III	**263**	---	**100**	---	**100**	---	---	---
	IV	**333**	---	**83** (78, 89)	---	**68** (58, 78)	---	---	---

[a] First-primary invasive and age of 15-99 years at diagnosis
[b] Ratios should be interpreted with caution since the number of cases are small
[c] Diagnosed between 2005 and 2006

Cancer ***stage*** (extent or severity of cancer) at diagnosis affects survival. Three-year relative survival ratios for colorectal cancer at stage I and II are above 90%, but are significantly lower than those diagnosed with colorectal cancer at stage IV (male 13% and female 14%) (**Table 2-6**). There is little difference between males and females.

Most lung cancer cases in Alberta were diagnosed at the later stages (III & IV) and the relative survival ratios, compared to the earlier stages (I & II), are low. Survival ratios are higher among females than males at all stages of diagnosis.

The majority of females diagnosed with early stage breast cancer (Stage I or II) have a similar survival pattern as the general population for the first three years. The three-year relative survival ratio for those diagnosed at stage IV is much lower (33%) than that for those at stage I and II (**Table 2-6**).

In 2005-2006, the majority of prostate cancer cases were diagnosed at stage II. Similar to female breast cancer, one- and two-year relative survival ratios are very close to the general population even for those diagnosed at stage III. Even though the two-year relative survival ratio for males diagnosed with prostate cancer at stage IV (68%) is lower than that for those diagnosed at an earlier stage, it is somewhat higher than the survival rates for other major cancers.

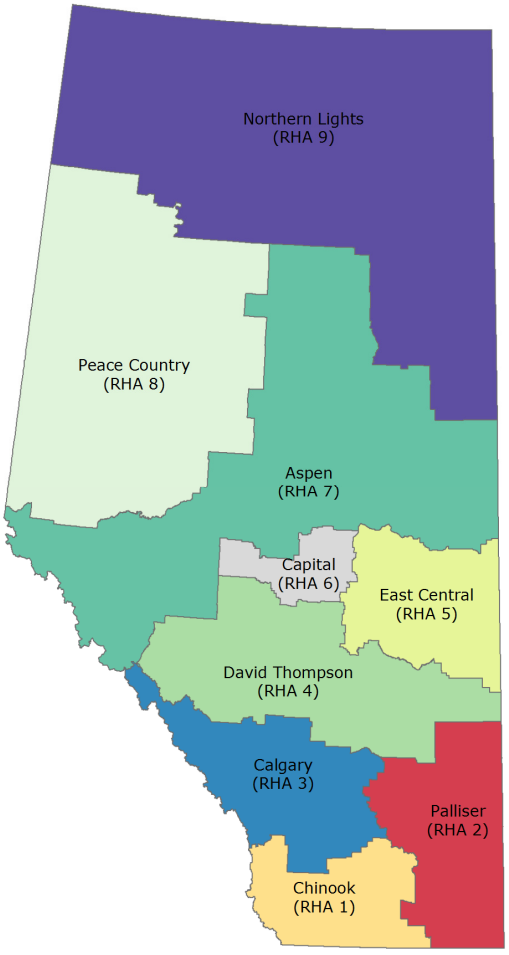
In general, cancer diagnosis at a later stage results in a lower survival ratio than diagnosis at an earlier stage.

Geographic Variation

The geographic variation section illustrates how the observed rates in each former regional health authority compare with the provincial average. These rates are three-year averages. The age standardized incidence and mortality rates for each former regional health authority are presented. Any observed differences in rates may be due to several factors such as regional differences in:

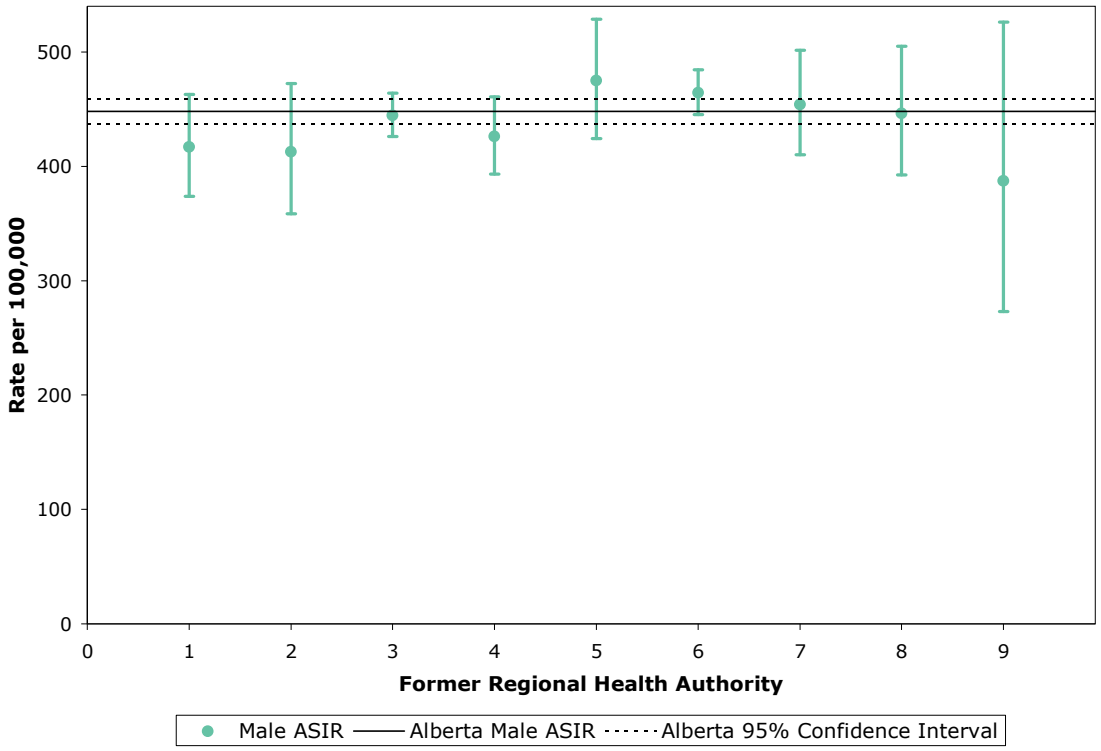
- risk factors such as smoking and obesity rates
- prevention efforts
- cancer screening
- diagnostic activity
- access to cancer care.[6]

Figure 2-17: Former Regional Health Authorities in Alberta



Alberta was divided into nine Regional Health Authorities (**Figure 2-17**).

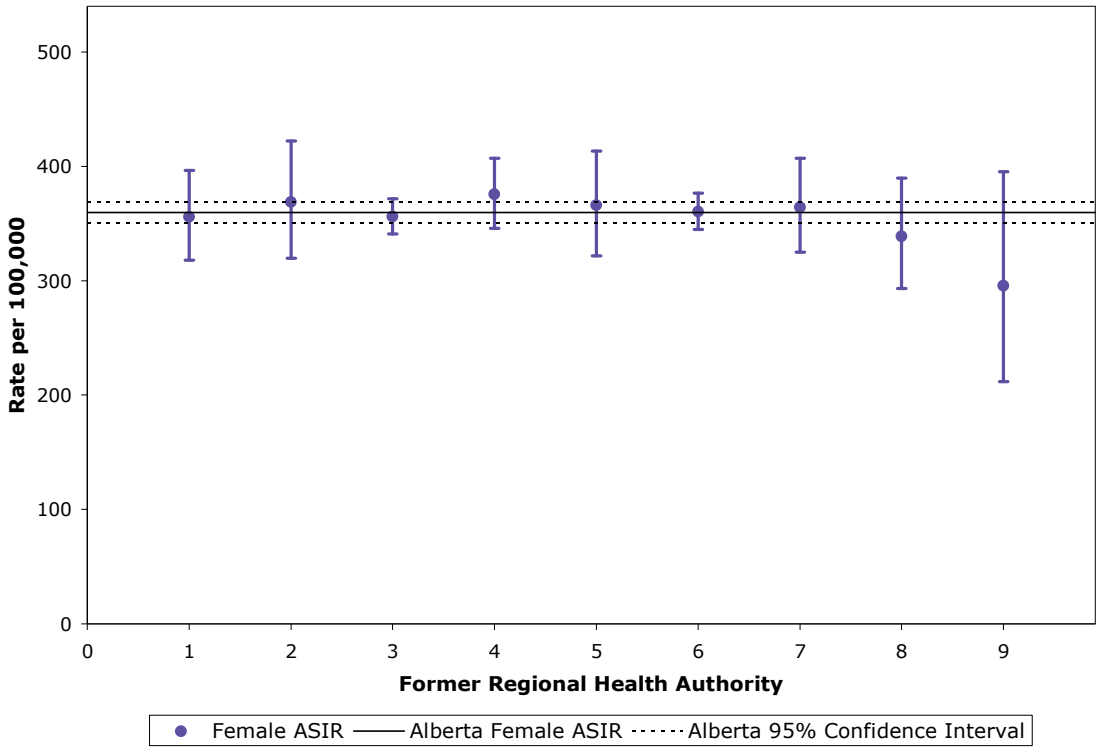
Figure 2-18: Age-Standardized Incidence Rates (ASIRs)[*†] for All Cancers by Former Alberta Regional Health Authority, Males, Alberta, 2004-2006[‡Я]



[*] Three-year average.
[†] Standardized to 1991 Canadian population.
[‡] Error bars represent 95% ***confidence intervals***.
[Я] Non-melanoma skin cancer is excluded.

There is no evidence that male ASIRs in former health regions are higher or lower than the provincial average (**Figure 2-18**).

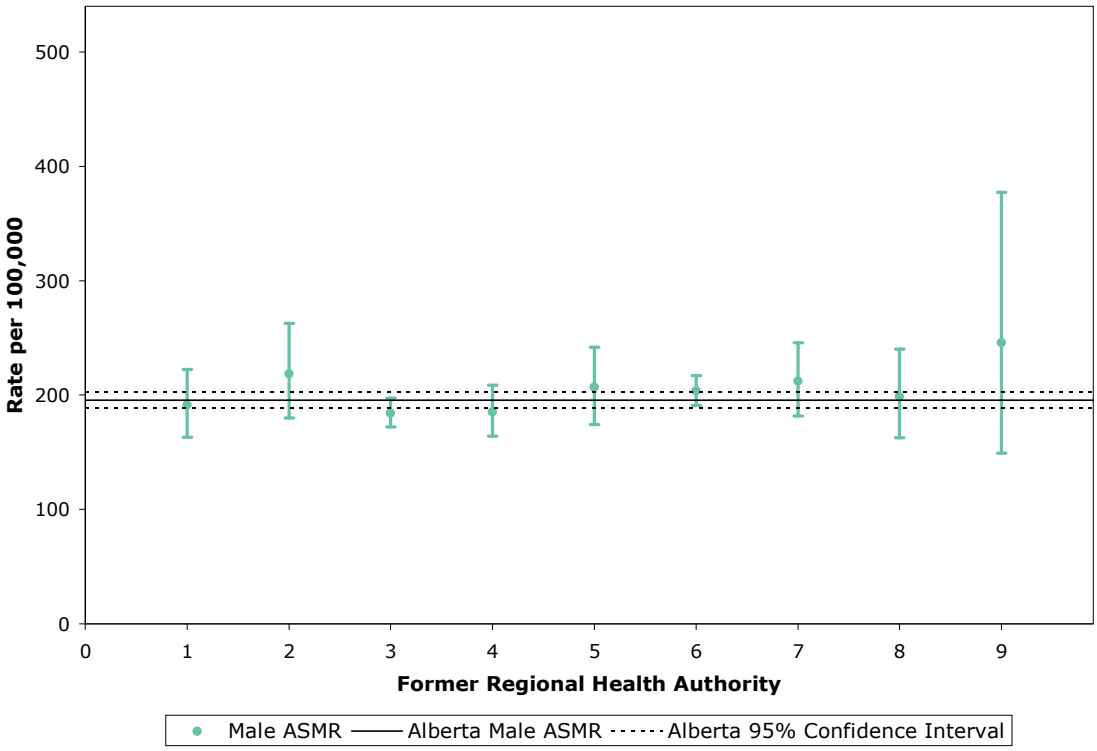
Figure 2-19: Age-Standardized Incidence Rates (ASIRs)[*†] for All Cancers by Former Alberta Regional Health Authority, Females, Alberta, 2004-2006[‡Я]



[*] Three-year average.
[†] Standardized to 1991 Canadian population.
[‡] Error bars represent 95% ***confidence intervals***.
[Я] Non-melanoma skin cancer is excluded.

There is no evidence that female ASIRs in former health regions are higher or lower than the provincial average (**Figure 2-19**).

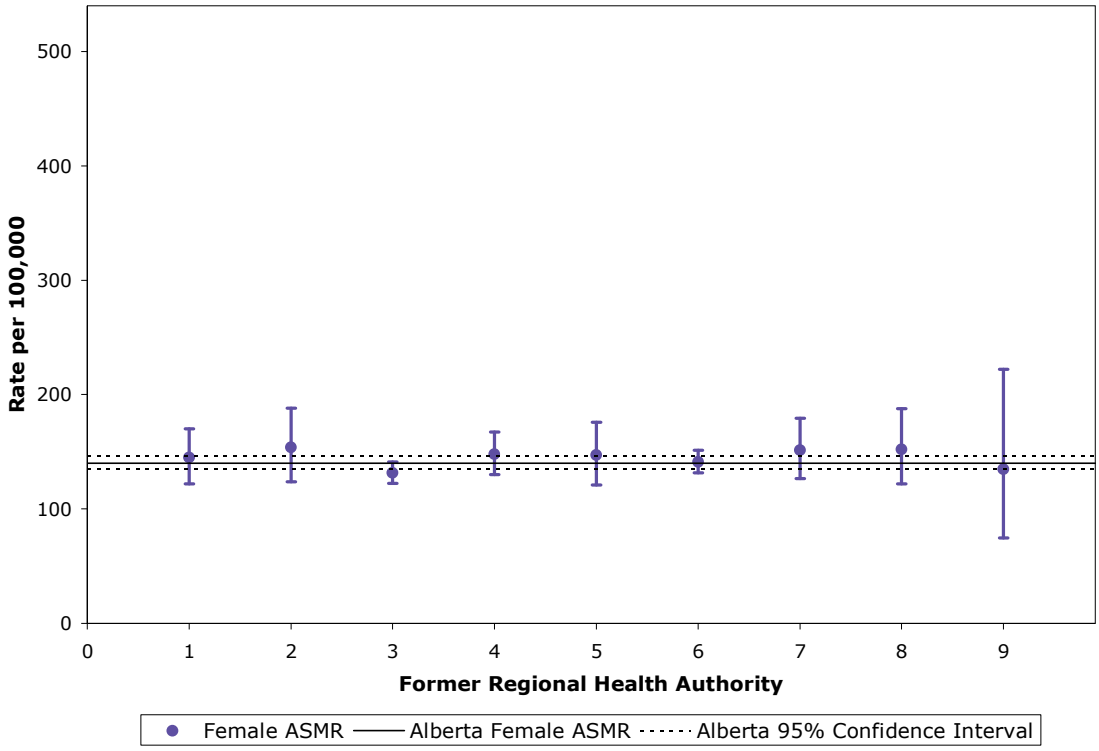
Figure 2-20: Age-Standardized Mortality Rates (ASMRs)[*†] for All Cancers by Former Regional Health Authority, Males, Alberta, 2004-2006[‡Я]



[*] Three-year average.
[†] Standardized to 1991 Canadian population.
[‡] Error bars represent 95% ***confidence intervals***.
[Я] Non-melanoma skin cancer is excluded.

There is no evidence that male ASMRs in former health regions are higher or lower than the provincial average (**Figure 2-20**).

Figure 2-21: Age-Standardized Mortality Rates (ASMRs)[*†] for All Cancers by Former Regional Health Authority, Females, Alberta, 2004-2006[‡Я]



[*] Three-year average.
[†] Standardized to 1991 Canadian population.
[‡] Error bars represent 95% ***confidence intervals***.
[Я] Non-melanoma skin cancer is excluded.

There is no evidence that female ASMRs in former health regions are higher or lower than the provincial average (**Figure 2-21**).

Further Information

Data Sources and Quality

The data presented within this report are derived from the Alberta Cancer Registry (ACR). The ACR is responsible for recording and maintaining data on all new primary cancers, as well as all cancer deaths occurring within the province of Alberta, as mandated by the Regional Health Authorities (RHA) Act of Alberta.[9]

The quality of data collected by any registry is dependent on three factors: comparability, completeness and validity. Firstly, comparability is accomplished by applying standard practices regarding classification and coding of new cases and by using consistent definitions, such as the coding of multiple primaries. To achieve comparability, the ACR employs the International Classification for Oncology (ICD-O-2 for 1986-2000 data and ICD-O-3 for 2001 onwards) to classify all cancers by site and morphology. Cancer deaths are coded using the International Statistical Classification of Diseases and Related Health Problems (ICD-9 for 1986-2000 data and ICD-10 for 2001 onwards).

Secondly, completeness refers to the extent to which all the cancers in Alberta are accurately captured by the ACR. The ACR is notified of new cancers by doctors and laboratories throughout the province, who are mandated to report such information. Cancer-related deaths are recorded and validated by the ACR using registry and Alberta Vital Statistics information. Over the years, the ACR has achieved a completeness of over 95%.

Lastly, validity depends on the documentation available and the level of expertise in the abstracting, coding and recording of data within a registry. The ACR has numerous data edits to ensure all information is input as accurately as possible. For example, date of diagnosis of cancer must be after the date of birth. There are additional data quality reviews performed on ACR data by the Canadian Cancer Registry and the North American Association of Central Cancer Registries (NAACCR).

Confidentiality and security of personal information are protected by the RHA Act and the Health Information Act (HIA). The Alberta Cancer Registry maintains the trust of the public, the government, the data provider, and the general public by requiring rigorous confidentiality and security practices, in accordance with the RHA Act and HIA, to access the Registry database. Formal policies on information disclosure are available on request from the Alberta Cancer Registry.

By recording information on cancer cases and cancer-related deaths over the past few decades, the Alberta Cancer Registry has been able to compare cancer statistics in Alberta with other provinces and countries. The Registry also provides information to health care stakeholders throughout the province so that they can plan effective prevention, treatment and research programs.

For many years, the Alberta Cancer Registry has been certified by NAACCR and has achieved a Gold Standard for completeness of the data, timely reporting and other measures that judge data quality.

Glossary of Terms

Age-specific rates:
The number of new cancer cases or cancer deaths per 100,000 people per year within a given age group.

Age-standardized (incidence/mortality) rates:
A weighted average of age-specific rates using a standard population distribution. They reflect the overall rates that would be expected if the population of interest had an age structure identical to the standard population they used to compare cancer rates among populations or identify trends over time.

Benign:
A tumour that is not malignant (i.e. does not spread).

Carcinoma:
A tumour that begins in the skin or in tissues that line or cover body organs.

Childhood cancer:
Cancers diagnosed and cancer deaths in 0-14 year olds.

Confidence intervals:
An indication of the reliability of an estimate. A wide confidence interval indicates less precision and occurs when a population size is small.

Count:
Count refers to the number of cases (primaries) or deaths in a given time period. One patient may have multiple primaries.

Incidence count:
The frequency of new cancer cases during a period of time; often the number of new invasive cases diagnosed in a year.

Invasive cancer:
Cancer with the ability to spread beyond its point of origin.

Life table:
A life table estimates, for people at a certain age, what the probability is that they die before their next birthday. From this starting point, a number of statistics can be derived and thus also included in the table: *a)* the probability of surviving any particular year of age; *b)* remaining life expectancy for people at different ages; *c)* the proportion of the original birth cohort still alive. They are usually constructed separately for males and females because of their substantially different mortality rates.

Lymphatic system:
A system of vessels that carry lymph between lymph nodes located throughout the body.

Malignant:
Refers to a tumour that invades and destroys surrounding tissues, may spread elsewhere in the body, and is likely to recur after removal; a cancerous tumour.

Median Age:
The age at which half of the population is older and half is younger.[10]

Metastasis:
Refers to the spread of the original tumour to other parts of the body.

Mortality count:
The number of deaths due to cancer during a period of time.

Potential years of life lost (PYLL):
PYLL is the total number of years of life lost obtained by multiplying, for each age group, the number of deaths by the life expectancy of survivors. The indicator was calculated by obtaining the number of deaths and mean life expectancy for each age group.[7]

Prevalence:
The number of people alive at a specific point in time with cancer. Complete prevalence is the number of people alive today who have *ever* been diagnosed with cancer. In this document, we report complete prevalence.

Primary Site of Cancer:
The tissue or organ in which the cancer originates.[11]

Probability of developing/dying of cancer:
The risk of an individual in a given age range developing/dying of cancer in a given time period, and is conditional on the person being cancer-free prior to the beginning of that age range.

Prognosis:
A prediction about the outcome or likelihood of recovering from a given cancer.

Projection:
An estimate of cancer incidence or mortality in the future, based on recent historical trends.

Rate:
The number of cancer cases or deaths occurring in a specified time period.

Relative survival:
The survival of cancer patients relative to that of the general population, assuming cancer was the only cause of death. It is the ratio of observed survival in a group of cancer patients relative to the expected survival of a similar group of people in the general public, matched by age and sex in Alberta.

Stage of cancer:
Refers to the degree of cancer progression and the size of tumor at the time of diagnosis. If the cancer has spread, the stage describes how far it has spread from the original site to other parts of the body.[10]

Surveillance:
Cancer surveillance includes the collection of data, and the review, analysis and dissemination of findings on incidence (new cases), prevalence, morbidity, survival and mortality. Surveillance also serves to collect information on the knowledge, attitudes and behaviours of the public with respect to practices that prevent cancer, facilitate screening, extend survival and improve quality of life.[12]

Survival - Cohort method:
The cohort method provides survival estimates of cases having complete follow-up for the number of years of survival of interest. For example, cases diagnosed in 2001, for which vital status data are available to the end of year 2006, the cohort method may be used to obtain an estimate of five-year survival. The cohort survival represents the actual survival experience of individuals.

Survival - Period analysis:
The period method provides up-to-date survival estimate of recently diagnosed cases considering the survival experience of those cases within the most recent calendar period that allows for the estimation of a given period of survival. For example, to estimate the five year survival for cases diagnosed in 2004-2006, this method considers zero to one year survival experience for cases diagnosed in 2004-2006, one to two year survival experience for cases diagnosed in 2003-2005 who survived at least one year, and so on up to four to five year survival experience for cases diagnosed in 2000-2002 who survived at least four years.

Three-year moving average:
Three-year moving averages are used to smooth out year-to-year fluctuations in age-standardized rates so that the underlying trend may be more easily observed. They are calculated based on aggregating three years of data.

Tumour:
An abnormal mass of tissue that is not inflammatory, arises without obvious cause from cells of pre-existent tissue, and possesses no physiologic function.

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