



2012 Report on Cancer Statistics in Alberta

Cancer in Alberta

Surveillance & Reporting

CancerControl AB

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Purpose of the Report

Surveillance & Reporting, a specialized team within Cancer Measurement Outcomes Research and Evaluation (C-MORE), Alberta Health Services, actively contributes to Changing our Future: Alberta's Cancer Plan to 2030. As well, Surveillance & Reporting keenly contributes to the goal of making Alberta a place where most cancers are prevented, more cancers are cured, and suffering is reduced. This is accomplished in part by conducting cancer **surveillance** through the collection, integration, analysis, and dissemination of cancer-related data and information.

The report is designed to provide comprehensive and detailed information regarding cancer in Alberta. It will help support health professionals, researchers and policy makers in the planning, monitoring and evaluation of cancer-related health programs and initiatives. 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 in the Glossary within the **Appendix** document.

Data Notes

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 accurate at the time of publication, 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 July 14, 2014.

Incidence **rates** presented in this document exclude basal and squamous skin cancer cases which together are commonly known as non-melanoma skin cancer. Although approximately 30% of the **malignant** cancers diagnosed among Albertans each year are basal and squamous skin cancers, these **tumours** are generally not life-threatening and are inconsistently reported and coded across registries; therefore basal and squamous skin cancers 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 **Appendix** document.

Summary

- Approximately **1 in 2** Alberta residents will develop cancer in their lifetime and approximately **1 in 4** people born in Alberta will die from cancer. Survival after diagnosis has improved over time resulting in more individuals alive with a prior cancer diagnosis.
- As of December 31, 2012, approximately **131,550** Albertans were alive who had previously been diagnosed with cancer.
- Overall cancer incidence has increased over the last 21 years. In 2012, the most recent year available, there were **16,330** new cancer cases diagnosed in Alberta and **5,817** Albertans died from the disease. The most commonly diagnosed cancers were breast, prostate, lung and colorectal. These four cancers combined accounted for **52%** of new cancer cases and about half of cancer deaths.
- Cancer accounted for **27%** of deaths in the province for all ages in 2012 making cancer the second leading cause of death in Alberta after deaths from circulatory system diseases (**30%**). Among Albertans aged 35-64 years it accounted for **35%** of deaths which is more than circulatory system, respiratory system and digestive system diseases combined.
- Potential years of life lost (PYLL) is the number of years of life lost when a person dies prematurely from any cause, based on their life expectancy. In 2012, cancer was the leading contributor to PYLL, representing about **28%** of the total PYLL. Lung and bronchus, colorectal, breast and pancreatic cancers accounted for the most PYLL.
- Approximately **19,500** cases of cancer are expected to be diagnosed in 2017. This is a **125%** increase in the number of cancer cases between 1992 and 2017. Of this **125%** the majority is estimated to be attributed to an aging population (**61%**) and population growth (**60%**). Cancer is more common later in life so as the average age of the population increases, there will be more cancer cases. There is expected to be a small increase (**3%**) due to an increase in the incidence rate.

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 2012 there were 16,330 cancer cases diagnosed in Alberta and 5,817 Albertans died from the disease. According to the most recent statistics available from the Government of Alberta, 27% of all deaths in Alberta in 2012 were attributable to cancer.² For those 35-64 years of age, 35% of deaths were due to cancer; more than deaths from circulatory system disease, respiratory system diseases and digestive system diseases combined.

In order to develop a clear understanding of the effect of cancer on the population in the province, it is important to consider the numbers of people affected, their age and sex, and also where people live in the province. This can be done through an assessment of the burden cancer imposes 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).

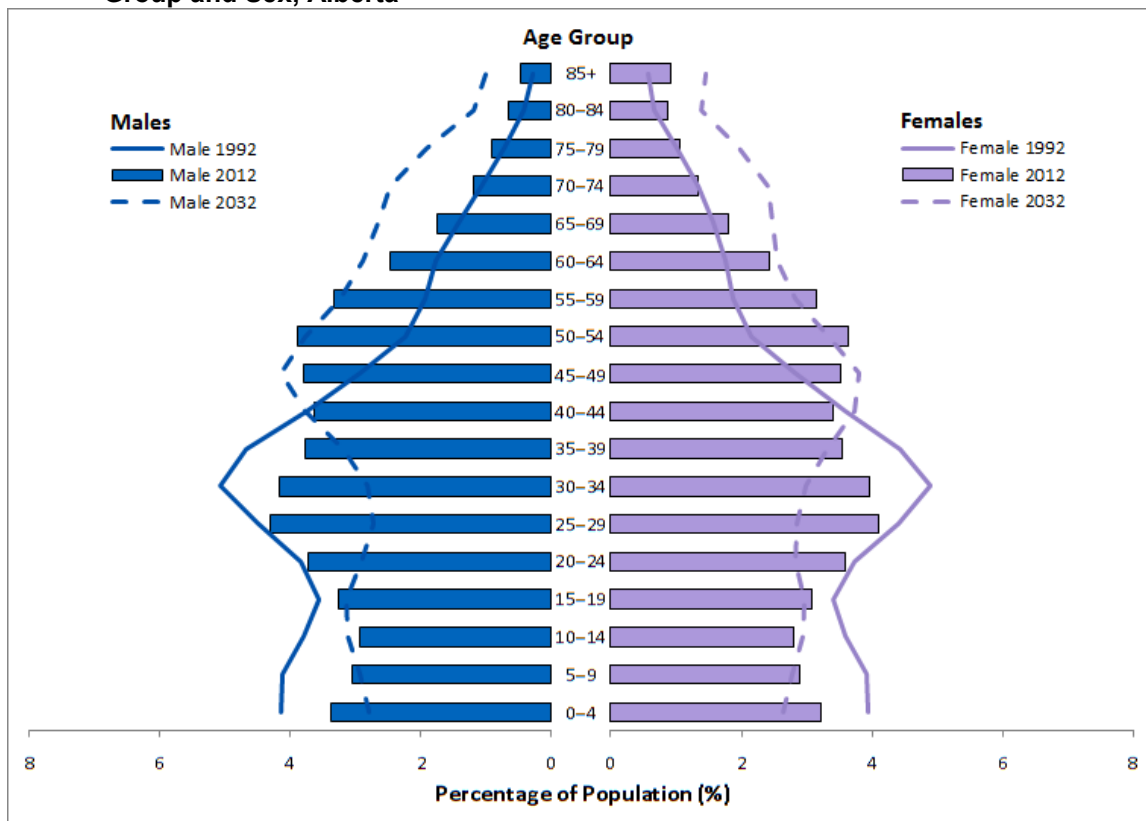
Provincial cancer statistical information (Incidence and Mortality Trends, Cancer Projections, Relative Survival and Incidence of Selected Cancer Sites by Zones) helps health professionals develop screening, prevention and treatment programs that can lessen the effect of cancer on the population.

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 (births), 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 (1992), Actual (2012) and Projected (2032) Population Structure by Age Group and Sex, Alberta



Data Source: Alberta Health

Comparing population estimates in 1992 and 2012 with projections for 2032³ shows that the population of Alberta is aging (**Figure 2-1**).

Population size

The population of Alberta has increased 48% over the past 20 years from 2.6 million in 1992 to 3.9 million in 2012. This growth is expected to continue over the next two decades and by 2032, the population is expected to increase an additional 32% to approximately 5.1 million.⁴

Population structure

The percentage of the population aged 65 and over has increased from 9% in 1992 to 11% in 2012. This older adult age group is expected to also increase to 19% of the total population in 2032. The proportion of the Alberta population aged 35-64 has increased in the last twenty years; in 1992, 35-64 year olds made up 34% of the population and in 2012 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. In 1992, the **median age** of the population was 31 years. The median age of the population rose to 36 years in 2012 (Table 2-1) and is expected to increase to 42 years by 2032.

Table 2-1: Population, Mean Age, Median Age and Interquartile Age Range across Health Zones, Alberta, 2012

Zone	Population	Mean Age	Median Age	25th Percentile Age	75th Percentile Age
South	292,483	37	35	19	55
Calgary	1,455,958	37	36	20	52
Central	458,639	38	37	19	55
Edmonton	1,222,322	37	36	21	53
North	459,146	35	33	18	51
Alberta*	3,888,548	37	36	20	53

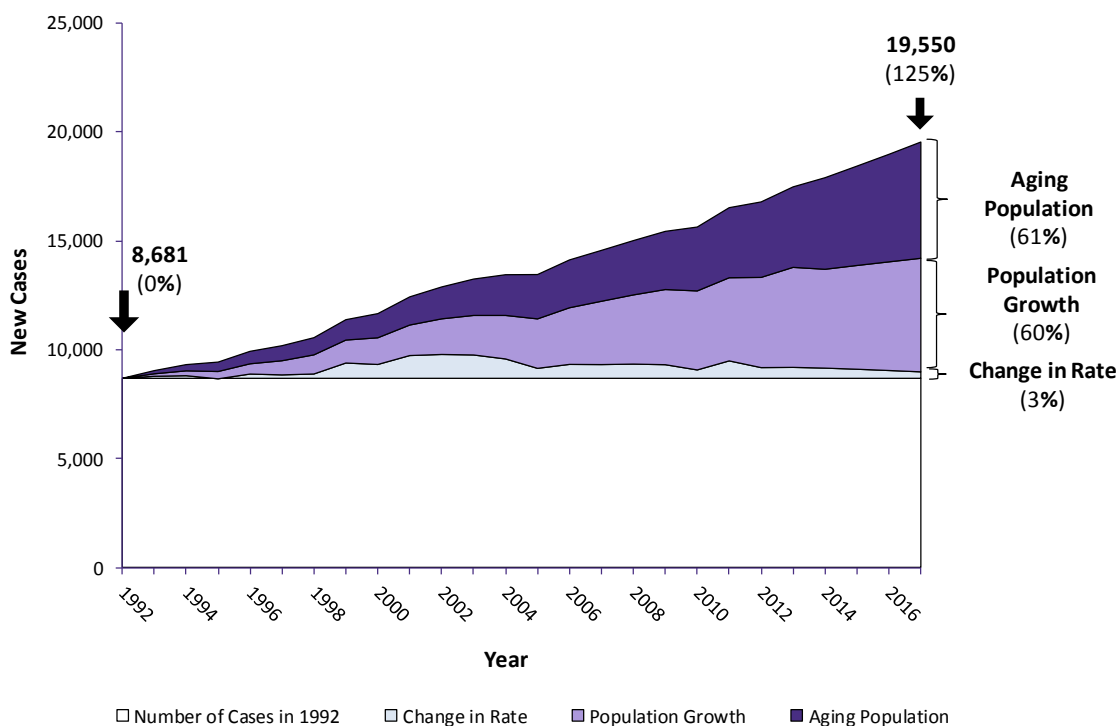
Data Source: Alberta Health

* Zone populations may not add up to the Alberta provincial population total due to lack of Zone assignments for some individuals in the Alberta population data used for these estimates.

In 2012, the North Zone had the youngest age distribution with a median age of 33 years, 25% of the population younger than 18 years of age, and 25% of the population older than 51 years of age. Central (37 years), Calgary and Edmonton zones (36 years each) had the highest median ages with 25% of the population younger than 20 years for Calgary zone, 21 years for Edmonton zone, and 19 years for Central zone. For Calgary and Edmonton zones 25% of the population was older than 52 years and 53 years respectively.

The South Zone had a median age of 35 years but a wider distribution of ages with 25% of the population younger than 19 years and 25% of the population older than 55 years. This compares to 25% of the overall Alberta population being younger than 20 years and 25% of the total population being older than 53 years (Table 2-1).

Figure 2-2: Trends in New Cases Attributed to Aging Population, Population Growth and Cancer Rate, Both Sexes, Alberta, 1992-2017



Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

Changes in demography in Alberta (aging of the population and population growth) contributed far more new cases of cancer over the last two decades as compared to the minor change in the cancer rate (**Figure 2-2**).

The horizontal black line in **Figure 2-2** represents the 8,691 new cancer cases that occurred in 1992. In 2017, approximately 19,550 new cancer cases are projected to occur, accounting for a 125% increase in cases from 1992. The line at the top of the dark purple-shaded area of the graph represents the number of new cases that actually occurred between 1992 and 2012, projected to 2017. Between these two lines, the three colored areas reflect the increase in cases due to the impact of rate change, population growth and aging population.

The light blue 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 1992. This will account for approximately 3% of the total increase in new cancer cases in 2017.

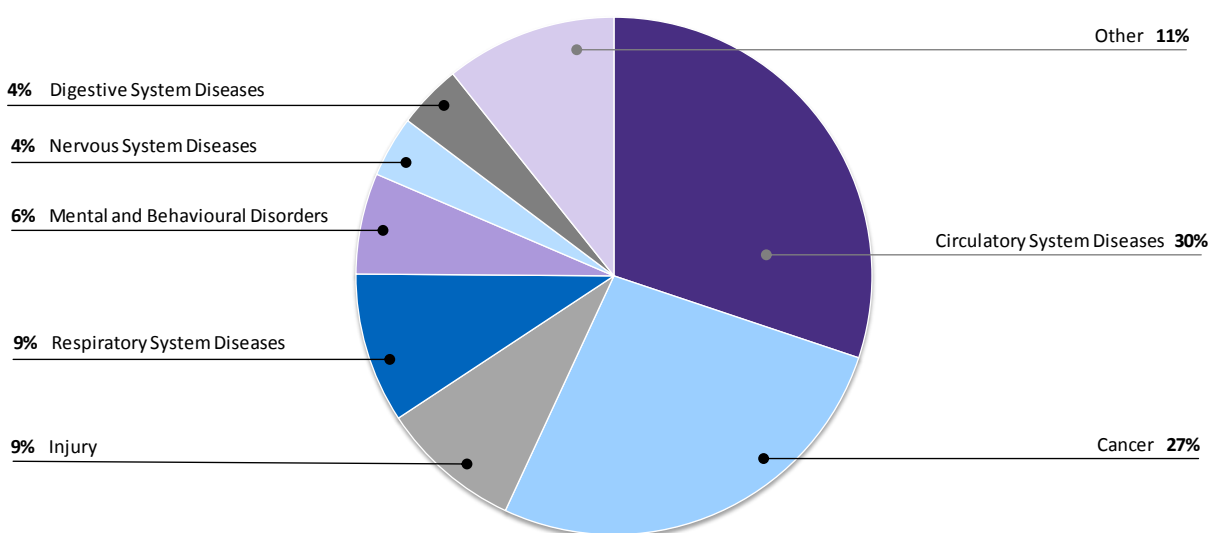
The light purple shaded area (middle) represents the number of new cases that would have occurred each year if the population alone had grown larger but the population age distribution had remained the same as in 1992. This will account for approximately 60% of the total increase in new cancer cases in 2017.

The dark purple shaded area (top) represents the number of new cases attributed to increases in the older adult population - the aging population. This will account for approximately 61% of the total increase in new cancer cases in 2017.

Causes of Death in Alberta

Cancer is one of the leading causes of death in Alberta; over a quarter of the deaths in the province in 2012 were due to cancer. **Figure 2-3** and **Figure 2-4** compare cancer-related deaths and deaths from other causes in Alberta.

Figure 2-3: Leading Causes of Death[†] in Alberta, All Ages, Both Sexes, Alberta, 2012

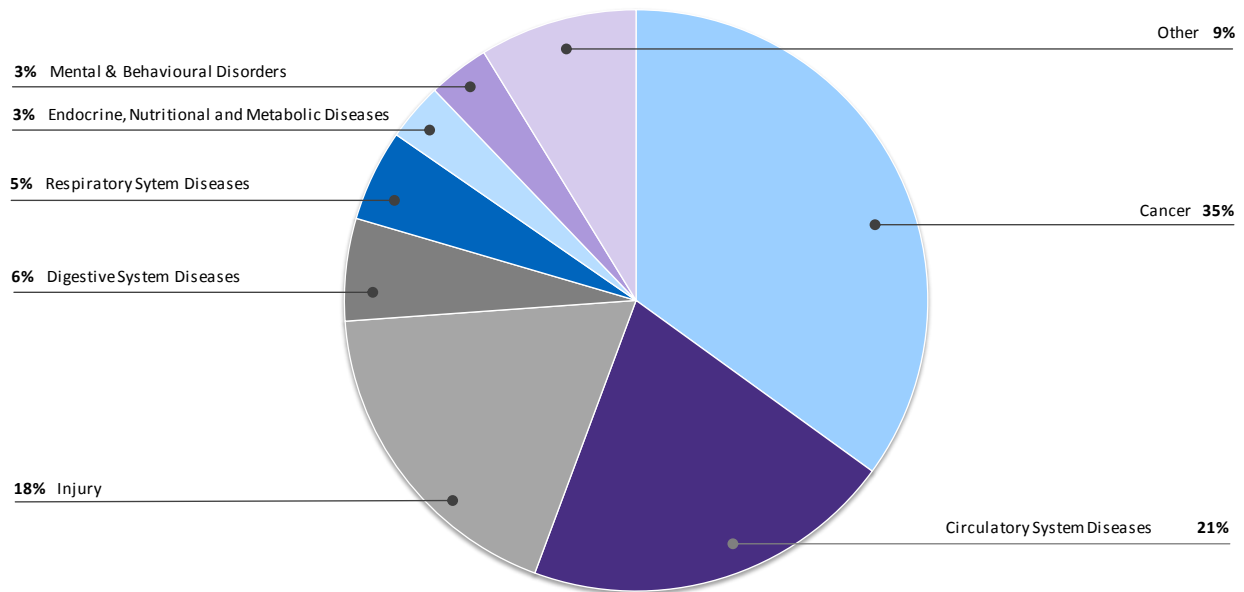


Data Source: Health Status Assessment, Alberta Health Services; Alberta Vital Statistics, Government of Alberta².

[†]Proportions may not add up to 100% due to rounding.

According to the most recent statistics available from the Government of Alberta² (**Figure 2-3**), 27% of deaths in Alberta for all ages in 2012 were attributable to cancer, 30% were attributable to circulatory system diseases and 9% to injury. All other causes combined accounted for the remaining 34% of all deaths.

Figure 2-4: Leading Causes of Death[‡], Ages 35-64, Both Sexes, Alberta, 2012



Data Source: Health Status Assessment, Alberta Health Services; Alberta Vital Statistics, Government of Alberta².

[‡]Proportions may not add up to 100% due to rounding.

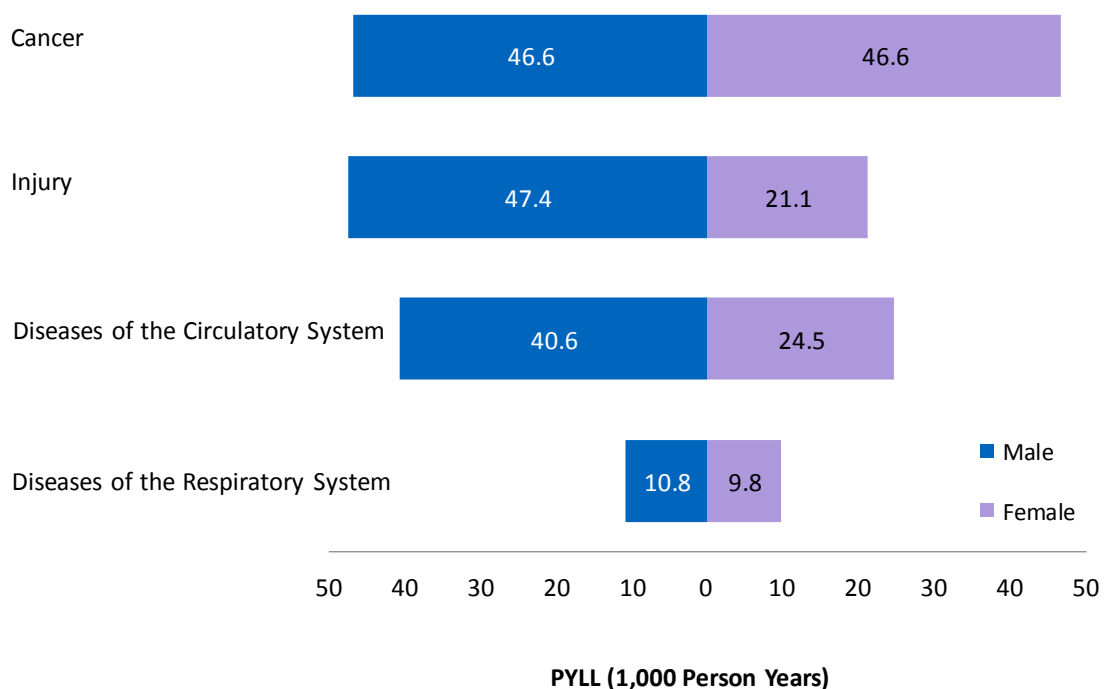
Although cancer is associated with aging, it is important to note that, for the 35–64 year age group (**Figure 2-4**) cancer is the leading cause of death, accounting for 35% of all deaths, which is more than deaths from circulatory system diseases, respiratory system diseases and digestive system diseases combined.

Potential Years of Life Lost

One frequently used measure of premature death is **potential years of life lost (PYLL)**, which is the number of years of life lost when a person dies prematurely from any cause, given their life expectancy⁵.

PYLL is calculated by taking the mid-point age in each age group, subtracting from the age and sex-specific, expected, Albertan life expectancy, and multiplying by the number of deaths in that age group disaggregated by sex and cause of death to determine the years of life lost in each cohort (**Figure 2-5**). The age and sex-specific life expectancy is calculated by determining the difference between the age to which an individual would have been expected to live on average and the age they died at.

Figure 2-5: Selected Causes of Potential Years of Life Lost (PYLL), by Sex, Alberta, 2012



Data Source: Health Status Assessment, Alberta Health Services; Statistics Canada

The top four aggregated causes of premature death in Alberta in 2012 are represented by potential years of life lost (PYLL) and are ranked in order of total PYLL for both males and females combined (**Figure 2-5**).

Overall, cancer was the leading contributor to PYLL, representing about 28% of the total PYLL in the province. Injury was the second leading contributor to PYLL for males and females, representing about 21% of the PYLL resulting from all causes of death in Alberta.

Table 2-2: Potential Years of Life Lost by Cancer Site and Sex, Alberta, 2012

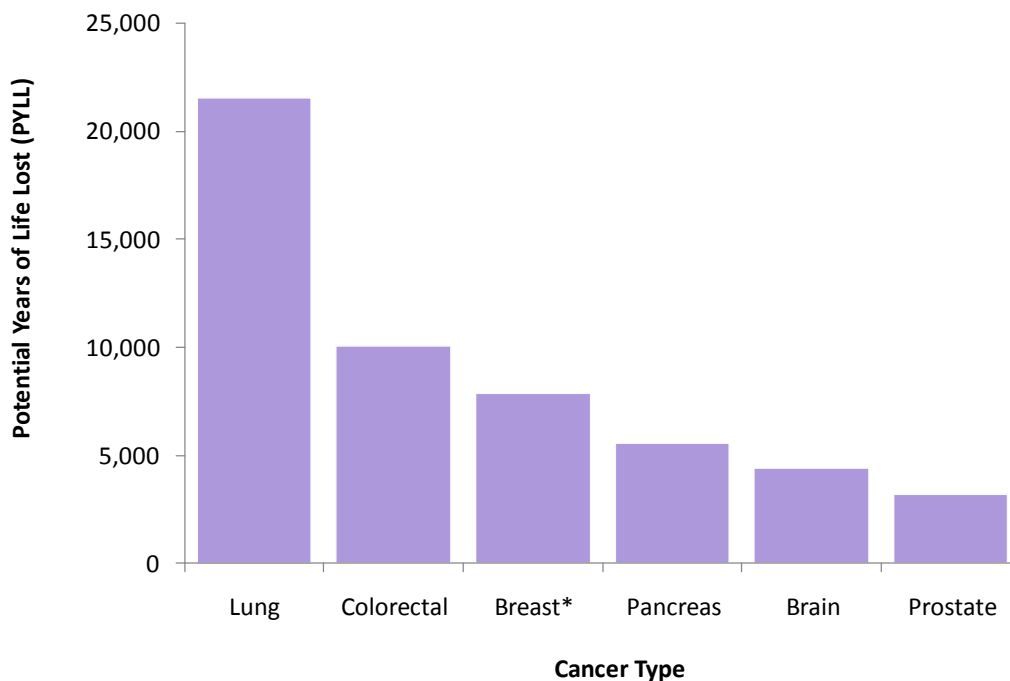
Cancer Site	Both Sexes		Male		Female	
	Years	%	Years	%	Years	%
All Cancers	92,484	100	46,451	100	46,033	100
Lung and bronchus	21,578	23.3	10,111	21.8	11,467	24.9
Colorectal	10,065	10.9	5,684	12.2	4,381	9.5
Breast	7,876	8.5	83	0.2	7,793	16.9
Pancreas	5,532	6.0	2,541	5.5	2,991	6.5
Brain	4,412	4.8	2,756	5.9	1,656	3.6
Prostate	3,209	3.5	3,209	6.9	---	---
Non-Hodgkin lymphoma	3,101	3.4	1,819	3.9	1,282	2.8
Leukemia	3,096	3.3	1,878	4.0	1,218	2.6
Stomach	2,745	3.0	1,731	3.7	1,014	2.2
Kidney and renal pelvis	2,581	2.8	1,820	3.9	761	1.7
Liver	2,438	2.6	1,803	3.9	635	1.4
Oral	2,168	2.3	1,673	3.6	495	1.1
Bladder (including in situ)	2,088	2.3	1,565	3.4	523	1.1
Esophagus	2,073	2.2	1,755	3.8	318	0.7
Ovary	2,051	2.2	---	---	2,051	4.5
Body of uterus	1,641	1.8	---	---	1,641	3.6
Multiple myeloma	1,571	1.7	795	1.7	776	1.7
Melanoma of the skin	1,462	1.6	976	2.1	486	1.1
Cervix uteri	1,090	1.2	---	---	1,090	2.4
Larynx	354	0.4	327	7.0	27	0.1
Thyroid	311	0.3	202	0.4	109	0.2
Testis	247	0.3	247	0.5	---	---
Hodgkin's disease	157	0.2	137	0.3	20	0.0
All Other Cancers	10,638	11.5	5,339	11.5	5,299	11.5

Note: Count and percentage totals may not add up due to rounding.
Data Source: Alberta Cancer Registry, Alberta Health Services.

The PYLL for cancer sites shown in **Table 2-2** are ranked in decreasing order of total PYLL for both sexes combined and are calculated based on the age-specific life expectancy at the time of death. Lung cancer was the leading contributor to PYLL (21,578 years).

Even though pancreatic cancer comprised only 2% of the total cancer cases diagnosed in Alberta in 2012, it was the fourth highest contributor to PYLL (5,532) among all cancer sites. On the other hand, prostate cancer is the second most commonly diagnosed cancer yet it was sixth on the list of PYLL (3,209) attributable to cancer.

Figure 2-6: Potential Years of Life Lost by Top Six Cancer Sites, Both Sexes, Alberta, 2012



*Female breast cancer only

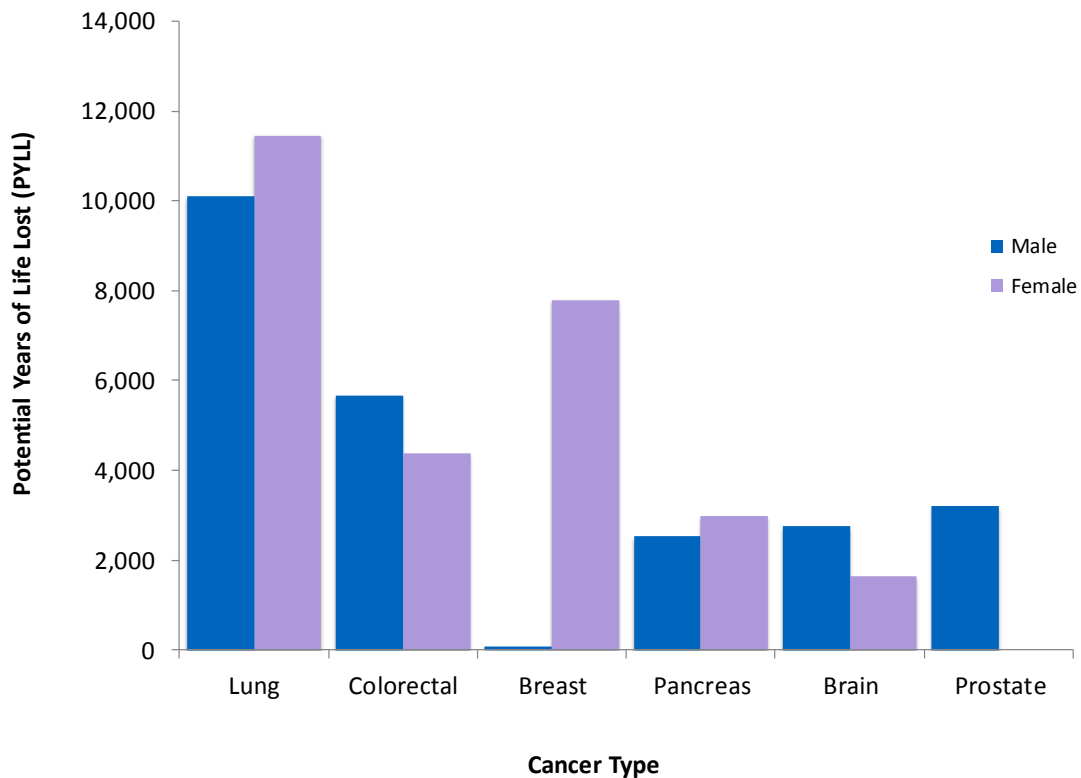
Data Source: Alberta Cancer Registry, Alberta Health Services

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 prostate (**Figure 2-6**). Deaths due to all cancers resulted in 92,484 potential years of life lost in Alberta in 2012 (**Table 2-2**).

More years of life are lost due to cancers that are more common, have an earlier age of onset and/or are generally diagnosed at a later stage of disease.

The PYLL due to the six types of cancer shown in **Figure 2-6** account for 57.0% of the total potential years of life lost due to cancer. Lung cancer alone was responsible for 21,578 PYLL, which represents 23.3% of premature mortality caused by cancer.

Figure 2-7: Potential Years of Life Lost by Top Six Cancer Sites and Sex, Alberta, 2012



Data Source: Alberta Cancer Registry, Alberta Health Services

The PYLL due to specific cancer types show that lung, colorectal and prostate were the top three cancers in males responsible for PYLL, accounting for 40.9% of the total PYLL in males due to cancer (**Figure 2-7**). Although prostate cancer is more common than lung cancer among men, the PYLL due to lung cancer is more than three times higher than that 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 51.3% of the total PYLL in females due to cancer (**Figure 2-7**).

Probability of Developing or 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 or dying of cancer represent all of Alberta's population on average and should be interpreted with caution at the individual level as the probabilities will be affected by other risk factors relevant to the individual. In addition, someone diagnosed with cancer has a higher probability of developing another cancer in the future.⁶

Table 2-3: Lifetime Probability of Developing Cancer by Sex, Alberta, 2008-2012

Cancer Type	Males	Females
All Cancers (excluding NMSC)	1 in 2	1 in 2
Prostate	1 in 6	---
Breast	Less than 1 in 10,000	1 in 8
Lung and Bronchus	1 in 13	1 in 14
Colorectal	1 in 13	1 in 16
Body of Uterus	---	1 in 33
Non-Hodgkin's Lymphoma	1 in 39	1 in 46
Leukemia	1 in 42	1 in 65
Kidney and Renal Pelvis	1 in 55	1 in 85
Pancreas	1 in 67	1 in 61
Melanomas of the Skin	1 in 55	1 in 69
Bladder (including <i>in situ</i>)	1 in 23	1 in 81
Ovary	---	1 in 77
Stomach	1 in 74	1 in 138
Thyroid	1 in 196	1 in 68
Oral	1 in 73	1 in 150
Cervix Uteri	---	1 in 138
Multiple Myeloma	1 in 111	1 in 152
Brain	1 in 127	1 in 184
Esophagus	1 in 101	1 in 349
Liver	1 in 123	1 in 306
Larynx	1 in 206	1 in 1194

--- Not applicable

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

The **probability of developing cancer** differs by cancer site (**Table 2-3**). The probability of an Albertan developing cancer within his or her lifetime is approximately 1 in 2.

A male is more likely to develop prostate cancer (1 in 6) than lung cancer (1 in 13); while a female in Alberta is more likely to develop breast cancer (1 in 8) than lung cancer (1 in 14). Some cancers affect

one sex more than another, for example males are more likely to develop bladder cancer (1 in 23) than females (1 in 81).

Table 2-4: Lifetime Probability of Dying from Cancer by Sex, Alberta, 2008-2012

Cancer Type	Males	Females
All Cancers	1 in 4	1 in 5
Lung and Bronchus	1 in 16	1 in 18
Prostate	1 in 26	---
Breast	Less than 1 in 10,000	1 in 33
Colorectal	1 in 32	1 in 38
Pancreas	1 in 77	1 in 71
Non-Hodgkin's Lymphoma	1 in 100	1 in 118
Ovary	---	1 in 109
Leukemia	1 in 98	1 in 130
Stomach	1 in 106	1 in 192
Bladder (including <i>in situ</i>)	1 in 89	1 in 296
Kidney and Renal Pelvis	1 in 141	1 in 227
Body of Uterus	---	1 in 179
Brain	1 in 156	1 in 229
Esophagus	1 in 130	1 in 416
Multiple Myeloma	1 in 190	1 in 257
Oral	1 in 204	1 in 368
Liver	1 in 184	1 in 407
Melanomas of the Skin	1 in 302	1 in 566
Cervix Uteri	---	1 in 498
Larynx	1 in 537	1 in 3115
Thyroid	1 in 2206	1 in 1233

--- Not applicable

Data Source: Alberta Cancer Registry, Alberta Health Services

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

Cancer site and sex affect the **probability of dying** from cancer (**Table 2-4**). A male in Alberta has a higher chance of dying from lung cancer (1 in 16) than dying from prostate cancer (1 in 26). Similarly, a female in Alberta today has a higher chance of dying from lung cancer (1 in 18) than dying from breast cancer (1 in 33). A male has a higher chance of dying from kidney cancer (1 in 141) than a female (1 in 227).

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 who are alive at a given point who had been previously diagnosed with that disease.

Limited-duration cancer prevalence represents the number of people alive on a certain day who had previously been diagnosed with cancer within a specified number of years (e.g. 2, 5, 10 or 20 years) while complete cancer prevalence represents the proportion of people alive on a certain day who had previously been diagnosed with cancer, regardless of how long ago the diagnosis was⁷.

In this section of the report, both limited-duration and complete cancer prevalence are presented; the latter describing the number of people alive as of December 31, 2012 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, 2012, approximately **131,550** Albertans were alive who had previously been diagnosed with cancer, out of which there were about **62,200** males and about **69,350** females (**Table 2-5**). In addition, there were **25,100** Albertans alive who had been diagnosed with cancer within the previous two years. The two year time period is significant because most definitive cancer treatments will occur within two years of diagnosis.

Table 2-5: Limited-Duration and Complete Prevalence for All Cancers*, Both Sexes, Alberta, 2012

Duration	Prevalence (#)		
	<i>Both sexes</i>	<i>Males</i>	<i>Females</i>
2-Year	25,100	12,900	12,200
5-Year	51,950	26,500	25,450
10-Year	83,200	41,850	41,300
20-Year	114,050	55,950	58,100
Complete (Ever diagnosed)	131,550	62,200	69,350

Data Source: Alberta Cancer Registry, Alberta Health Services

*Excluding non-melanoma skin 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 residents in a calendar year. Incidence rates are the number of new cancer cases diagnosed per 100,000 in the 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 residents in a calendar year, regardless of date of diagnosis. Mortality rates are the number of deaths per 100,000 in the 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 among populations that differ in size, structure and/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 standard population is used.

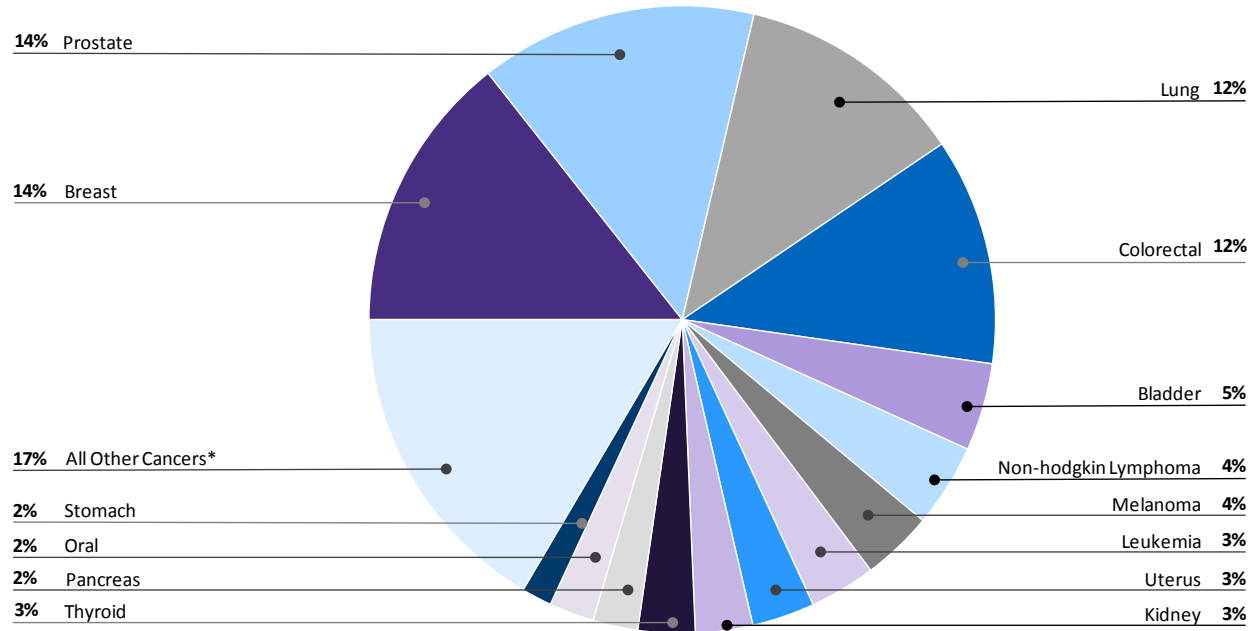
Three-year moving averages are used to smooth out year-to-year fluctuations so that the underlying trend may be more easily observed. They are calculated based on aggregating three years of data. Age-standardized incidence rates (ASIRs) and age-standardized mortality rates (ASMRs) are presented as three-year moving averages; therefore, information can only be presented for 1993-2011. 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. The statistical significance* of the trends was determined by using Joinpoint⁸ and is 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). Comparisons between Alberta Health Services cancer information and that of other organizations such as the Canadian Cancer Society should be made with caution as methods differ for counting cases with more than one primary cancer.

* Throughout this report, the use of the word significant refers to statistical significance at an alpha level of 0.05 (i.e. 95%CI).

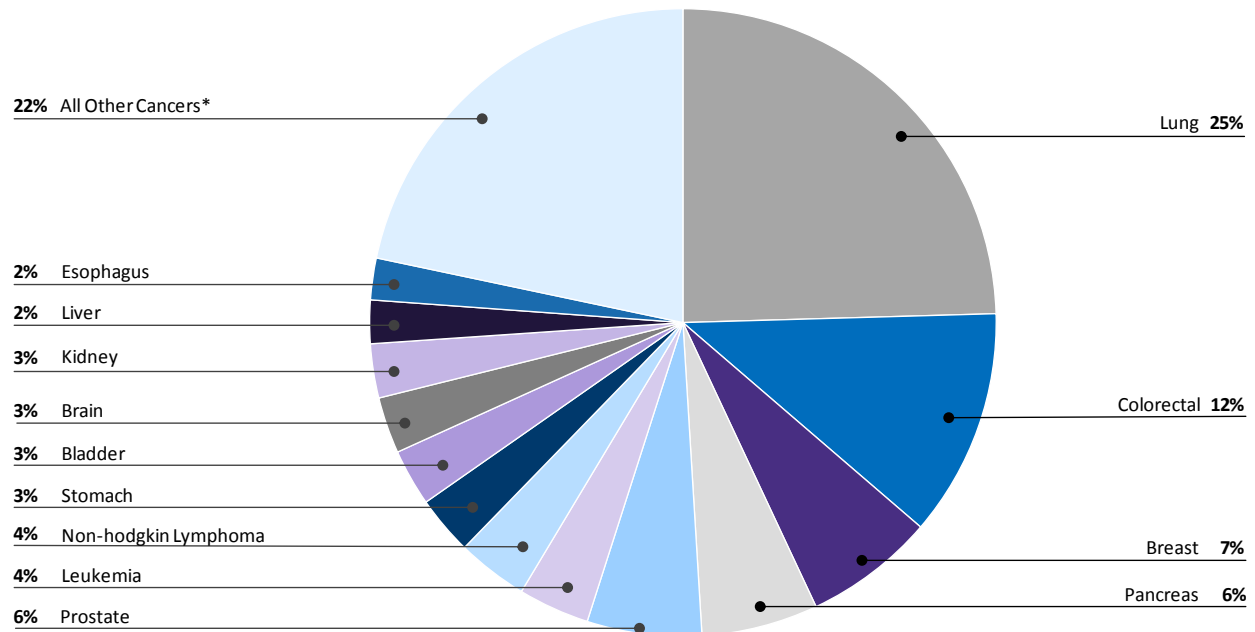
Figure 2-8: New Cancers by Site (Percentage), Both Sexes, Alberta, 2012



* **All Other Cancers:** comprised of all other cancer sites contributing to less than 2% of new cases individually
Data Source: Alberta Cancer Registry, Alberta Health Services

Breast, prostate, lung and colorectal cancers were the most frequently diagnosed cancers in 2012 in Alberta, comprising 52% of all cancers diagnosed (**Figure 2-8**).

Figure 2-9: Cancer Deaths by Site (Percentage), Both Sexes, Alberta, 2012



* **All Other Cancers:** comprised of unknown primary and all other cancer sites contributing to less than 2% of deaths
Data Source: Alberta Cancer Registry, Alberta Health Services

Lung, colorectal, breast and prostate cancers were responsible for 50% of cancer deaths in 2012 in Alberta (**Fig 2-9**). Some cancers are not very common but, due to their poor *prognosis*, make a relatively large contribution to mortality such as pancreatic, stomach, and brain cancers. These three cancers combined were responsible for 12% of the cancer deaths in 2012 but less than 5% of newly diagnosed cases. Lung cancer also has a poorer prognosis relative to other cancers: it accounts for 12% of new cases but 25% of cancer deaths.

Table 2-6: Incidence and Mortality Counts by Cancer Type, Both Sexes, Males and Females, Alberta, 2012

Cancer Type	Incidence Counts			Mortality Counts		
	<i>Both Sexes</i>	<i>Males</i>	<i>Females</i>	<i>Both Sexes</i>	<i>Males</i>	<i>Females</i>
All Cancers[†]	16,330	8,481	7,849	5,817	3,113	2,704
Breast	2,346	13	2,333	391	6	385
Prostate Gland	2,338	2,338	--	344	344	--
Bronchus/Lung	1,938	946	992	1,428	730	698
Colorectal	1,911	1,090	821	683	378	305
Bladder	738	565	173	170	130	40
Non-Hodgkin Lymphoma	700	396	304	213	120	93
Melanoma of Skin	599	329	270	72	46	26
Leukemia	557	346	211	214	127	87
Body of Uterus	529	--	529	87	--	87
Kidney	483	320	163	162	107	55
Thyroid Gland	480	128	352	18	10	8
Pancreas	380	172	208	350	165	185
Oral	378	275	103	109	85	24
Stomach	256	159	97	176	116	60
Multiple Myeloma	209	127	82	111	56	55
Brain	201	113	88	169	101	68
Ovary	196	--	196	106	--	106
Esophagus	183	151	32	125	106	19
Liver	169	126	43	130	95	35
Cervix Uteri	135	--	135	35	--	35
Testis	117	117	--	6	6	--
Hodgkin's Disease	83	54	29	6	5	<5
Larynx	75	63	12	29	25	<5
All Other Cancers	1,329	653	676	683	355	328

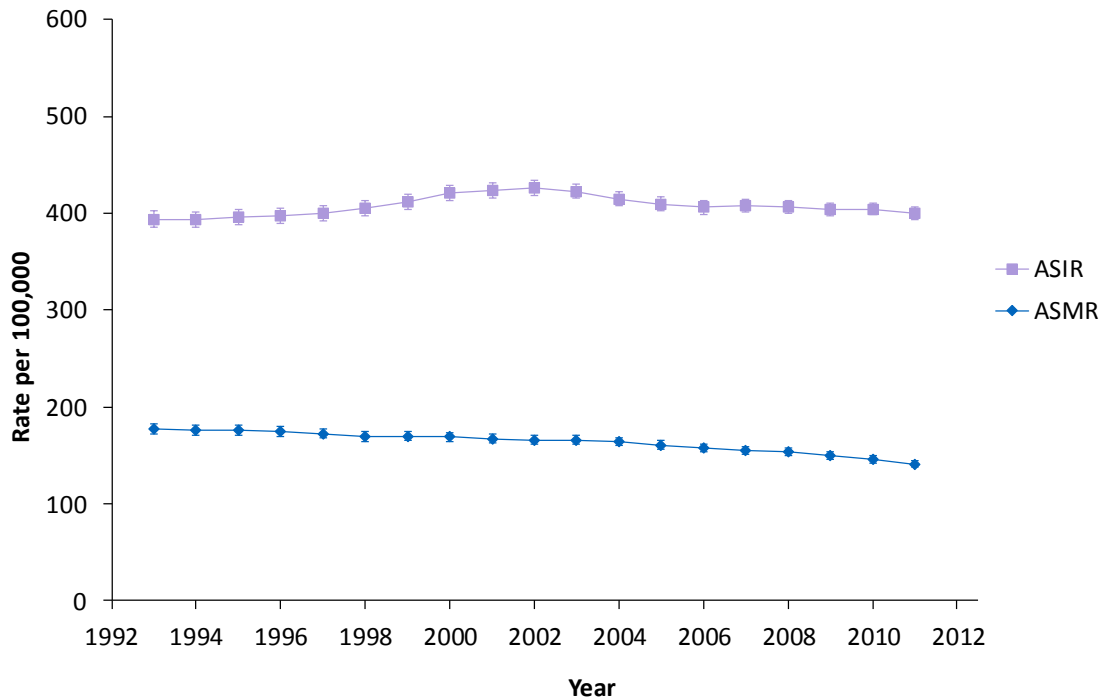
† Incidence counts exclude non-melanoma skin cancer (basal and squamous)

-- Not Applicable

Data Source: Alberta Cancer Registry, Alberta Health Services

In Alberta, there were 16,330 cancer cases (excluding non-melanoma skin cancer) diagnosed in 2012 and 5,817 people died from cancer in that year. (**Table 2-6**). Lung cancer was the leading cause of cancer deaths among both men and women. Prostate cancer was the most commonly diagnosed cancer among men and breast cancer was the most commonly diagnosed cancer among women. Deaths that occurred in 2012 include cancers diagnosed in 2012 or earlier.

Figure 2-10: Age-Standardized Incidence Rates (ASIRs),^{†} Age-Standardized Mortality Rates (ASMRs),[†] and 95% Confidence Intervals (CI) for All Cancers, Both Sexes, Alberta, 1992-2012**



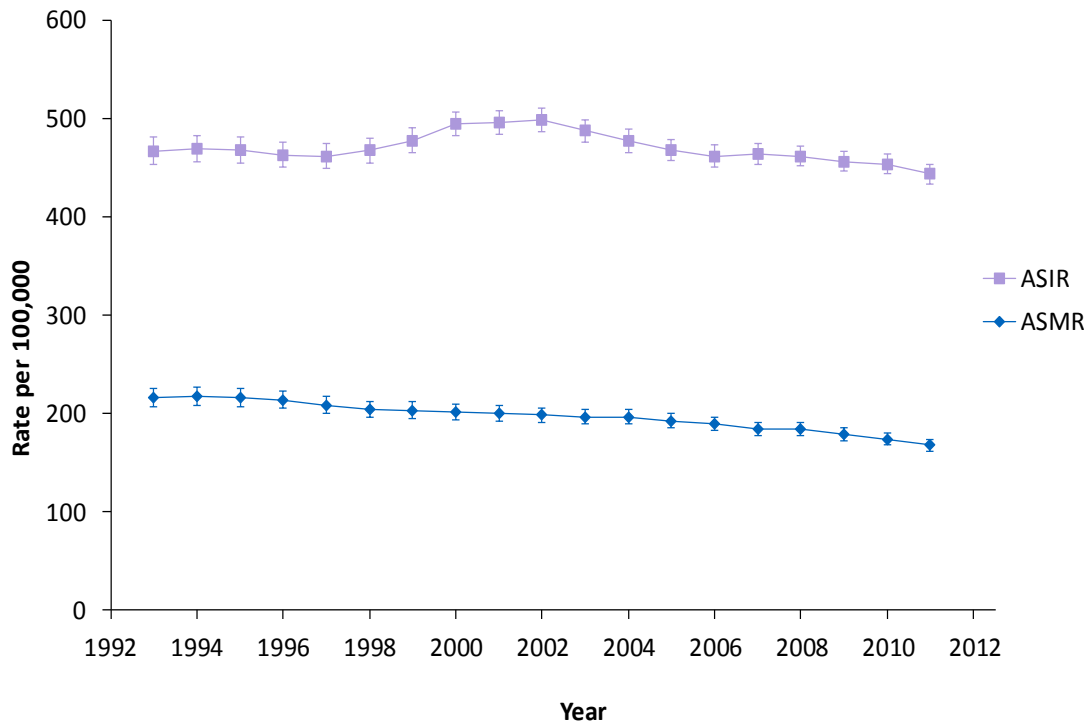
* Three-year moving average.
 † Standardized to 1991 Canadian population.
 ‡ Excludes basal and squamous skin cancers

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

ASIRs of all cancers increased significantly between 1992 and 2002 by 0.9% annually and decreased significantly between 2002 and 2012 by 0.7% annually (**Figure 2-10**). In 2012, the ASIR for all cancers in both sexes was about 391.4 per 100,000 in the population.

Mortality rates are lower than incidence rates. ASMRs decreased significantly by 0.7% annually between 1992 and 2005, and by 2.2% annually between 2005 and 2012 (**Figure 2-10**). In 2012, the ASMR for all cancers in both sexes was 138.9 per 100,000 in the population.

Figure 2-11: Age-Standardized Incidence Rates (ASIRs),^{†} Age-Standardized Mortality Rates (ASMRs),[†] and 95% Confidence Intervals (CI) for All Cancers, Males, Alberta, 1992-2012**



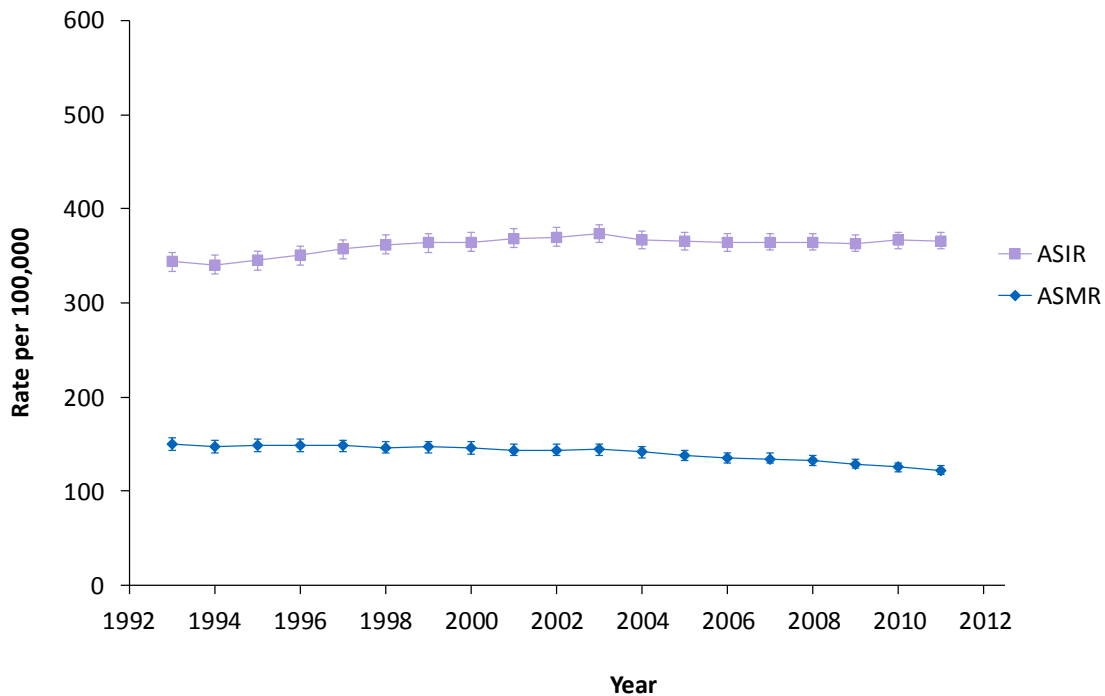
* Three-year moving average.
 † Standardized to 1991 Canadian population.
 ‡ Excludes basal and squamous skin cancers.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

Male ASIRs for all cancers increased significantly between 1992 and 2001 by 0.9% annually and decreased significantly between 2001 and 2012 by 1.0% annually (**Figure 2-11**). In 2012, the ASIR for all cancers in males was 430.7 per 100,000 male population.

Male ASMRs for all cancers decreased significantly by 1.1% annually between 1992 and 2007 and by 2.7% annually between 2007 and 2012 (**Figure 2-11**). In 2012, the ASMR for all cancers in males was 165.09 per 100,000 male population.

Figure 2-12: Age-Standardized Incidence Rates (ASIRs),^{†} Age-Standardized Mortality Rates (ASMRs),[†] and 95% Confidence Intervals (CI) for All Cancers, Females, Alberta, 1992-2012**



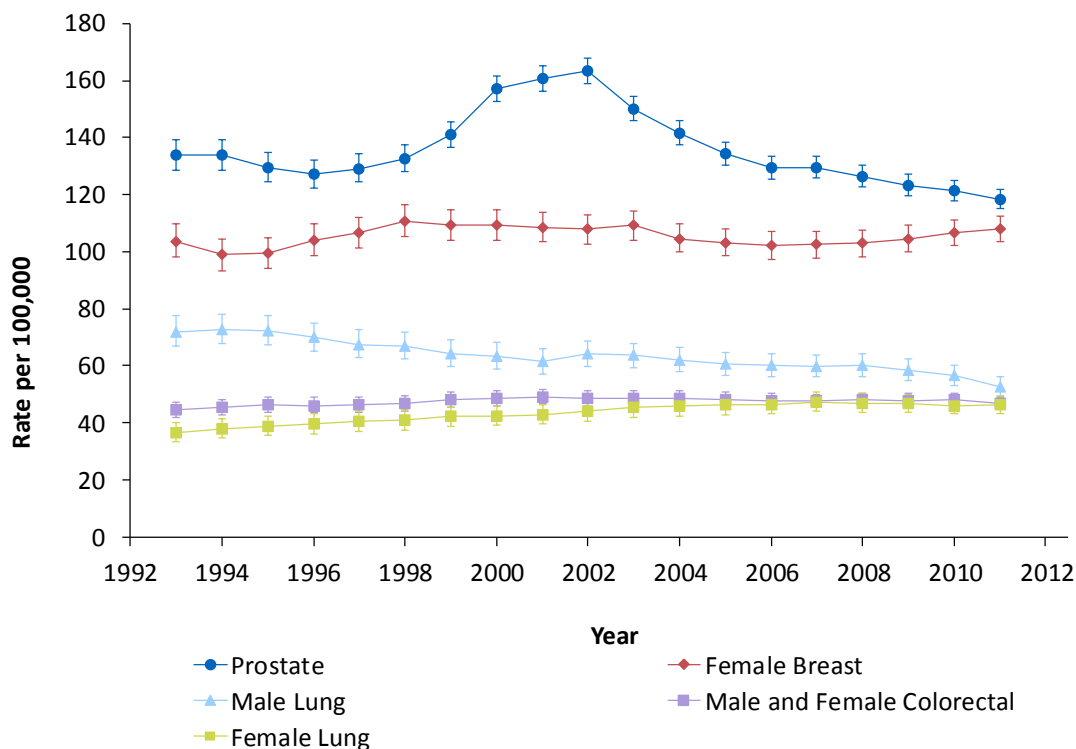
* Three-year moving average.
 † Standardized to 1991 Canadian population.
 ‡ Excludes basal and squamous skin cancers.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

Female ASIRs for all cancers increased significantly between 1992 and 2002 by 0.9% annually, but decreased between 2002 and 2012 by 0.2% annually (**Figure 2-12**). In 2012, the ASIR for all cancers in females was 361.5 per 100,000 female population.

Female ASMRs for all cancers decreased by 0.4% annually between 1992 and 2003. From 2003 to 2012, there was a further significant decrease by 2.0% annually (**Figure 2-12**). In 2012, the ASMR for all cancers in females was 119.5 per 100,000 female population.

Figure 2-13: Age-Standardized Incidence Rates (ASIRs)[†] for Prostate Cancer, Breast Cancer (Female), Lung Cancer (Male, Female), and Colorectal Cancer (Both Sexes Combined) with 95% Confidence Intervals (CI), Alberta, 1992-2012



* Three-year moving average.

† Standardized to 1991 Canadian population.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

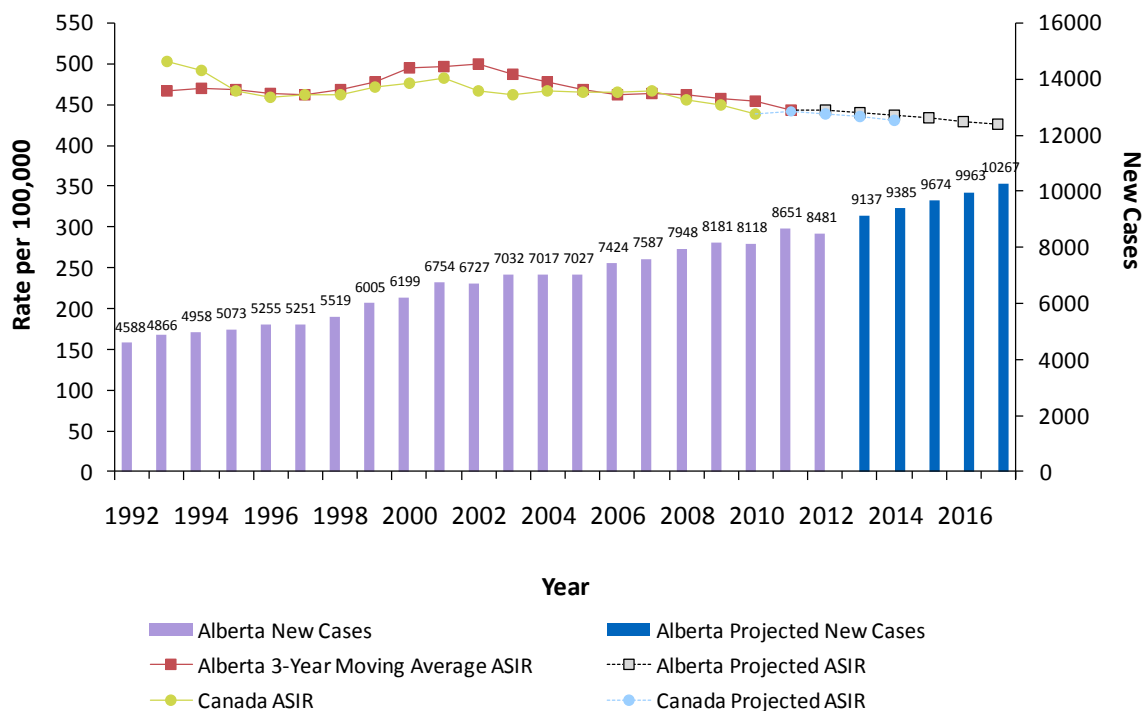
Prostate cancer ASIRs peaked in 2001. Over the time period 1992 to 1998, the prostate cancer ASIRs decreased by 0.8% annually and increased between 1998 and 2001 by 10.6% annually. However, from 2001 to 2005 the prostate cancer ASIRs decreased by 6.4% annually and by 1.7% annually from 2005 to 2012. It has been speculated that the peak in 2001 was the result of increased PSA screening test activity after the Federal Minister of Health, Allan Rock, was diagnosed with prostate cancer^{9, 10} (**Figure 2-13**).

Female breast cancer ASIRs did not change significantly between 1992 and 2012 (**Figure 2-13**).

Male lung cancer ASIRs decreased by 1.5% annually between 1992 and 2012. Female lung cancer ASIRs increased significantly by 1.9% annually between 1992 and 2006 then decreased between 2006 and 2012 by 0.4% annually (**Figure 2-13**).

Finally, colorectal cancer ASIRs increased significantly from 1992 to 2001 by 1.2% annually and decreased by 0.4% annually between 2001 and 2012 (**Figure 2-13**).

Figure 2-14: Actual and Projected Number of New Cases and Age-Standardized Incidence Rates (ASIRs)^{*†‡} for All Cancer, Males, Alberta, 1992-2017



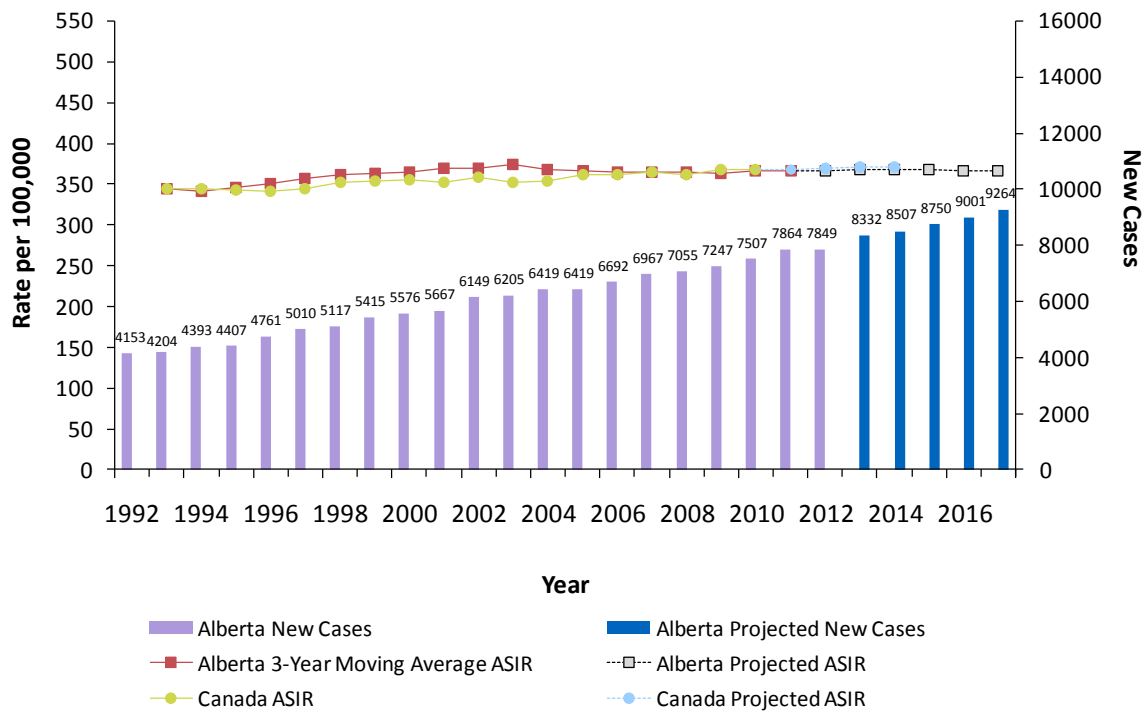
* Three-year moving average.
 † Standardized to 1991 Canadian population.
 ‡ Excludes basal and squamous skin cancers.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health; Canadian Cancer Society

In 2012, 8,481 cases of cancer were diagnosed in males in Alberta (**Figure 2-14**). ASIRs for cancer in males in Alberta were lower than ASIRs in Canada between 1992 and 1994 and higher than ASIRs in Canada over the period 1995-2005.

It is estimated that 10,250 cases of cancer will be diagnosed in males in Alberta in 2017.

Figure 2-15: Actual and Projected Number of New Cases and Age-Standardized Incidence Rates (ASIRs)^{*†‡} for All Cancer, Females, Alberta, 1992-2017



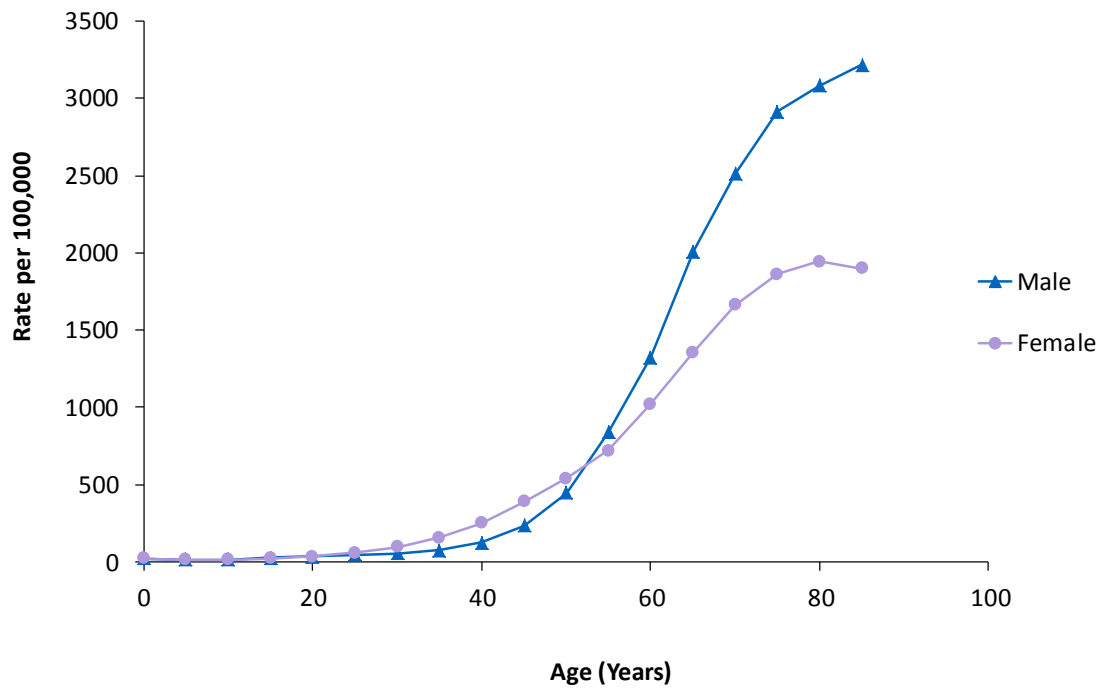
* Three-year moving average.
 † Standardized to 1991 Canadian population.
 ‡ Excludes basal and squamous skin cancers.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health; Canadian Cancer Society

In 2012, 7,848 cases of cancer were diagnosed in females in Alberta (**Figure 2-15**). ASIRs for cancer in females in Alberta were slightly higher than ASIRs for females in Canada between 1995 and 2008.

It is estimated that 9,250 cases of cancer will be diagnosed in females in Alberta in 2017.

Figure 2-16: Age-Specific Incidence Rates for All Cancers by Sex, Alberta, 2008-2012*

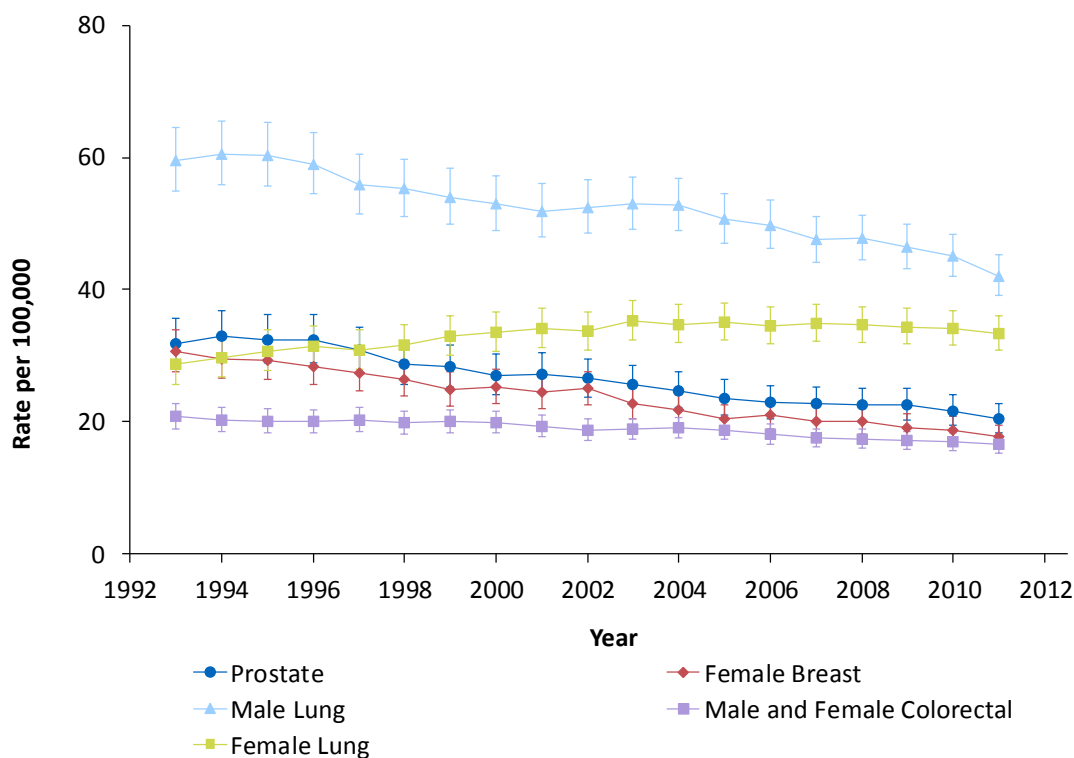


* Excludes basal and squamous skin cancers

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

Cancer rates increase with age (**Figure 2-16**). In females, cancer rates remain very low until about the age of 35 when they begin to increase. In males, cancer rates remain low until about the age of 40, at which point they begin increasing rapidly. After the age of about 50, the age-specific cancer rates are higher in males than females. In both males and females, the highest cancer incidence rates occur in the oldest age groups.

Figure 2-17: Age-Standardized Mortality Rates (ASMRs)^{††} for Lung Cancer (Male, Female), Colorectal Cancer (Both Sexes Combined), Prostate Cancer, and Breast Cancer (Female) with 95% Confidence Intervals (CI), Alberta, 1992-2012



* Three-year moving average.

† Standardized to 1991 Canadian population.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

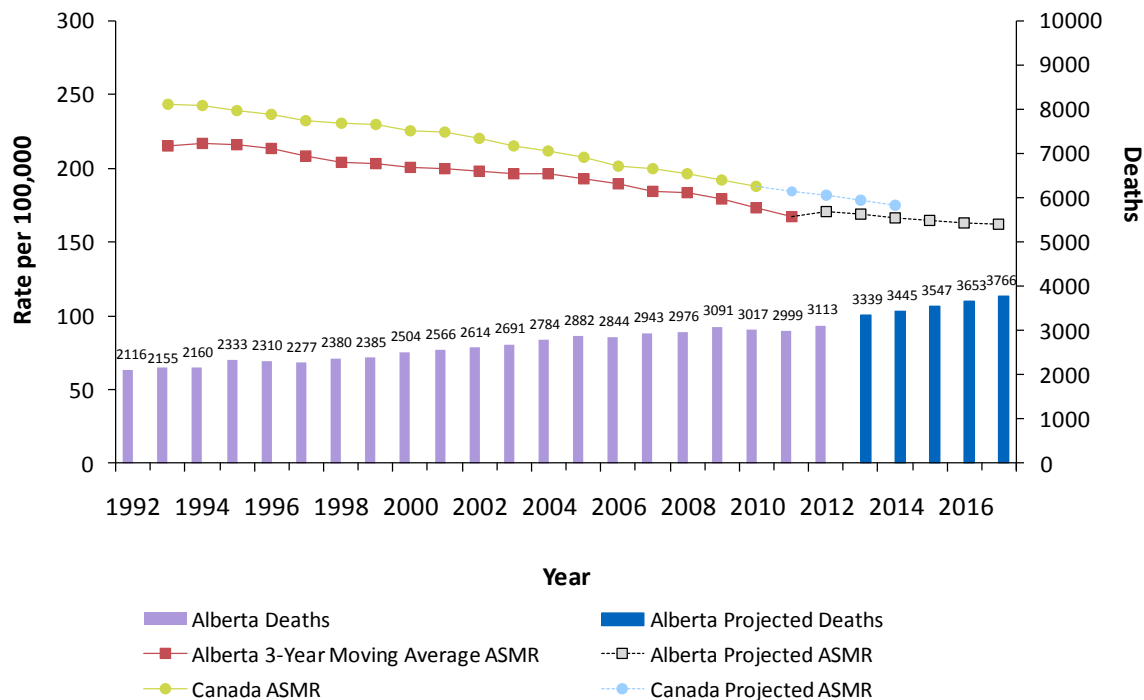
Between 1992 and 2012, prostate cancer ASMRs decreased significantly by 2.6% annually (**Figure 2-17**).

Breast cancer ASMRs in females decreased significantly between 1992 and 2012 by 3.0% annually (**Figure 2-17**).

Male lung cancer ASMRs decreased significantly between 1992 and 2009 by 1.5% annually and by 5.9% annually between 2009 and 2012 (**Figure 2-17**). Female lung cancer ASMRs increased significantly by 1.9% annually between 1992 and 2004. From 2004 to 2012, female lung cancer decreased by 0.8% annually.

Over the period 1992 to 2012, colorectal cancer ASMRs decreased by 1.3% annually (**Figure 2-17**).

Figure 2-18: Actual and Projected Number of Deaths and Age-Standardized Mortality Rates (ASMRs)[†] for All Cancers, Males, Alberta, 1992-2017



* Three-year moving average.

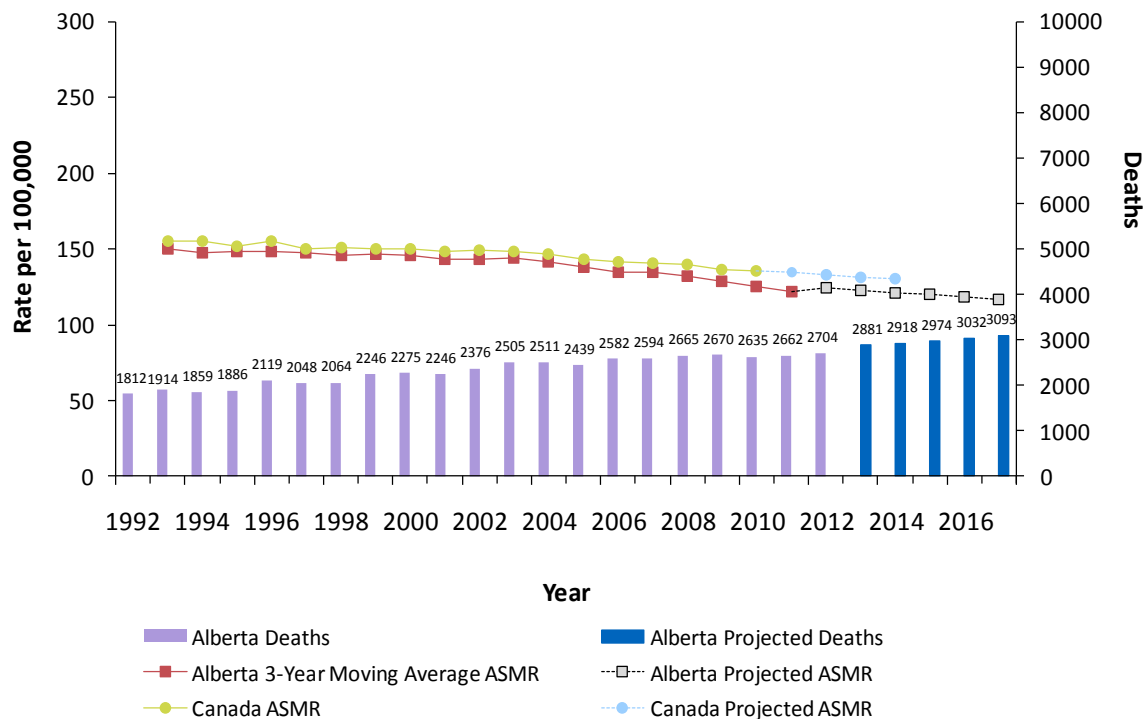
[†] Standardized to 1991 Canadian population.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health; Canadian Cancer Society

In 2012, 3,113 males died of cancer in Alberta (**Figure 2-18**). ASMRs for all cancers in males in Alberta were lower than ASMRs in Canada.

It is estimated that 3,750 males will die from cancer in Alberta in 2017.

Figure 2-19: Actual and Projected Number of Deaths and Age-Standardized Mortality Rates (ASMRs)[†] for All Cancers, Females, Alberta, 1992-2017



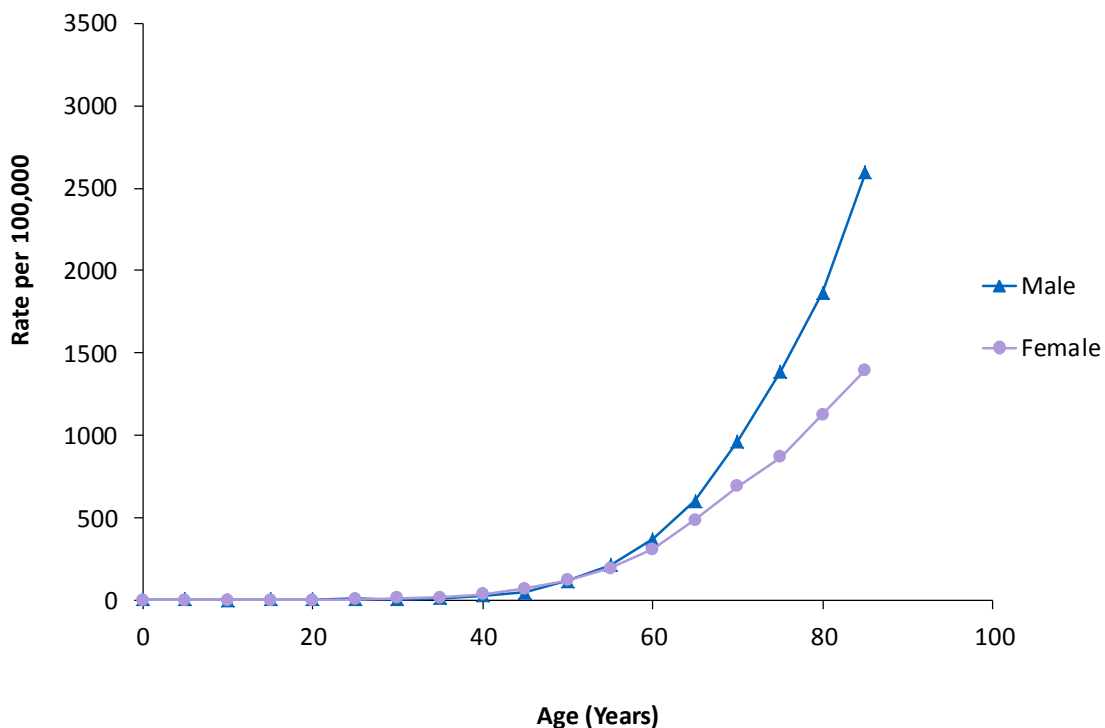
* Three-year moving average.
[†] Standardized to 1991 Canadian population.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health; Canadian Cancer Society

In 2012, 2,704 females died of cancer in Alberta (**Figure 2-19**). ASMRs for all cancers in females in Alberta were lower than ASMRs in Canada.

It is estimated that 3,100 females will die from cancer in Alberta in 2017.

Figure 2-20: Age-Specific Mortality Rates for All Cancers by Sex, Alberta, 2008-2012



Data Source: Alberta Cancer Registry, Alberta Health Services, Alberta Health

For both males and females, cancer mortality rates remain very low until about the age of 40, at which point they begin increasing rapidly (**Figure 2-20**). After the age of 55, females have lower cancer mortality rates than males. 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 treatment and control programs.

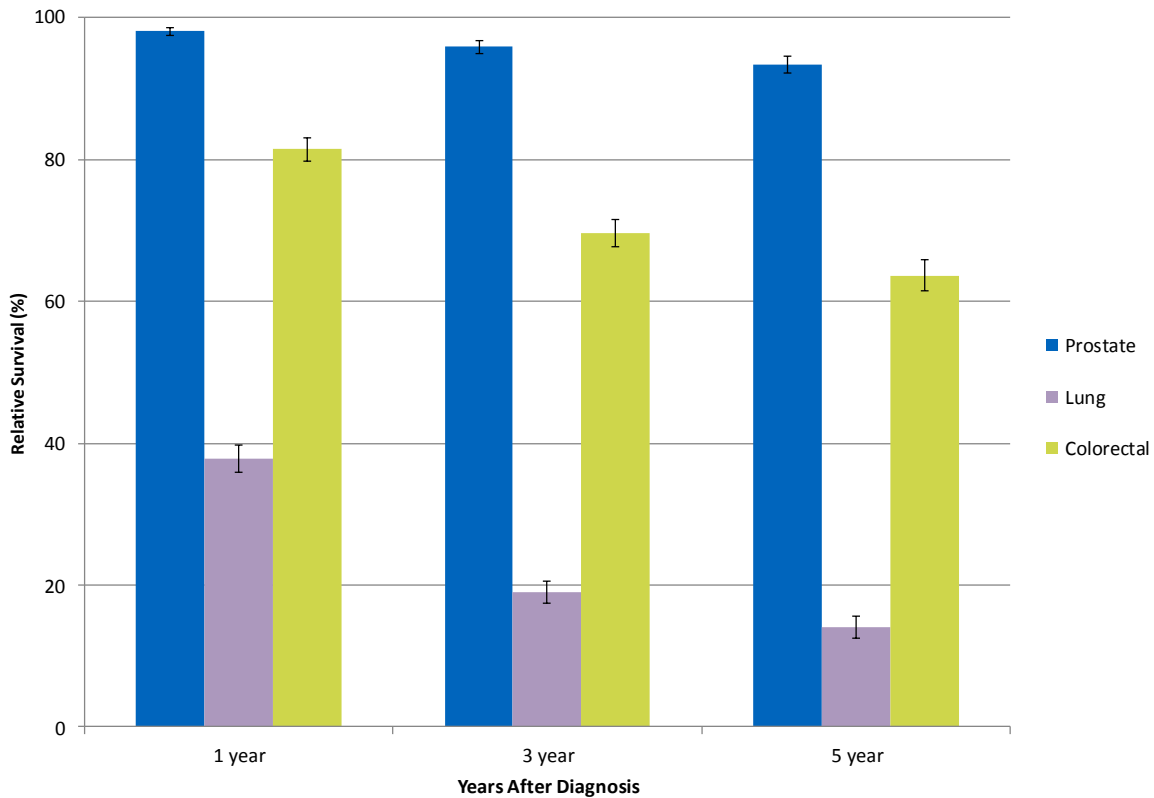
Survival depends on several factors including the cancer type (most importantly site, stage and morphology at diagnosis), sex, age at diagnosis, health status and available treatments for that cancer. While **relative survival ratios** (RSRs) give a general expectation of survival over the whole province, these ratios may not apply to individual cases. Individual survival outcomes depend on the stage at 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 year¹¹. For common cancer sites, RSRs are standardized by the age structure in the standard population (i.e. all persons who were diagnosed with that cancer in Canada between 1992 and 2001) to permit RSRs to be compared over time, independent of differences in age distribution of cancer cases. For cancer sites with fewer case counts which do not permit age standardizing or those which are stratified by incidence stage, the crude RSRs are provided.

RSRs are estimated by the **cohort method**¹¹ when complete follow-up data (e.g., at least five years of follow-up to estimate five-year rate) after diagnosis are available. For recently diagnosed cases, whose complete follow-up data are not available, the up-to-date estimates are computed using the **period method**¹². However, comparison between cohort and period RSRs should be interpreted with caution because of the two different methods used to derive the respective ratios.

The 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 2-21: Age-Standardized One, Three and Five-Year Relative Survival Ratios and 95% Confidence Intervals (CI) for Prostate, Lung and Colorectal Cancers, Males, Alberta, 2010-2012*

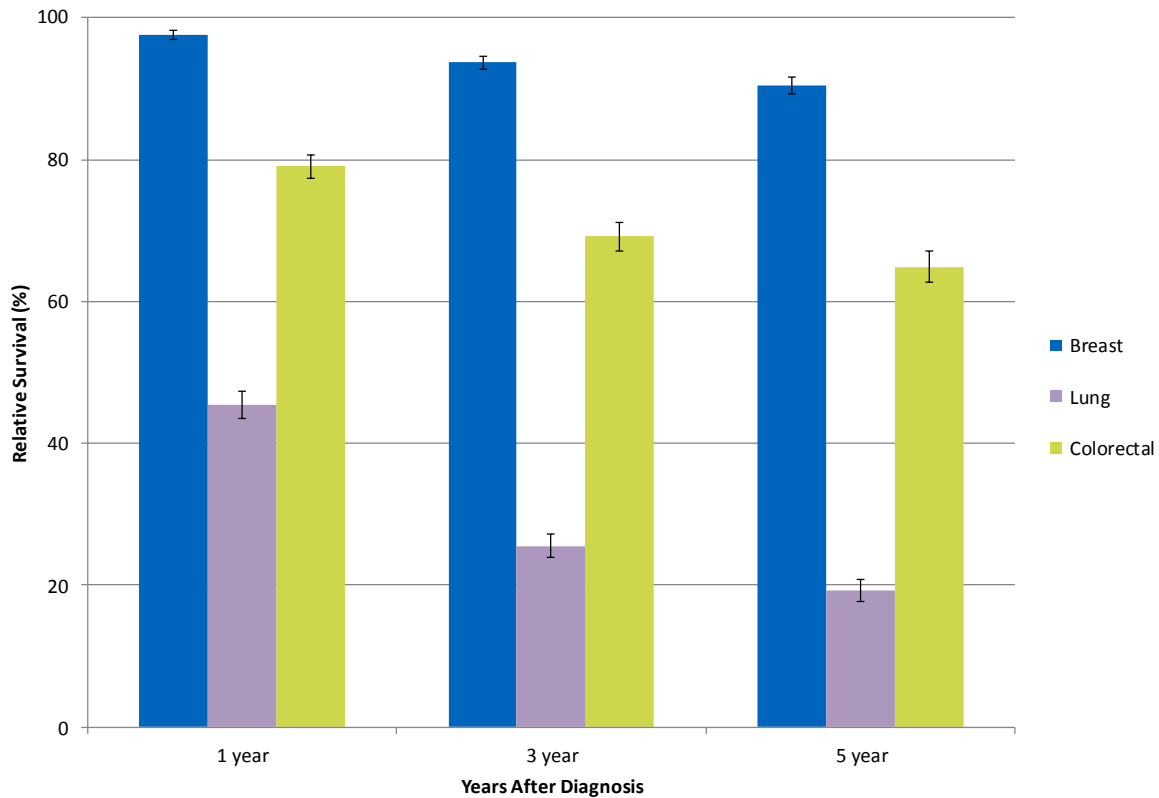


* Ratios calculated by period method where complete follow-up data are not available

Data Source: Alberta Cancer Registry, Alberta Health Services; Statistics Canada

The five-year relative survival ratios for males diagnosed with prostate, lung and colorectal cancers from 2010 to 2012 are 93%, 14% and 64%, respectively (**Figure 2-21**). This means that out of all males diagnosed with prostate cancer between 2010 and 2012, around 93% are as likely to be alive five years after diagnosis as males from the general Alberta population of the same age.

Figure 2-22: Age-Standardized One, Three and Five-Year Relative Survival Ratios and 95% Confidence Intervals (CI) for Breast, Lung and Colorectal Cancers, Females, Alberta, 2010-2012*



* Ratios calculated by period method where complete follow-up data are not available

Data Source: Alberta Cancer Registry, Alberta Health Services; Statistics Canada

The five-year relative survival ratios for females diagnosed with breast, lung and colorectal cancers are 90%, 19% and 65%, respectively (**Figure 2-22**). This means that females diagnosed with breast cancer in 2010 to 2012 are about 90% as likely to be alive for the following five years as women from the general population of the same age. Females have a better five-year relative survival ratio (19%) for lung cancer than males (14%). Survival in females diagnosed with lung cancer is still very low.

Table 2-7: Age-Standardized One-, Three- and Five-Year Relative Survival Ratios (%) and 95% Confidence Intervals (CIs) for Selected Cancers Diagnosed Between 2010 and 2012 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
Bladder	90 (88,92)	87 (83,90)	82 (79,84)	79 (74,83)	77 (74,80)	79 (74,84)
Body of Uterus	---	93 (91,95)	---	86 (84,88)	---	83 (80,85)
Breast	---	98 (97,98)	---	94 (93,94)	---	90 (89,91)
Colorectal	81 (80,83)	79 (77,81)	70 (68,72)	69 (67,71)	64 (61,66)	65 (63,67)
Kidney	79 (76,82)	82 (78,85)	71 (67,74)	75 (71,79)	67 (63,70)	71 (67,75)
Leukemia	81 (78,84)	78 (74,82)	76 (72,79)	73 (69,77)	71 (67,75)	70 (66,75)
Lung	38 (36,40)	45 (43,47)	19 (17,21)	25 (24,27)	14 (12,16)	19 (18,21)
Melanoma	95 (93,96)	98 (97,99)	89 (86,92)	97 (95,99)	87 (83,89)	95 (93,98)
Non-Hodgkin Lymphoma	83 (80,85)	87 (85,90)	75 (72,77)	82 (79,84)	70 (67,74)	76 (73,79)
Prostate	98 (97,99)	---	96 (95,97)	---	93 (92,95)	---

Data Source: Alberta Cancer Registry, Alberta Health Services; Statistics Canada

Survival ratios vary by type of cancers and sex (**Table 2-7**). Of the 10 most common cancers, lung cancer patients have the lowest survival ratio whereas those diagnosed with prostate and breast cancers have very high survival ratios. Survival is about the same in males and females for colorectal cancer. Survival is greater in females than males for lung, kidney, melanoma of the skin and non-Hodgkin lymphoma. Males have slightly greater survival than females for leukemia.

Table 2-8: Crude One-, Two- and Three-Year Relative Survival Ratios[†] (%) for Colorectal, Lung, Breast and Prostate Cancers by Stage and Sex, Alberta, 2009-2012.

Cancer Type*	Stage [‡]	Number of Cases		One-year Survival Rate (95% CI)		Two-year Survival Rate (95% CI)		Three-year Survival Rate (95% CI)	
		Male	Female	Male	Female	Male	Female	Male	Female
Colorectal	I	667	507	98 (96, 100)	98 (96, 99)	98 (95, 100)	97 (94, 99)	98 (95, 100)	97 (94, 100)
	II	804	613	95 (93, 97)	95 (93, 97)	95 (92, 97)	93 (90, 96)	94 (90, 96)	93 (89, 96)
	III	990	730	94 (92, 96)	92 (89, 94)	89 (87, 91)	86 (83, 89)	83 (80, 86)	81 (77, 84)
	IV	821	615	48 (45, 52)	44 (40, 48)	30 (27, 33)	27 (24, 31)	19 (17, 22)	19 (16, 23)
Lung	I	398	538	87 (83, 90)	92 (90, 95)	75 (70, 79)	84 (80, 87)	64 (58, 69)	77 (73, 81)
	II	207	198	81 (74, 86)	69 (62, 76)	56 (48, 63)	59 (51, 67)	45 (36, 54)	50 (41, 59)
	III	588	608	48 (44, 52)	56 (52, 60)	26 (22, 29)	36 (33, 40)	16 (13, 19)	26 (23, 30)
	IV	1852	1607	17 (16, 19)	21 (19, 23)	7 (6, 8)	10 (8, 11)	5 (4, 6)	5 (4, 7)
Breast	I	---	3523	---	100 (100, 100)	---	100 (100, 100)	---	100 (100, 100)
	II	---	2664	---	100 (100, 100)	---	99 (98, 100)	---	98 (97, 99)
	III	---	1010	---	97 (95, 98)	---	91 (89, 93)	---	86 (83, 88)
	IV	---	394	---	68 (63, 72)	---	51 (45, 56)	---	39 (33, 44)
Prostate	I	1403	---	100 (100, 100)	---	100 (100, 100)	---	100 (100, 100)	---
	II	4847	---	100 (100, 100)	---	100 (100, 100)	---	100 (100, 100)	---
	III	895	---	100 (100, 100)	---	100 (100, 100)	---	100 (100, 100)	---
	IV	816	---	82 (79, 85)	---	64 (60, 68)	---	52 (47, 56)	---

* Inclusion criteria: First-primary invasive cancer and age 15 to 99 years at diagnosis.

[†] Ratios calculated by period method, where complete follow-up data are not available

[‡] The staging method changed in 2010 (from AJCC 6 to AJCC 7), so caution should be used when comparing to data from previous reports.

Data Source: Alberta Cancer Registry, Alberta Health Services; Statistics Canada

Cancer **stage** (extent or severity of cancer) at diagnosis affects survival. Those diagnosed at an earlier stage have better survival than those diagnosed at a later stage.

For colorectal cancers diagnosed between 2009 and 2012, there was little difference in the proportion of cases in each stage. The three-year relative survival ratios for colorectal cancer at stage I and II are estimated above 93%, which are significantly higher than those diagnosed with colorectal cancer at stage IV (male 19% and female 19%) (**Table 2-8**). There is little difference between males and females.

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

The majority of females were diagnosed with early stage breast cancer (Stage I or II) and 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 (39%) than that for those at stage I and II (**Table 2-8**).

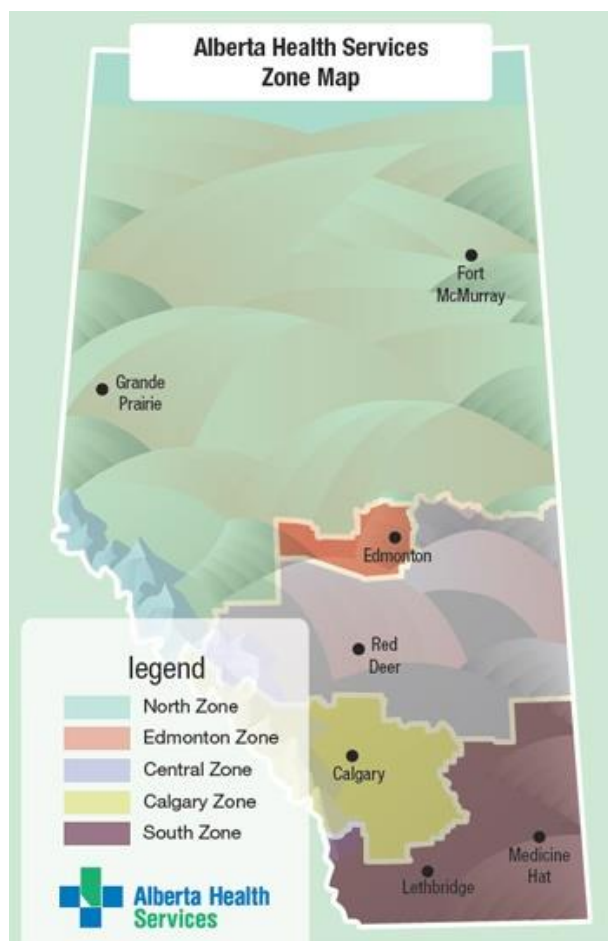
In 2009 to 2012, the majority of prostate cancer cases were diagnosed at stage II and all males who were diagnosed at stage I, II and III were alive three years after diagnosis. Even though the three-year relative survival ratio for males diagnosed with prostate cancer at stage IV (52%) is lower than that for those diagnosed at an earlier stage, it is higher than the survival ratios for other major cancers.

Geographic Variation

The geographic variation section illustrates how the observed rates in each health zone compare with the provincial average. It also compares each zone to the rest of Alberta (excluding the zone of interest). The age standardized incidence and mortality rates for each zone and the respective “rest of Alberta” groupings are presented with their corresponding 95% *confidence intervals*¹³. Any observed differences in rates may be due to several factors such as regional differences in:

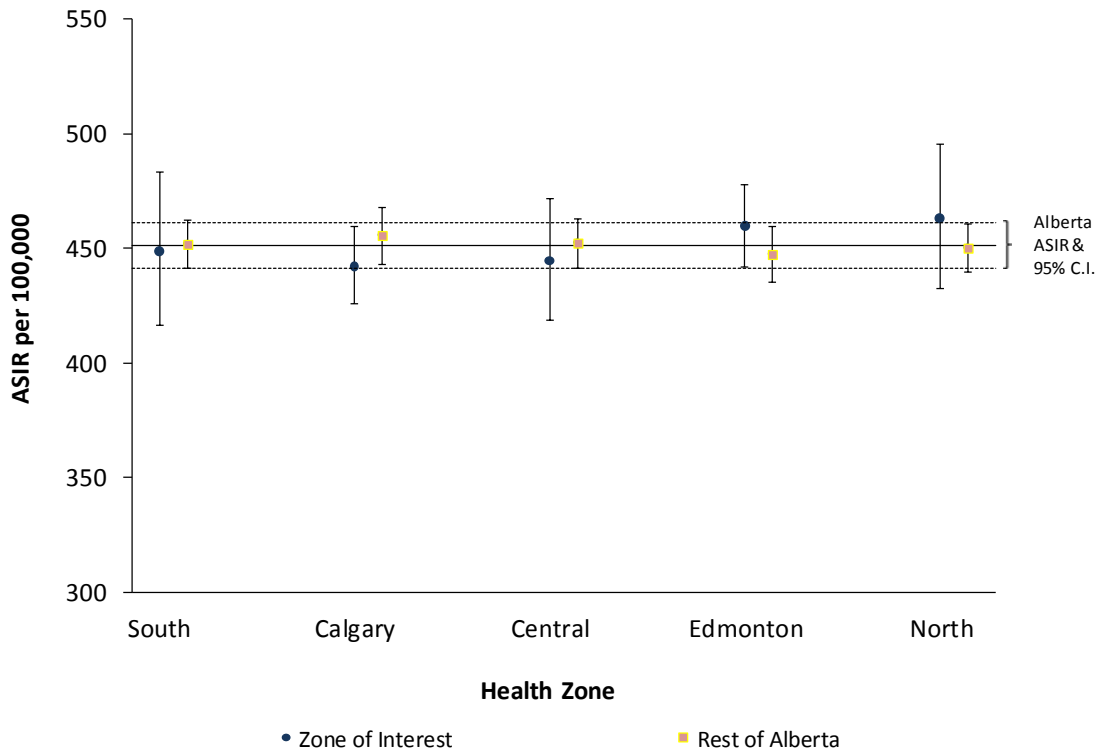
- individual risk factors
- prevention efforts
- cancer screening
- diagnostic activity
- access to cancer care.¹⁴

Figure 2-23: Five Health Zones in Alberta, 2012



Source: Alberta Health Services

Figure 2-24: Age-Standardized Incidence Rates (ASIRs)[†] and 95% Confidence Intervals (CI) by Zone for All Cancers, Males, Alberta, 2008-2012

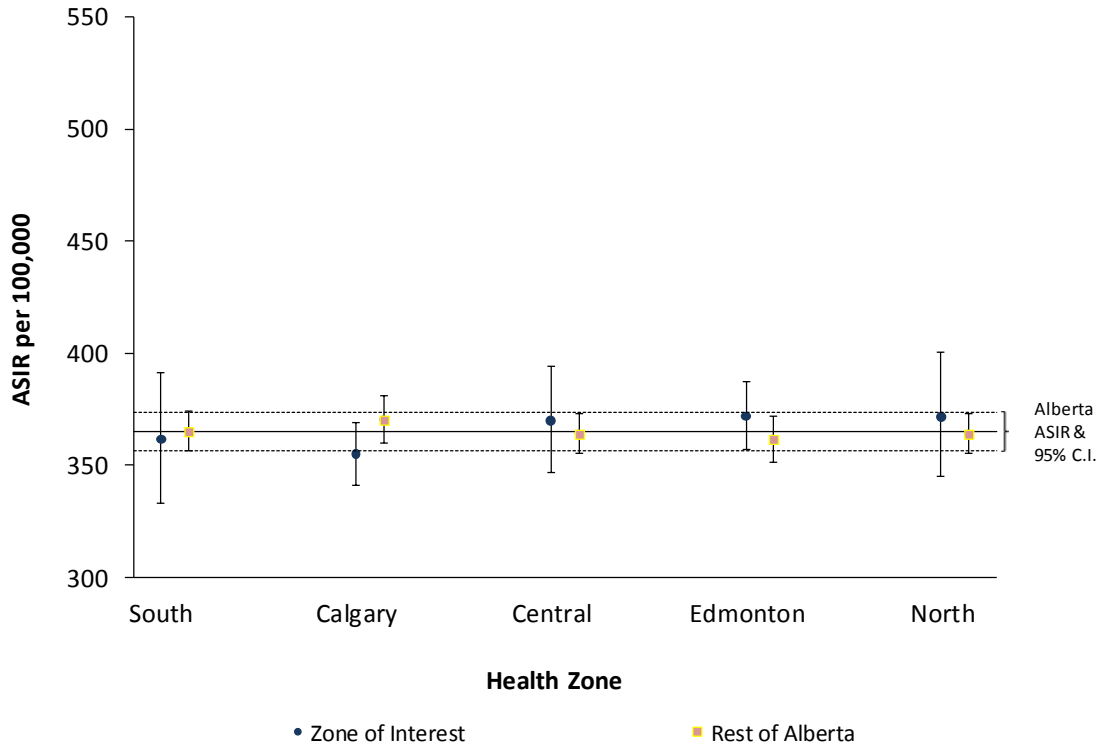


[†] Standardized to 1991 Canadian population for age-specific rates in 2008-2012.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

There is no evidence that male ASIRs in the zones are higher or lower than the provincial average or the “rest of Alberta” (excluding the zone of interest) (**Figure 2-24**).

Figure 2-25: Age-Standardized Incidence Rates (ASIRs)[†] and 95% Confidence Intervals (CI) by Zone for All Cancers, Females, Alberta, 2008-2012

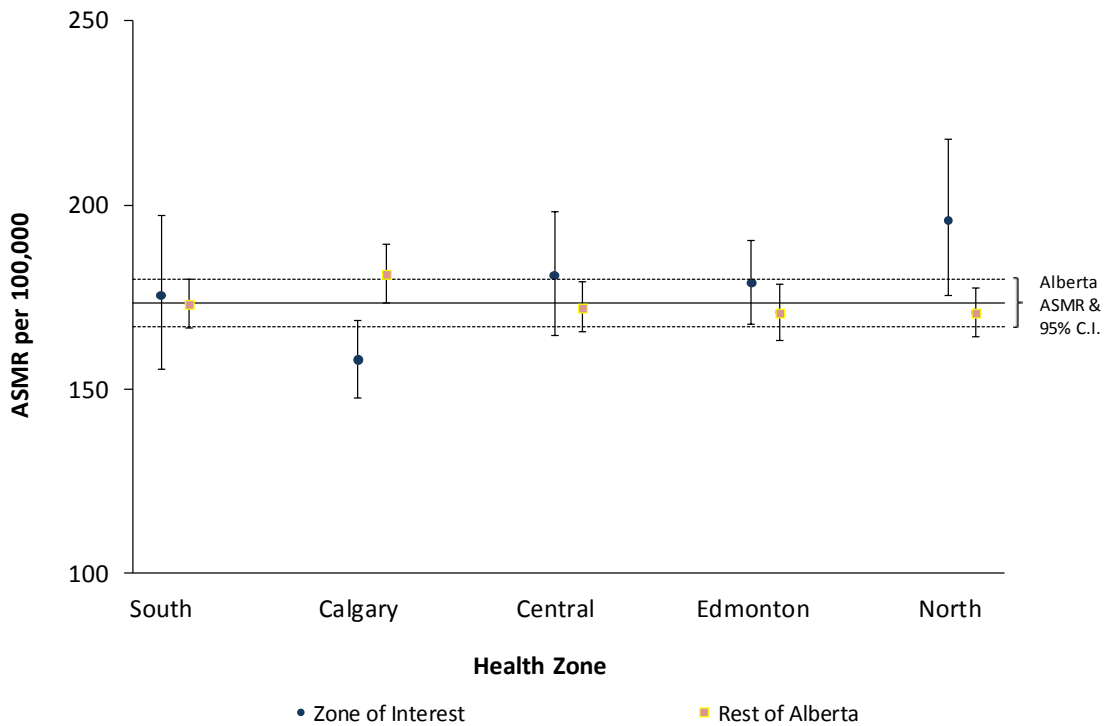


[†] Standardized to 1991 Canadian population for age-specific rates in 2008-2012.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

There is no evidence that female ASIRs in the zones are higher or lower than the provincial average or the “rest of Alberta” (excluding the zone of interest) (**Figure 2-25**).

Figure 2-26: Age-Standardized Mortality Rates (ASMRs)[†] and 95% Confidence Intervals (CI) by Zone for All Cancers, Males, Alberta, 2008-2012

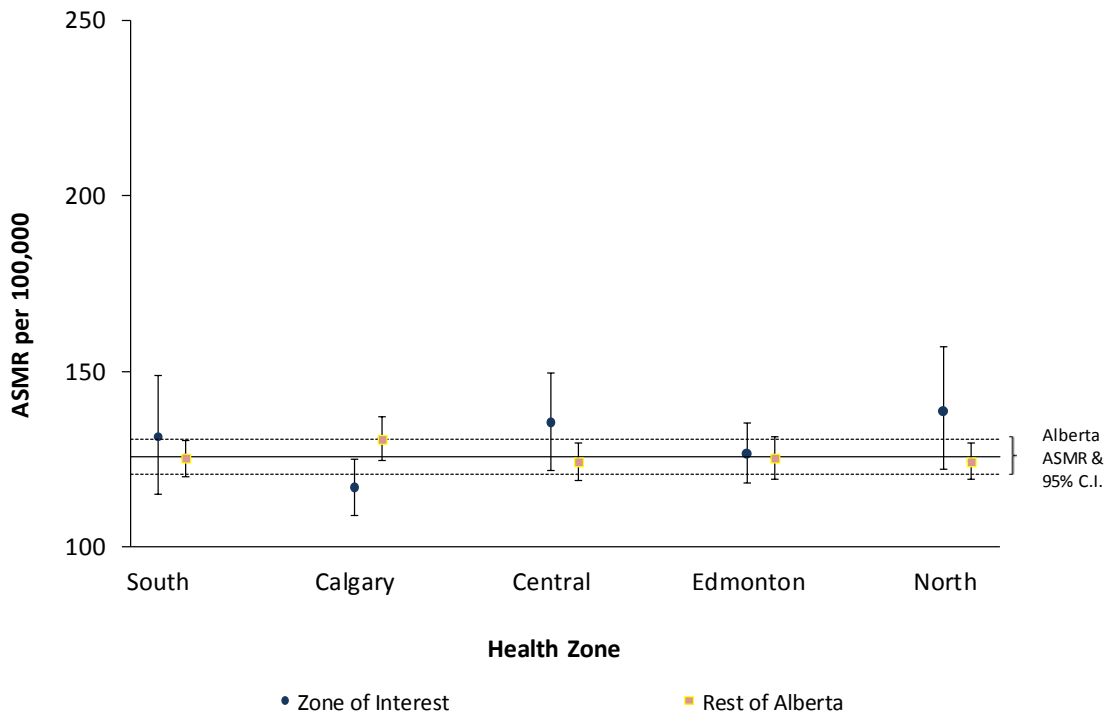


[†] Standardized to 1991 Canadian population for age-specific rates in 2008-2012.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

There is no evidence that male ASMRs in the zones are higher or lower than the provincial average; however, the ASMR in Calgary Zone is significantly lower than that in the “rest of Alberta” (excluding the zone of interest) (**Figure 2-26**).

Figure 2-27: Age-Standardized Mortality Rates (ASMRs)[†] and 95% Confidence Intervals (CI) by Zone for All Cancers, Females, Alberta, 2008-2012



[†] Standardized to 1991 Canadian population for age-specific rates in 2008-2012.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

There is no evidence that female ASMRs in the zones are higher or lower than the provincial average or the “rest of Alberta” (excluding the zone of interest) (**Figure 2-27**).

Further Information

Further information is available on a separate document, the [Appendix](#):

Appendix 1: Glossary of Terms

Appendix 2: Cancer Definitions

Appendix 3: Data Notes

References

1. Surveillance and Reporting, C-MORE, Cancer Control, Alberta Health Services. Report on Cancer Statistics in Alberta 2010. Available from: <http://www.albertahealthservices.ca/poph/hi-poph-surv-cancer-cancer-in-alberta-2010.pdf>
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