Cancer in Alberta

December 2012

2010 Report on Cancer Statistics in Alberta

Acknowledgements

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Purpose of the Report

Cancer Surveillance is a specialized team within Alberta Health Services, Cancer Care, that actively contributes to Alberta Health Service's goal of creating the best-performing publicly funded health system in Canada. This is accomplished 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 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 July 31, 2012.

Incidence *rates* presented in this document exclude basal and squamous skin cancer cases. 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

- In 2010, there were **15,232** new cancer cases diagnosed in Alberta and **5,526** Albertans died from the disease.
- Approximately **18,500** cases of cancer are expected to be diagnosed in 2015.
- Cancer accounted for **27%** of deaths in the province for all ages in 2010; the second leading cause of death in Alberta after deaths from circulatory system diseases (**31%**). It accounted for **37%** of deaths in the 35-64 age group which is more than circulatory system, respiratory system and digestive system diseases combined.
- In 2010, cancer was the second leading contributor, after injury, to potential years of life lost (PYLL) for men and women, representing **24%** of the PYLL resulting from all causes of death in Alberta.
- Approximately **1 in 2** Albertans will develop cancer in their lifetime and approximately **1 in 4** people born in Alberta will die from cancer.
- As of December 31, 2010, approximately **120,400** Albertans were alive who had previously been diagnosed with cancer.
- The most commonly diagnosed cancers in Alberta in 2010 were breast, prostrate, colorectal and lung. These four cancers accounted for **53%** of new cancer cases and about half of cancer deaths.

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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 2010 there were 15,232 cancer cases diagnosed in Alberta and 5,526 Albertans died from the disease. According to the most recent statistics available from the Government of Alberta, 27% of all deaths in Alberta in 2010 were attributable to cancer.[2] For those 35-64 years of age, 37% 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 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 Selected Cancer Sites by Zones).

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.

Comparing population estimates in 1990 and 2010 with projections for 2030[3] shows that the population of Alberta is aging (*Figure 2-1*).

Population Size

The population of Alberta has increased 46% over the past 20 years from 2.6 million in 1990 to 3.8 million in 2010. This growth is expected to continue over the next two decades and by 2030, the population is expected to increase an additional 35% to approximately 5 million.[3]

Population Structure

The percentage of the population aged 65 and over has increased from 9% in 1990 to 11% in 2010. This older adult age group is expected to increase to 17% of the total population in 2030. The proportion of the Alberta population aged 35-64 has increased in the last twenty years; in 1990, 35-64 year olds made up 33% of the population and in 2010 they made up 40% 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 2-1: **Historical (1990), Actual (2010) and Projected (2030) Population Structure by Age Group and Sex, Alberta**
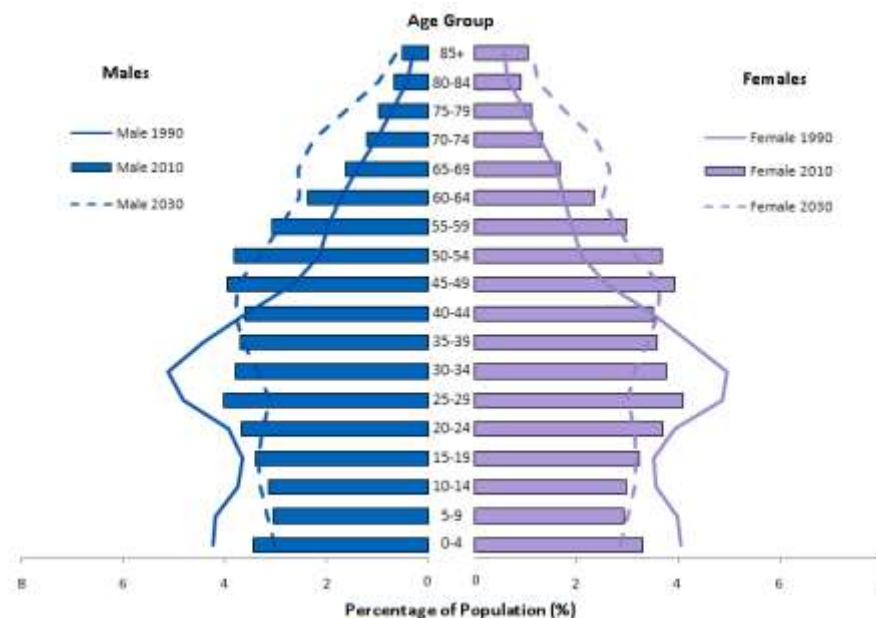
Data Source: Alberta Health

Table 2-1: **Population, Mean Age, Median Age and Interquartile Age Range across Health Zones, Alberta, 2010**

Zone	Population	Mean Age	Median Age	25th Percentile Age	75th Percentile Age
South	289, 727	37	35	18	54
Calgary	1,395,391	36	36	20	52
Central	454,335	37	37	18	54
Edmonton	1,178,306	37	36	20	53
North	444,476	34	33	17	50
Alberta*	3,763,028	37	36	19	52

* 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

In 1990, the **_median age_** of the population was 30 years. The median age of the population rose to 36 years in 2010 (*Table 2-1*) and is expected to increase to 41[4] years by 2030.

In 2010 the North Zone had the youngest age distribution with a median age of 33 years and 25% of the population less than 17 years of age, and 25% of the population greater than 50 years of age.

Central (37 years), Calgary and Edmonton zones (36 years each) had the highest median age with 25% of the population less than 20 years for Calgary and Edmonton zones and 18 years for Central zone. For Calgary and Edmonton zones 25% of the population was greater than 53 years and 52 years respectively.

The South Zone had a median age 35 years but a wider distribution of ages with 25% of the population less than 18 years and 25% of the population greater than 54 years. This compares to 25% of the total population being less than 19 years and 25% of the total population being greater than 52 years (*Table 2-1*).

Trends in New Cases Attributed to Aging Population, Population Growth and Cancer Rate

Figure 2-2: **Trends in New Cases Attributed to Aging Population, Population Growth and Cancer Rate, Both Sexes Combined, Alberta, 1990-2015**
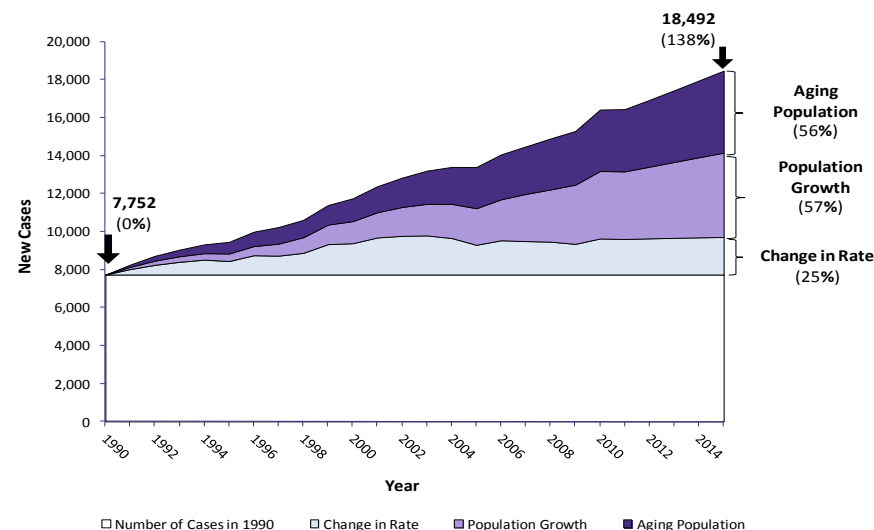
Data Sources: Alberta Cancer Registry, Alberta Health

The increase in the number of new cases of cancer over the last two decades is mainly attributable to changes in demography (aging of the population and population growth), and less to the increases in the cancer incidence rate (*Figure 2-2*).

The horizontal black line indicating 7,752 new cancer cases in *Figure 2-2* represents the number of cancer cases that occurred in 1990. In 2015, approximately 18,500 new cancer cases are projected to occur, accounting for a 138% increase in cases from 1990.

The line at the top of the dark purple-shaded area of the graph (*Figure 2-2*) represents the number of new cases that actually occurred between 1990 and 2010, projected to 2015. 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 1990. This will account for approximately 25% in the total new cancer cases in 2015.
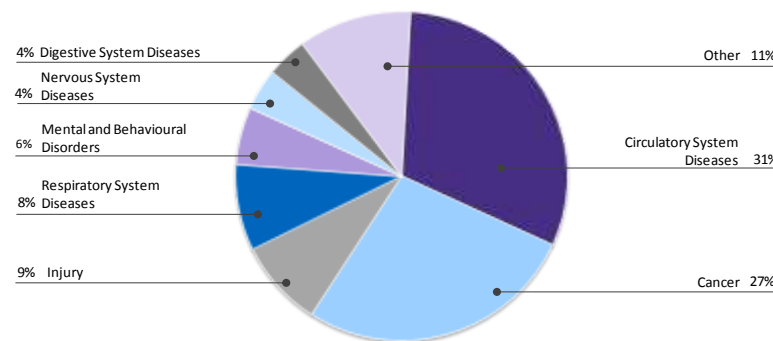
The light purple shaded area (middle) represents the number of new cases that would have occurred each year if the population alone had grown larger but the population age distribution had remained the same as in 1990. This will account for approximately 57% in the total new cancer cases in 2015.

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 56% in the total new cancer cases in 2015.

Causes of Death in Alberta

Cancer is one of the leading causes of death in Alberta; over a quarter of the deaths among residents of Alberta in 2010 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 Combined, Alberta, 2010**

4% Digestive System Diseases

4% Nervous System Diseases

6% Mental and Behavioural Disorders

8% Respiratory System Diseases

9% Injury

Other 11%

Circulatory System Diseases 31%

Cancer 27%

[‡]Proportions may not add up to 100% due to rounding.
Data Source: Surveillance and Health Status Assessment with data obtained from Alberta Vital Statistics, Service Alberta.[2]

According to the most recent statistics available from Service Alberta[2] (*Figure 2-3*), 27% of deaths in Alberta for all ages in 2010 were attributable to cancer, 31% were attributable to circulatory system diseases and 9% to injury. All other causes combined accounted for the remaining 33% of all deaths.

Figure 2-4: **Leading Causes of Death[‡], Ages 35-64, Both Sexes Combined, Alberta, 2010**

3% Nervous System Diseases

4% Respiratory Sytem Diseases

5% Digestive System Diseases

19% Injury

Mental & Behavioural Disorders 3%

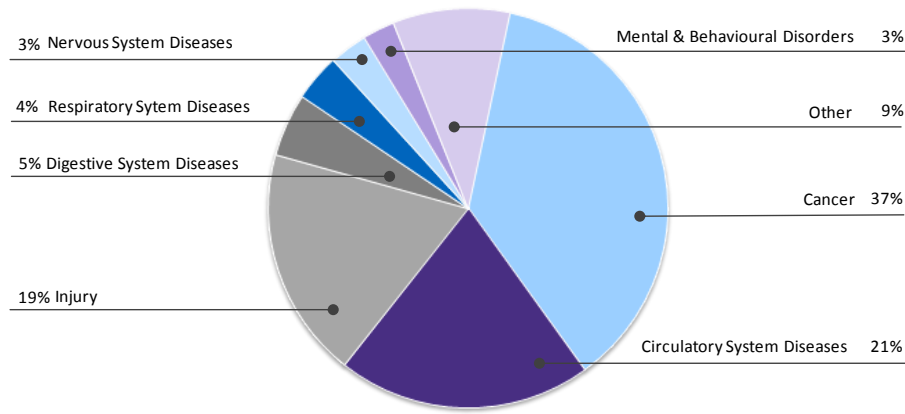Other 9%

Cancer 37%

Circulatory System Diseases 21%

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

Data Source: Surveillance and Health Status Assessment with data obtained from Alberta Vital Statistics, Service Alberta.[2]
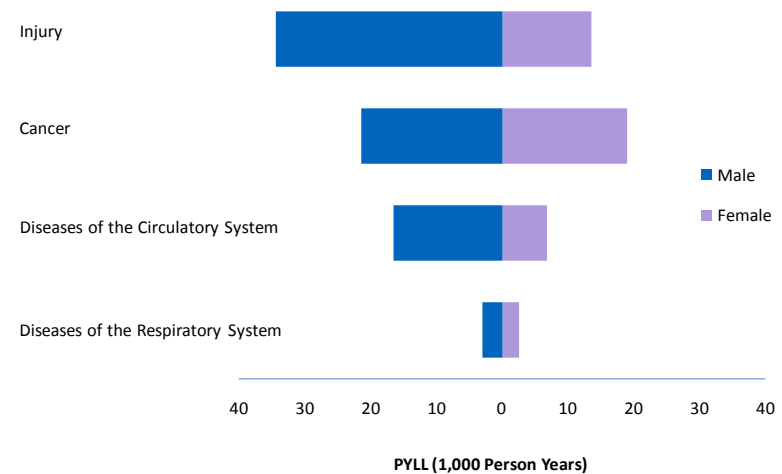
Although cancer is associated with aging, it is important to note that, for the 35–64 age group (**Figure 2-4**) cancer is the leading cause of death, accounting for 37% of all deaths, which is more than deaths from circulatory system disease, respiratory system diseases and digestive system diseases 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 expectancy.

Alberta Health[5] calculates PYLL by taking the mid-point age in each age group, subtracting from 75 (the overall Canadian 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 potential years of life lost (PYLL) for the top four causes of premature death in Alberta in 2010 are ranked in order of total PYLL for both males and females combined (**Figure 2-5**).

Figure 2-5: **Selected Causes of Potential Years of Life Lost (PYLL)[5] before Age 75, by Sex, Alberta, 2010, as Estimated by Alberta Health**

Injury

Cancer

Diseases of the Circulatory System

Diseases of the Respiratory System

■ Male
■ Female

40 30 20 10 0 10 20 30 40

PYLL (1,000 Person Years)

Data Sources: Alberta Cancer Registry, Alberta Health

The potential years of life lost (PYLL) for the top four causes of premature death in Alberta in 2010 are ranked in order of total PYLL for both males and females combined (*Figure 2-5*).

Overall, injury was the leading contributor to PYLL, representing about 29% of the total PYLL in the province. Cancer was the second leading contributor to PYLL for males and females, representing about 24% of the PYLL resulting from all causes of death in Alberta. Diseases of the circulatory system and diseases of the respiratory system contributed 14% and 3% respectively of the total PYLL from all causes of death.

Cancer Surveillance calculates PYLL due to cancer by multiplying the number of deaths in each age group and the absolute difference between the mid-point age of an age group and the age-specific life expectancy. The age-specific life expectancy is calculated by determining the age to which an individual would have been expected to live had they not died from cancer.

Since cancer tends to affect people in older age-groups, this method accounts for deaths due to cancer that occur even after the 75-year cutoff that Alberta Health uses. Therefore, the estimated PYLL due to cancer in *Table 2-2* is larger than that estimated by Alberta Health (*Figure 2-5*).

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 (21,160 years).

Even though pancreatic cancer contributed to only 2% of the total cancer cases diagnosed in Alberta in 2010, it was the fifth highest contributor to PYLL (4,261) among all cancer sites. On the other hand, prostate cancer is the most commonly diagnosed cancer yet it was sixth on the list of PYLL (2,961) attributable to cancer.
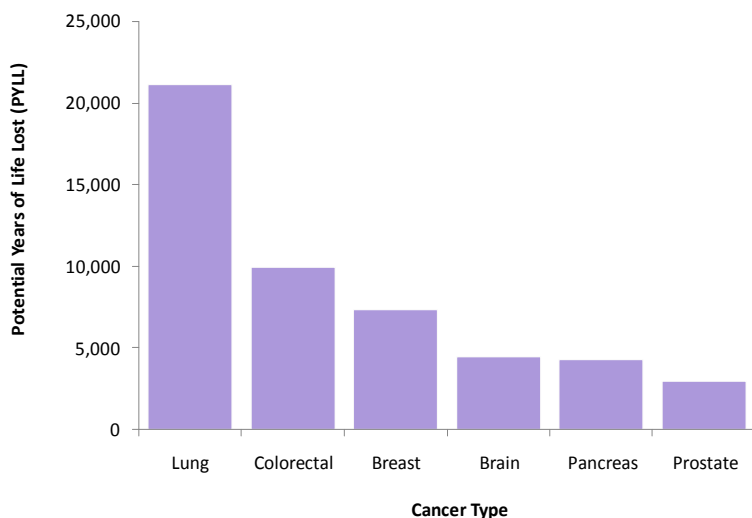
Table 2-2: **Potential Years of Life Lost by Cancer Site and Sex, Alberta, 2010, as Estimated by Cancer Surveillance**

Cancer Type	Total		Male		Female	
	Years	**%**	**Years**	**%**	**Years**	**%**
All Cancers	83,930	**100.0**	41,312	**100.0**	42,618	**100.0**
Lung and bronchus	21,160	**25.2**	10,535	**25.5**	10,625	**24.9**
Colorectal	9,957	**11.9**	4,981	**12.1**	4,976	**11.7**
Breast	7,331	**8.7**	41	**0.1**	7,290	**17.1**
Brain	4,462	**5.3**	2,803	**6.8**	1,659	**3.9**
Pancreas	4,261	**5.1**	2,072	**5.0**	2,189	**5.1**
Prostate	2,961	**3.5**	2,961	**7.2**	0	**0.0**
Leukemia	2,651	**3.2**	1,460	**3.5**	1,191	**2.8**
Non-Hodgkin lymphoma	2,623	**3.1**	1,616	**3.9**	1,007	**2.4**
Stomach	2,580	**3.1**	1,691	**4.1**	889	**2.1**
Ovary	2,243	**2.7**	0	**0.0**	2,243	**5.3**
Esophagus	2,201	**2.6**	1,624	**3.9**	577	**1.4**
Kidney and renal pelvis	1,814	**2.2**	1,142	**2.8**	672	**1.6**
Bladder (including *in situ*)	1,657	**2.0**	1,159	**2.8**	498	**1.2**
Oral	1,613	**1.9**	995	**2.4**	618	**1.5**
Liver	1,587	**1.9**	1,290	**3.1**	297	**0.7**
Melanoma of the skin	1,331	**1.6**	982	**2.4**	349	**0.8**
Body of uterus	1,071	**1.3**	0	**0.0**	1,071	**2.5**
Multiple myeloma	1,031	**1.2**	642	**1.6**	389	**0.9**
Cervix uteri	834	**1.0**	0	**0.0**	834	**2.0**
Hodgkin's disease	446	**0.5**	193	**0.5**	253	**0.6**
Larynx	411	**0.5**	354	**0.9**	57	**0.1**
Thyroid	138	**0.2**	27	**0.1**	111	**0.3**
Testis	125	**0.1**	125	**0.3**	0	**0.0**
All Other Cancers	9,442	**11.2**	4,619	**11.2**	4,823	**11.3**

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

Figure 2-6: **Potential Years of Life Lost by Top Six Cancer Sites, Both Sexes Combined, Alberta, 2010**


Breast cancer - female only

Data Source: Alberta Cancer Registry

The top six cancer sites in terms of potential years of life lost (PYLL) for both sexes in decreasing order are lung, colorectal, breast, brain, pancreas and prostate (*Figure 2-6*).   Deaths due to all cancers resulted in 83,930 potential years of life lost in Alberta in 2010 (*Table 2-2*).   More years of life are lost due to cancers that are more common, have an earlier age of onset and/or a more rapid progression to mortality.

The PYLL due to the six types of cancer shown in *Figure 2-6* account for 60% of the total potential years of life lost due to cancer. Lung cancer alone was responsible for 21,160 PYLL, which represents 25% of premature mortality caused by cancer.

Figure 2-7: **Potential Years of Life Lost by Top Six Cancer Sites and Sex, Alberta, 2010**
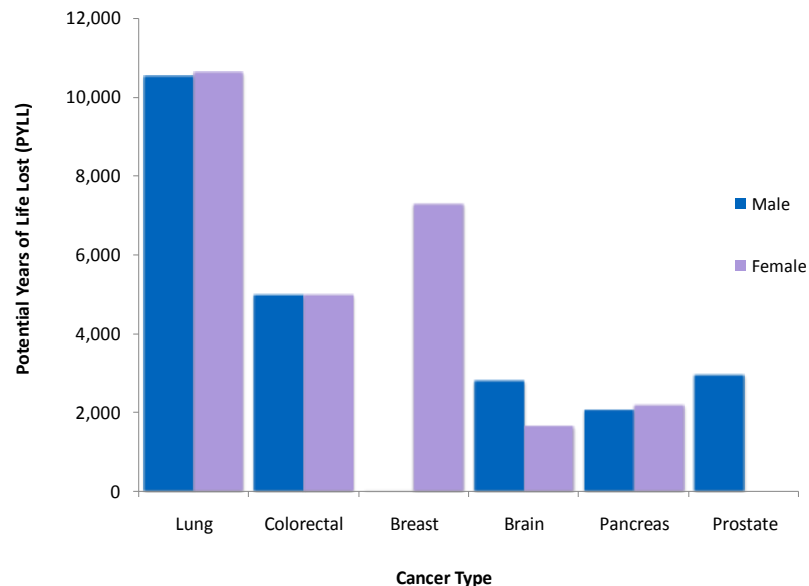
Data Source: Alberta Cancer Registry

Lung, colorectal and prostate cancers were the top three cancers in males responsible for PYLL, accounting for 45% of the total PYLL in males due to cancer (*Figure 2-7*). Although prostate cancer is more frequently diagnosed 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 54% of the total PYLL in females due to cancer (*Figure 2-7*).

Probability of Developing and Dying from Cancer

The lifetime *probability of developing or dying of cancer* measures the risk of an individual developing or dying of cancer during their lifetime.

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 as the probabilities will be affected by the risk behaviours of the individual. In addition, someone diagnosed with cancer has a higher probability of developing another cancer in the future.[6]

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

A male born in Alberta is more likely to develop prostate cancer (1 in 6) than lung cancer (1 in 12), while a female born 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 45) than females (1 in 146).

Table 2-3: **Lifetime Probability of Developing Cancer by Sex, Alberta, 2006-2010**

Cancer Type	Males	Females
All Cancers[*]	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 12	1 in 14
Colorectal	1 in 13	1 in 16
Body of Uterus	---	1 in 35
Non-Hodgkin's Lymphoma	1 in 39	1 in 44
Leukemia	1 in 46	1 in 63
Kidney and Renal Pelvis	1 in 54	1 in 84
Pancreas	1 in 66	1 in 62
Melanomas of the Skin	1 in 59	1 in 73
Bladder (including *in situ*)	1 in 45	1 in 146
Ovary	---	1 in 78
Stomach	1 in 72	1 in 133
Thyroid	1 in 198	1 in 73
Oral	1 in 76	1 in 147
Cervix Uteri	---	1 in 123
Multiple Myeloma	1 in 118	1 in 151
Brain	1 in 121	1 in 179
Esophagus	1 in 105	1 in 284
Liver	1 in 126	1 in 312
Larynx	1 in 210	1 in 1,030

*Excludes basal and squamous skin cancers
--- Not applicable

Data Sources: Alberta Cancer Registry, Alberta Health

Approximately 1 in 4 people born in Alberta will die of cancer (*Table 2-4*).

Cancer site and sex affect the ***probability of dying** from cancer* (*Table 2-4*). A male born in Alberta has a higher chance of dying from lung cancer (1 in 15) than dying from prostate cancer (1 in 26). Similarly, a female born in Alberta has a higher chance of dying from lung cancer (1 in 18) than dying from breast cancer (1 in 31). A male has a higher chance of dying from kidney cancer (1 in 144) than a female (1 in 217).

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.

Table 2-4: **Lifetime Probability of Dying from Cancer by Sex, Alberta, 2006-2010**

Cancer Type	Males	Females
All Cancers	1 in 4	1 in 4
Lung and Bronchus	1 in 15	1 in 18
Prostate	1 in 26	---
Breast	Less than 1 in 10,000	1 in 31
Colorectal	1 in 32	1 in 36
Pancreas	1 in 76	1 in 70
Non-Hodgkin's Lymphoma	1 in 97	1 in 110
Ovary	---	1 in 109
Leukemia	1 in 105	1 in 136
Stomach	1 in 97	1 in 203
Bladder (including *in situ*)	1 in 95	1 in 272
Kidney and Renal Pelvis	1 in 144	1 in 217
Body of Uterus	---	1 in 180
Brain	1 in 143	1 in 214
Esophagus	1 in 137	1 in 356
Multiple Myeloma	1 in 202	1 in 245
Oral	1 in 191	1 in 331
Liver	1 in 194	1 in 422
Melanomas of the Skin	1 in 301	1 in 617
Cervix Uteri	---	1 in 454
Larynx	1 in 547	1 in 3,193
Thyroid	1 in 1,680	1 in 1,236

--- Not applicable

Data Sources: Alberta Cancer Registry, Alberta Health, Surveillance and Health Status Assessment with data obtained from Alberta Vital Statistics, Service Alberta.[2]

Cancer Prevalence

The *prevalence* of a disease is defined as the number of people who are alive at a given time 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 time period (e.g. 2, 5, 10 or 20 years) while complete cancer prevalence represents the number of people alive on a certain day who had previously been diagnosed with cancer, regardless of how long ago the diagnosis was.[7]

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, 2010 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.

Table 2-5: **Limited-Duration and Complete Prevalence for All Cancers*, by Sex, Alberta, 2010**

Duration	Prevalence		
	Both sexes combined	*Males*	*Females*
2-Year	23,127	11,857	11,270
5-Year	48,070	24,458	23,612
10-Year	77,411	39,110	38,301
20-Year	104,516	50,967	53,549
Complete	120,391	56,564	63,827

*Excludes basal and squamous skin cancers
Data Source: Alberta Cancer Registry

As of December 31, 2010, approximately **120,400** Albertans were alive who had previously been diagnosed with cancer, out of which there were about **56,550** males and about **63,850** females (*Table 2-5*). Approximately **23,150** Albertans were alive on the same date who had been diagnosed with cancer in the previous two years, the period during which cases are more likely to receive definitive treatments.

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 Albertan residents 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 Albertan residents 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 to determine the weights. 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 population is used as the standard population.
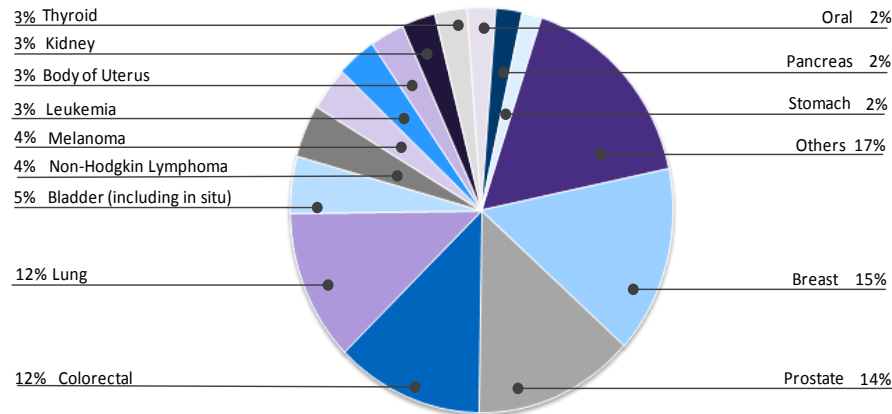
Three-year moving averages are used to smooth out year-to-year fluctuations so that the underlying trend may be more easily observed. They are calculated based on aggregating three years of data by age group. Age-standardized incidence rates (ASIRs) and age-standardized mortality rates (ASMRs) are presented 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 a variety of factors; 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 for all cancers combined in Alberta. Separate analyses for both incidence and mortality are shown in subsequent sections. The statistical significance of the trends was determined by using Joinpoint[8] method and is described in the text accompanying each graph. Joinpoint models are based on age standardized 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 2-8: **New Cancers by Site (Percentage), Both Sexes Combined, Alberta, 2010**
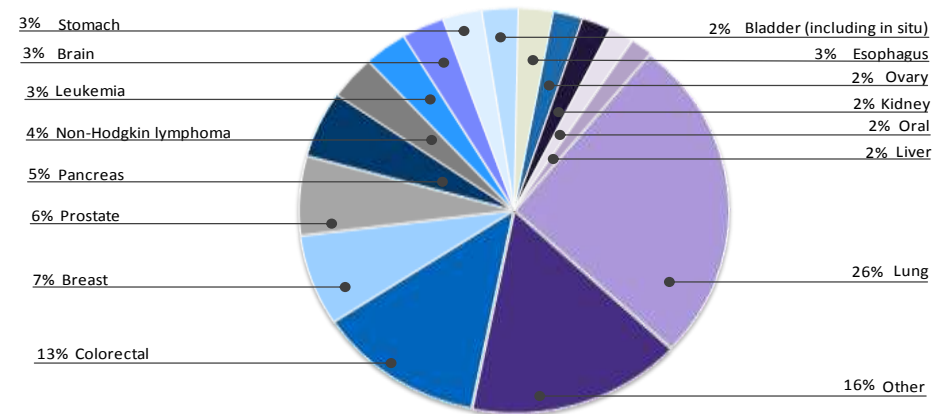

3% Thyroid
3% Kidney
3% Body of Uterus
3% Leukemia
4% Melanoma
4% Non-Hodgkin Lymphoma
5% Bladder (including in situ)
12% Lung
12% Colorectal

Oral 2%
Pancreas 2%
Stomach 2%
Others 17%
Breast 15%
Prostate 14%

* **Others**: comprised all other cancer sites with less than 2% of new cases

Data Source: Alberta Cancer Registry

Breast, prostate, lung and colorectal cancers were the most frequently diagnosed cancers in 2010 in Alberta, comprising 53% of all cancers diagnosed (**Figure 2-8**).

Figure 2-9: **Cancer Deaths by Site (Percentage), Both Sexes Combined, Alberta, 2010**

3% Stomach
3% Brain
3% Leukemia
4% Non-Hodgkin lymphoma
5% Pancreas
6% Prostate
7% Breast
13% Colorectal

2% Bladder (including in situ)
3% Esophagus
2% Ovary
2% Kidney
2% Oral
2% Liver
26% Lung
16% Other

* **Others**: comprised all other cancer sites with less than 2% of deaths

Data Source: Alberta Cancer Registry

Lung, colorectal, breast and prostate cancers were responsible for 52% of cancer deaths in 2010 in Alberta (**Figure 2-9**). Some cancers are not very common but, due to their poor **prognosis**, make a relatively large contribution to mortality such as pancreatic, brain and stomach cancers. These three cancers combined were responsible for 11% of the cancer deaths in 2010 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 26% of cancer deaths.

Table 2-6: **Incidence and Mortality Counts by Cancer Type and Sex, Alberta, 2010**

Cancer Type	Incidence Counts			Mortality Counts		
	Both Sexes	Males	Females	Both Sexes	Males	Females
All Cancers†	15,232	7,886	7,346	5,526	2,952	2,574
Bronchus/Lung	1,839	934	905	1,445	787	658
Prostate Gland	2,073	2,073	-	349	349	-
Breast	2,272	8	2,264	402	3	399
Colorectal	1,902	1,069	833	695	361	334
Non-Hodgkin Lymphoma	644	343	301	195	112	83
Pancreas	334	179	155	295	154	141
Leukemia	509	316	193	180	100	80
Melanoma of Skin	534	290	244	73	55	18
Kidney	428	267	161	122	75	47
Bladder	688	530	158	149	112	37
Stomach	246	160	86	162	110	52
Body of Uterus	440	-	440	63	-	63
Thyroid Gland	420	103	317	15	3	12
Brain	188	113	75	178	117	61
Liver	152	117	35	90	72	18
Oral	357	257	100	101	61	40
Ovary	171	-	171	125	-	125
Testis	129	129	-	3	3	-
Multiple Myeloma	190	113	77	82	51	31
Hodgkin's Disease	80	39	41	15	8	7
Esophagus	152	121	31	144	108	36
Cervix Uteri	150	-	150	33	-	33
Larynx	73	63	10	32	28	4
All Other Cancers	1,261	662	599	578	283	295

† Incidence counts exclude basal and squamous skin cancers
Data Source: Alberta Cancer Registry

Cancer Care
Cancer Surveillance

In Alberta, there were 15,232 cancer cases (excluding non-melanoma skin cancer) diagnosed in 2010 and 5,526 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 2010 include cancers diagnosed in 2010 or earlier.

Figure 2-10: **Age-Standardized Incidence Rates (ASIRs)[*†‡] and Age-Standardized Mortality Rates (ASMRs)[*†] and 95% Confidence Intervals (CI) for All Cancers, Both Sexes Combined, Alberta, 1990-2010**
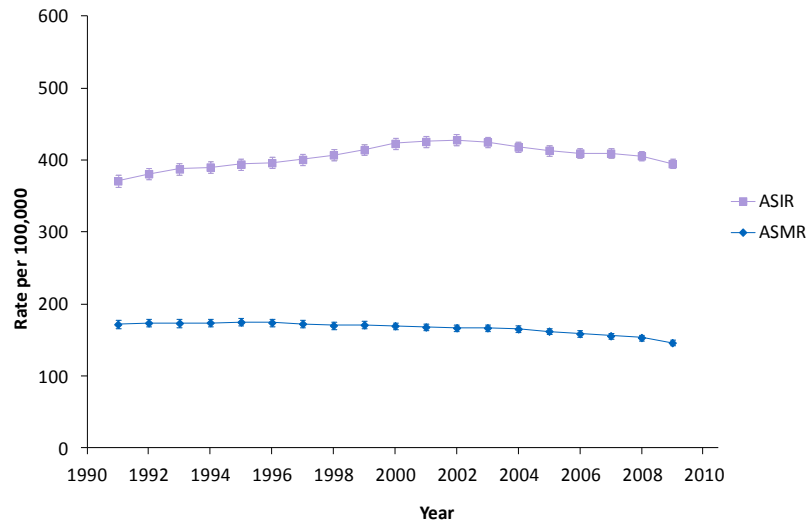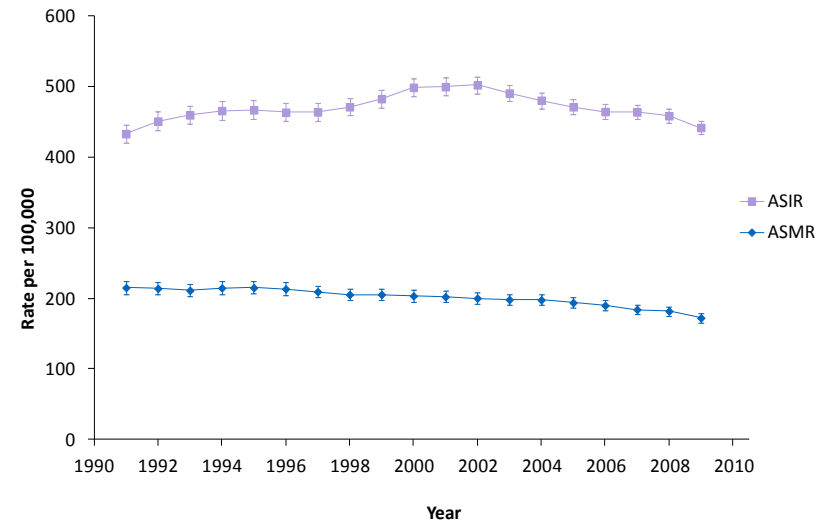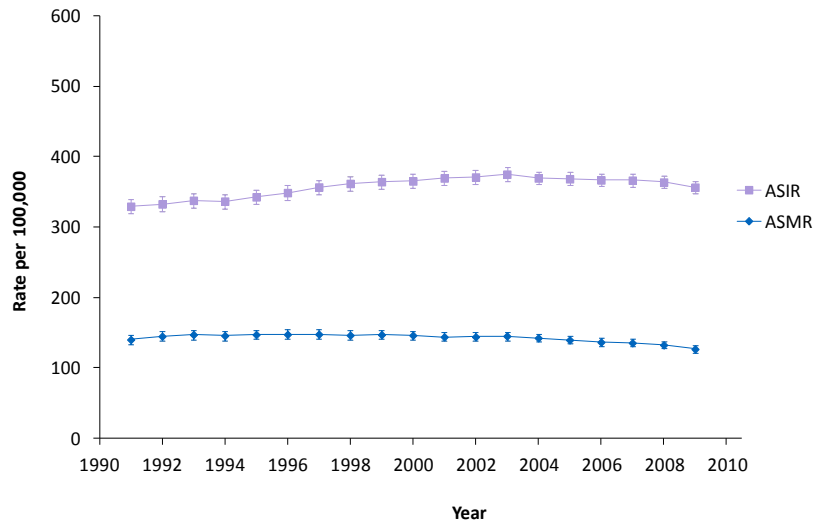

[*] Three-year moving average.
[†] Standardized to 1991 Canadian population.
[‡] Excludes basal and squamous skin cancers

Data Sources: Alberta Cancer Registry, Alberta Health

ASIRs for all cancers in both sexes combined increased significantly between 1990 and 2002 by 1.4% annually and decreased significantly between 2002 and 2010 by 1.3% annually (*Figure 2-10*). In 2010, the ASIR for all cancers in both sexes combined was 377 per 100,000 population.

Mortality rates are lower than incidence rates. ASMRs for all cancers in both sexes combined decreased significantly by 0.3% annually between 1990 and 2004, and by 2.8% annually between 2004 and 2010 (*Figure 2-10*). In 2010, the ASMR for all cancers in both sexes combined was 135 per 100,000 population.

Figure 2-11: **Age-Standardized Incidence Rates (ASIRs)[*†‡] and Age-Standardized Mortality Rates (ASMRs)[*†] and 95% Confidence Intervals (CI) for All Cancers, Males, Alberta, 1990-2010**

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

Data Sources: Alberta Cancer Registry, Alberta Health

Male ASIRs for all cancers increased significantly between 1990 and 2001 by 1.5% annually and decreased significantly between 2001 and 2010 by 1.7% annually (*Figure 2-11*). In 2010, the ASIR for all cancers in males was 413 per 100,000 male population.

Male mortality rates are lower than male incidence rates. Male ASMRs for all cancers decreased significantly by 0.7% annually between 1990 and 2005 and by 3.4% annually between 2005 and 2010 (*Figure 2-11*). In 2010, the ASMR for all cancers in males was 158 per 100,000 male population.

Figure 2-12: **Age-Standardized Incidence Rates (ASIRs)[*†‡] and Age-Standardized Mortality Rates (ASMRs)[*†] and 95% Confidence Intervals (CI) for All Cancers, Females, Alberta, 1990-2010**
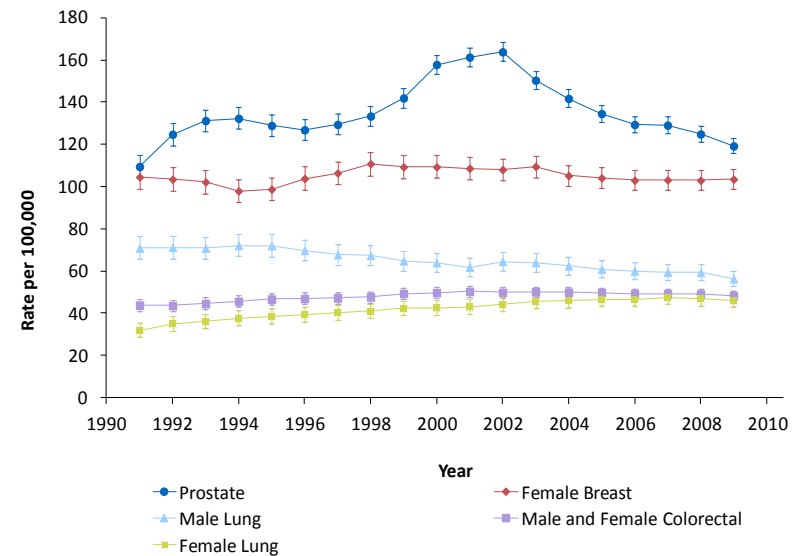

[*] Three-year moving average.
[†] Standardized to 1991 Canadian population.
[‡] Excludes basal and squamous skin cancers

Data Sources: Alberta Cancer Registry, Alberta Health

Female ASIRs for all cancers increased significantly between 1990 and 2002 by 1.3% annually, but decreased significantly between 2002 and 2010 by 0.8% annually (*Figure 2-12*). In 2010, the ASIR for all cancers in females was 348 per 100,000 female population.

Female mortality rates are lower than incidence rates. Female mortality rates were stable between 1990 and 2003. Over the period 2003 and 2010, ASMRs for all cancers in females decreased significantly by 2.5% annually (*Figure 2-12*). In 2010, the ASMR for all cancers in females was 118 per 100,000 female population.

Figure 2-13: **Age-Standardized Incidence Rates (ASIRs)[*†] and 95% Confidence Intervals (CI) for Prostate Cancer, Breast Cancer (Female), Lung Cancer (Male, Female), and Colorectal Cancer (Both Sexes Combined), Alberta, 1990-2010**

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

Data Sources: Alberta Cancer Registry, Alberta Health

Generally, cancer incidence rates for the four most common cancers in Alberta increased over the past 20 years except for male lung cancer and female breast cancer which have decreased and remained stable respectively (*Figure 2-13*).

Prostate cancer ASIRs have two peaks and two significant trends over time since 1990. The peaks for prostate cancer incidence occur in 1993 and 2002. Over the time period 1990 to 1993, prostate cancer ASIRs increased significantly by 12.5% annually, remained stable between 1993 and 1997, and increased significantly again between 1997 and 2001 by 8.0% annually. However, from 2001 to 2010 prostate cancer ASIRs decreased significantly by 4.4% annually. 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.[11] 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.[10]

Female breast cancer ASIRs did not change significantly between 1990 and 2010 (*Figure 2-13*).

Male lung cancer ASIRs decreased significantly by 1.4% annually between 1990 and 2010. On the other hand, female lung cancer ASIRs increased by 8.9% annually between 1990 and 1993 then continued to increase at lower rate between 1993 and 2008 by 1.7% annually. These rates remained stable from 2008 to 2010 (*Figure 2-13*).

Finally, colorectal cancer ASIRs in both sexes combined increased from 1990 to 2001 by 1.5% annually and remained stable from 2001 to 2010 (*Figure 2-13*).

Figure 2-14: Actual and Projected Number of New Cases and Age-Standardized Incidence Rates (ASIRs)[*†] for All Cancers[‡], Males, Alberta, 1990-2015
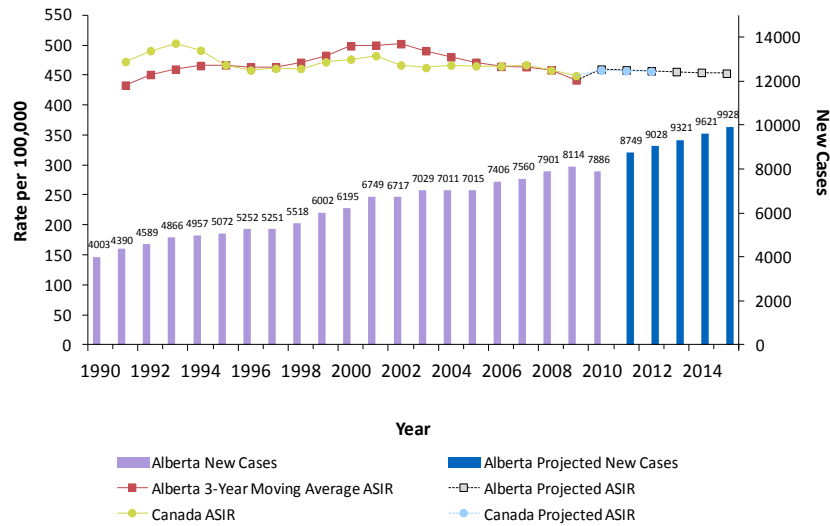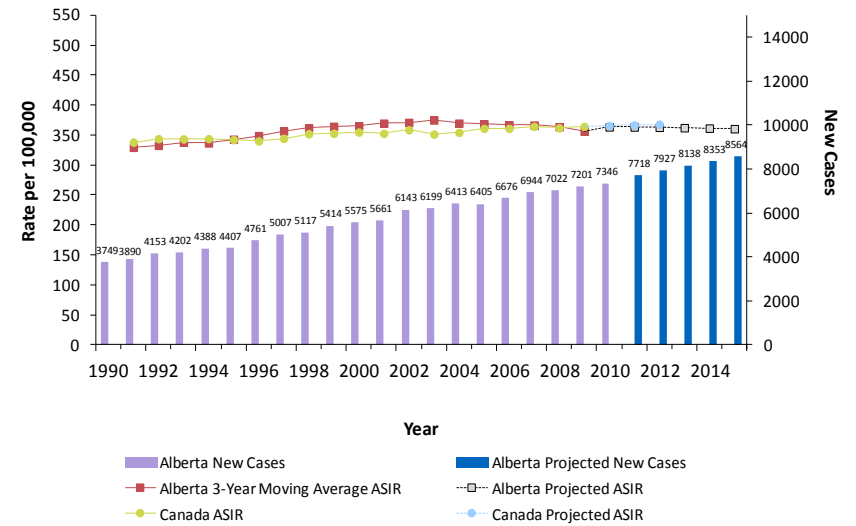

* Three-year moving average.
† Standardized to 1991 Canadian population.
‡ Excludes basal and squamous skin cancers

Data Sources: Alberta Cancer Registry, Alberta Health, Canadian Cancer Society

In 2010, 7,886 cases of cancer were diagnosed in males in Alberta (*Figure 2-14*). Alberta ASIRs for all cancers in males were lower than ASIRs in Canada between 1991 and 1994 and higher than those in Canada over the period 1996-2005.

Approximately 9,950 cases of cancer will be diagnosed in males in Alberta in 2015.

Figure 2-15: Actual and Projected Number of New Cases and Age-Standardized Incidence Rates ASIRs)[*†] for All Cancers[‡], Females, Alberta, 1990-2015
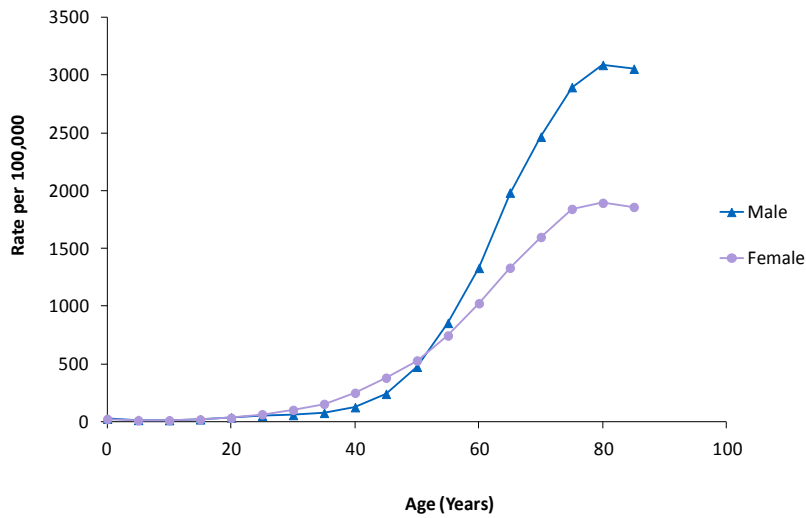

* Three-year moving average.
† Standardized to 1991 Canadian population.
‡ Excludes basal and squamous skin cancers

Data Sources: Alberta Cancer Registry, Alberta Health, Canadian Cancer Society

In 2010, 7,346 cases of cancer were diagnosed in females in Alberta (*Figure 2-15*). Alberta ASIRs for all cancers in females were lower than ASIRs in Canada over the period 1991-1994 then slightly higher than those in Canada between 1996 and 2008.

Approximately 8,550 cases of cancer will be diagnosed in females in Alberta in 2015.

Figure 2-16: **Age-Specific Incidence Rates for All Cancers by Sex, Alberta, 2006-2010**[*]


[*] Excludes basal and squamous skin cancers

Data Sources: Alberta Cancer Registry, 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 50 age-specific cancer rates are higher in males than females. The highest cancer incidence rates occur in the oldest age groups.

Figure 2-17: **Age-Standardized Mortality Rates (ASMRs)**[*†] **and 95% Confidence Intervals (CI) for Lung Cancer (Male, Female), Colorectal Cancer (Both Sexes Combined), Prostate Cancer, Breast Cancer (Female), Alberta, 1990-2010**
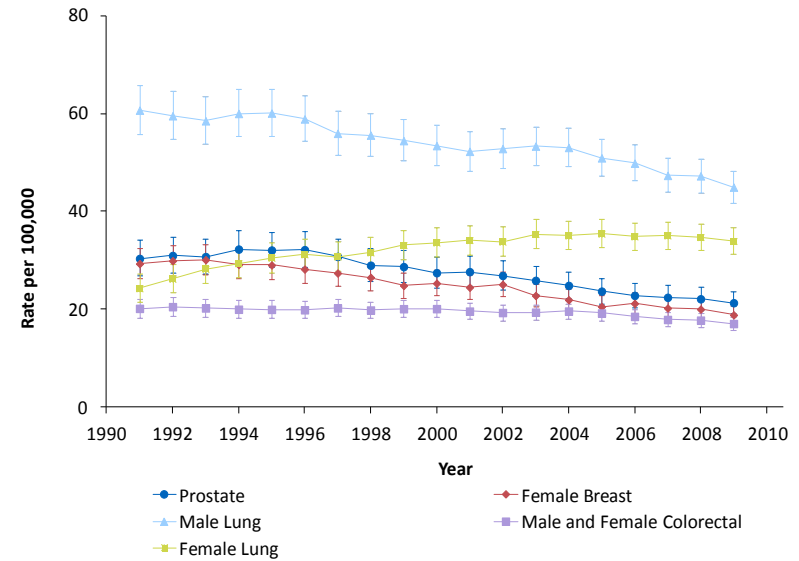
[*] Three-year moving average.
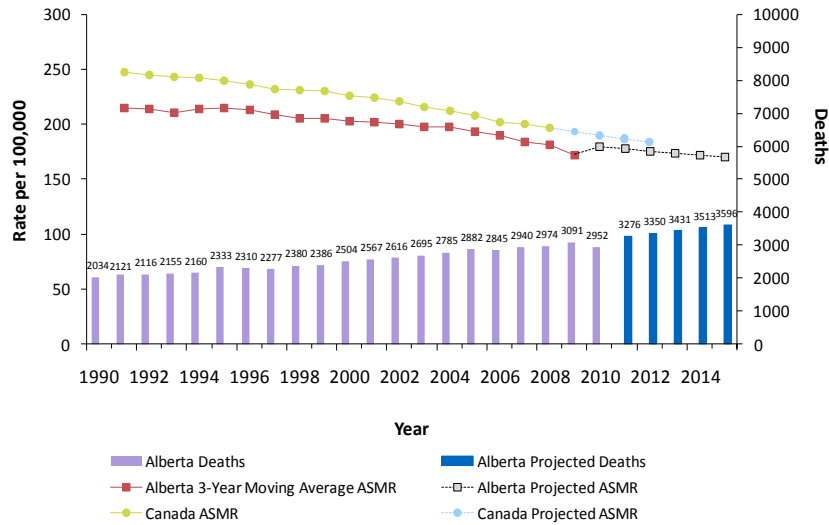[†] Standardized to 1991 Canadian population.

Data Sources: Alberta Cancer Registry, Alberta Health

Over the time period 1990 to 1995, prostate cancer ASMRs did not change significantly (*Figure 2-17*). However, from 1995 to 2010, prostate cancer ASMRs decreased significantly by 3.1% annually.

Breast cancer ASMRs in females decreased significantly between 1990 and 2010 by 2.6% annually.

Male lung cancer ASMRs decreased significantly between 1990 and 2010 by 1.6% annually. Female lung cancer ASMRs increased significantly by 3.7% annually between 1990 and 2000 and remained stable between 2001 to 2010. Over the period 1990 to 2010, colorectal cancer ASMRs in both sexes combined decreased by 0.8% annually.

Figure 2-18: **Actual and Projected Number of Deaths and Age-Standardized Mortality Rates (ASMRs)[*][†] for All Cancers, Males, Alberta, 1990-2015**

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

Data Sources: Alberta Cancer Registry, Alberta Health, Canadian Cancer Society

Figure 2-19: **Actual and Projected Number of Deaths and Age-Standardized Mortality Rates (ASMRs)[*][†] for All Cancers, Females, Alberta, 1990-2015**
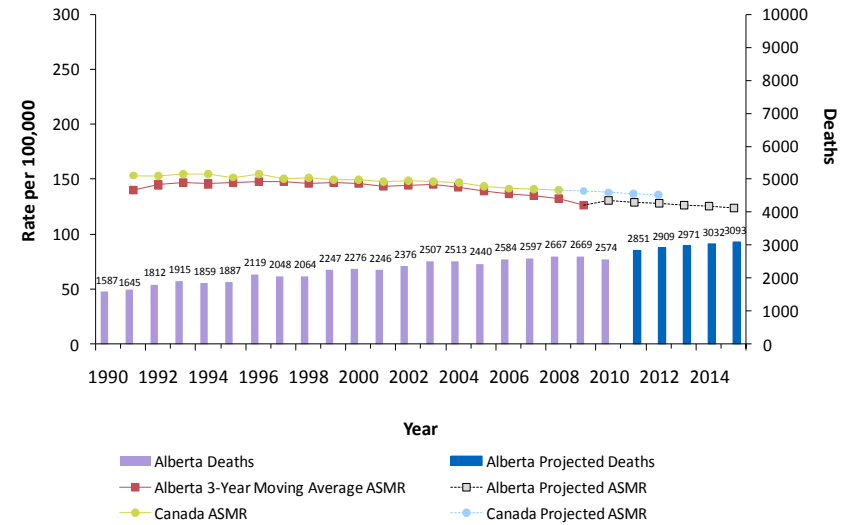

[*] Three-year moving average.
[†] Standardized to 1991 Canadian population.

Data Sources: Alberta Cancer Registry, Alberta Health, Canadian Cancer Society

In 2010, 2,952 males died of cancer in Alberta (*Figure 2-18*). Alberta ASMRs for all cancers in males were lower than those in Canada.

Approximately 3,600 males are expected to die from cancer in Alberta in 2015.

In 2010, 2,574 females died of cancer in Alberta (*Figure 2-19*). Alberta ASMRs for all cancers in females were lower than those in Canada.

Approximately 3,100 females are expected to die from cancer in Alberta in 2015.

Figure 2-20: **Age-Specific Mortality Rates for All Cancers by Sex, Alberta, 2006-2010**[*]
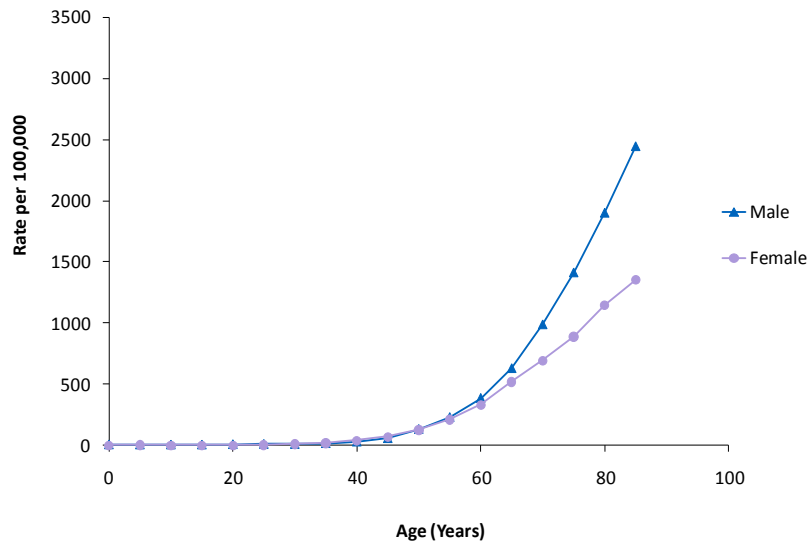
For both males and females, cancer mortality rates remain very low until about the age of 40, at which point they begin increasing rapidly (***Figure 2-20***). After the age of 55, females have lower cancer mortality rates than men. The highest cancer mortality rates occur in the oldest age groups.

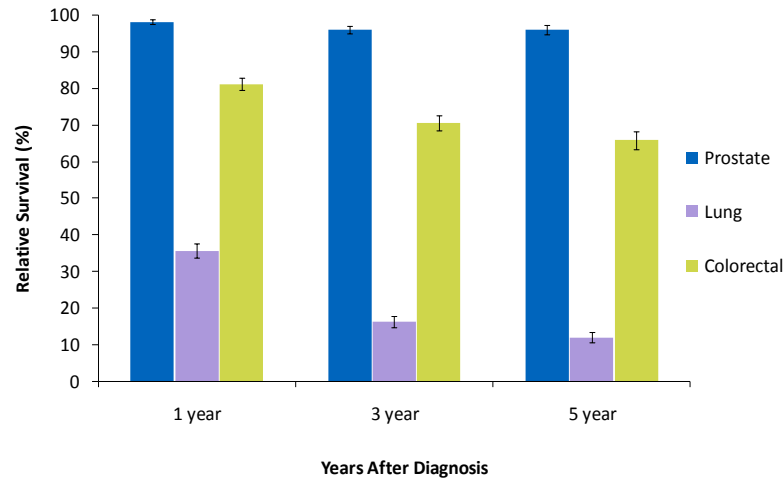**Data Sources**: Alberta Cancer Registry, Alberta Health

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, morphology and stage 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 year. For common cancer sites, RSRs are standardized by the age structure in the standard cancer patient 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*[12] 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*.[13] 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, 2008-2010**

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

Data Sources: Alberta Cancer Registry, Statistics Canada

The five-year relative survival ratios for males diagnosed with prostate, lung and colorectal cancers from 2008 to 2010 are 96%, 12% and 66%, respectively (**Figure 2-21**). This means that out of all males diagnosed with prostate cancer between 2008 and 2010, around 96% 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, 2008-2010**
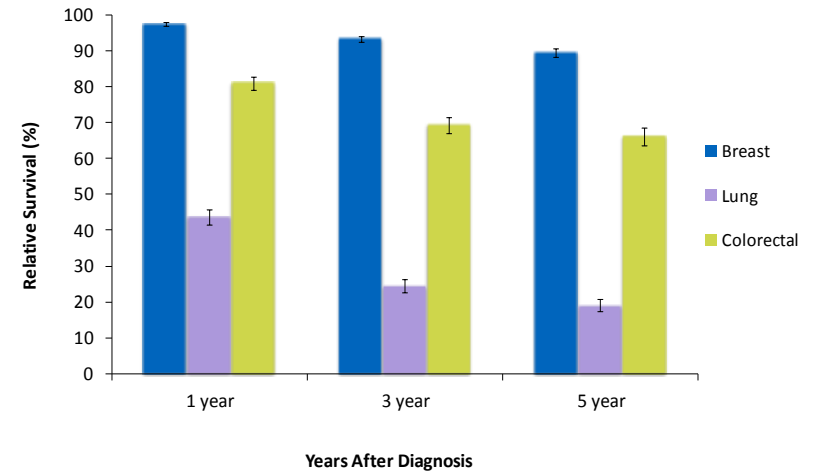

* Ratios calculated by period method, where complete follow-up data are not available

Data Sources: Alberta Cancer Registry, Statistics Canada

The five-year relative survival ratios for females diagnosed with breast, lung and colorectal cancers are 89%, 19% and 66%, respectively (**Figure 2-22**). This means that females diagnosed with breast cancer in 2008-2010 are about 89% 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 (12%). Survival in females diagnosed with lung cancer is still very low.

Survival ratios vary by type of cancers and sex (*Table 2-7*). Pancreatic 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 cancer and melanoma of the skin.

Table 2-7: **Age-Standardized and Crude* One-, Three- and Five-Year Relative Survival Ratios (%) and 95% Confidence Intervals (CIs) for Selected Cancers Diagnosed Between 2008 and 2010 by Sex, Alberta**

Cancer type	One-year Relative Survival Ratio (%) (95% CI)		Three-year Relative Survival Ratio (%) (95% CI)		Five-year Relative Survival Ratio (%) (95% CI)	
	Male	*Female*	*Male*	*Female*	*Male*	*Female*
Breast	---	**97** (96,98)	---	**93** (92,94)	---	**89** (88,90)
Cervix*	---	**91** (89,94)	---	**84** (80,87)	---	**81** (84,77)
Colorectal	**81** (79,82)	**81** (79,82)	**70** (68,72)	**69** (67,71)	**65** (63,68)	**66** (63,68)
Kidney	**80** (77,83)	**81** (77,85)	**68** (65,72)	**74** (70,78)	**64** (60,68)	**69** (65,74)
Leukemias	**80** (77,83)	**77** (73,80)	**75** (71,79)	**71** (67,75)	**71** (66,75)	**69** (64,73)
Lung	**35** (33,37)	**43** (41,45)	**16** (14,17)	**24** (22,26)	**11** (10,13)	**18** (17,20)
Melanoma	**95** (92,96)	**96** (94,98)	**88** (85,91)	**96** (94,98)	**84** (81,88)	**94** (91,97)
Non-Hodgkin Lymphoma	**81** (79,84)	**83** (81,86)	**72** (69,75)	**78** (75,81)	**69** (66,73)	**73** (70,77)
Pancreas*	**24** (20,28)	**21** (17,25)	**9** (7,12)	**9** (6,12)	**6** (4,9)	**7** (4,10)
Prostate	**98** (97,98)	---	**96** (95,97)	---	**96** (94,97)	---

Data Sources: Alberta Cancer Registry, Statistics Canada

Table 2-8: Crude One-, Two- and Three-Year Relative Survival Ratios[†] (%) and 95% Confidence Intervals (CI) for Breast, Colorectal, Lung, and Prostate Cancers by Stage

Cancer Type*	Stage	Cases Diagnosed by 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*
Breast	I	45	---	3,117	---	**100** (100, 100)	---	**100** (100, 100)	---	**100** (100, 100)
	II	36	---	2,500	---	**100** (99, 100)	---	**99** (98, 100)	---	**97** (96, 99)
	III	14	---	991	---	**97** (96, 99)	---	**91** (89, 94)	---	**86** (82, 89)
	IV	5	---	360	---	**62** (56, 67)	---	**45** (39, 51)	---	**33** (26, 41)
Colorectal	I	20	626	457	**97** (94, 99)	**99** (97, 100)	**97** (94, 99)	**99** (96, 100)	**96** (91, 99)	**99** (93, 100)
	II	24	678	590	**94** (92, 96)	**95** (93, 97)	**93** (90, 96)	**94** (91, 97)	**94** (90, 97)	**92** (87, 96)
	III	30	878	698	**93** (91, 95)	**91** (88, 93)	**88** (85, 91)	**83** (79, 86)	**84** (80, 88)	**77** (72, 82)
	IV	26	792	558	**51** (47, 55)	**44** (39, 48)	**31** (27, 35)	**25** (21, 29)	**20** (16, 24)	**14** (11, 19)
Lung	I	15	391	473	**86** (81, 89)	**94** (91, 97)	**72** (66, 78)	**86** (81, 90)	**66** (59, 73)	**78** (71, 84)
	II	4	148	113	**78** (69, 85)	**73** (62, 82)	**52** (41, 63)	**55** (43, 67)	**41** (29, 54)	**45** (32, 58)
	III	25	744	693	**45** (41, 49)	**51** (47, 55)	**21** (18, 25)	**32** (28, 36)	**10** (7, 14)	**22** (17, 26)
	IV	56	1,712	1,500	**15** (14, 17)	**21** (19, 24)	**6** (5, 7)	**10** (8, 12)	**3** (2, 5)	**6** (4, 8)
Prostate	I	6	414	---	**100** (100, 100)	---	**100** (100, 100)	---	**100** (100, 100)	---
	II	74	5,497	---	**100** (100, 100)	---	**100** (100, 100)	---	**100** (100, 100)	---
	III	10	751	---	**100** (100, 100)	---	**100** (100, 100)	---	**100** (100, 100)	---
	IV	10	742	---	**80** (77, 84)	---	**61** (56, 66)	---	**46** (41, 52)	---

* First-primary invasive and age of 15-99 years at diagnosis.
† Ratios calculated by period method, where complete follow-up data are not available

Data Sources: Alberta Cancer Registry, Statistics Canada

Cancer Care
Cancer Surveillance

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 those diagnosed between 2007 and 2010, 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 90%, which are significantly higher than those diagnosed with colorectal cancer at stage IV (male 20% and female 14%) (*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 late stages (III & IV). The estimated relative survival ratios for late stage cancers, 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 (33%) than that for those at stage I and II (*Table 2-8*).

In 2007-2010, the majority of prostate cancer cases were diagnosed at stage II and all males who were diagnosed at stage I were alive three years after diagnosis. Similar to female breast cancer, one-, two and three-year relative survival ratios are very close to the general population for those diagnosed at stage II and III. Even though the three-year relative survival ratio for males diagnosed with prostate cancer at stage IV (46%) 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. These rates are three-year averages. The age standardized incidence and mortality rates for each zone and the province are presented with their corresponding 95% *confidence intervals*.[14] Any observed differences in rates may be due to several factors such as regional differences in:
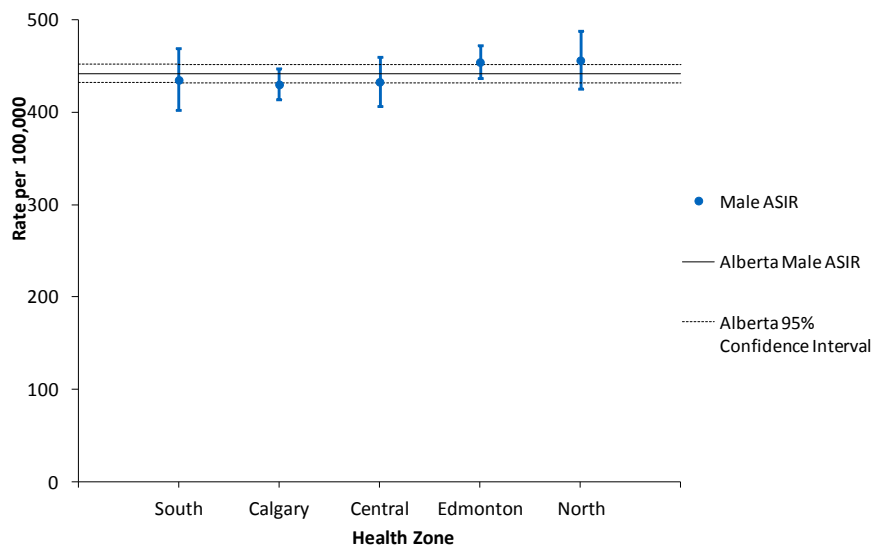
- risk factors such as smoking and obesity rates
- prevention efforts
- cancer screening
- diagnostic activity
- access to cancer care.[9]

Figure 2-23: **Five Health Zones in Alberta, 2010**

Source: Alberta Health Services

Figure 2-24: Age-Standardized Incidence Rates (ASIRs)[*†‡] and 95% Confidence Intervals (CI) for All Cancers by Zone, Males, Alberta, 2008-2010
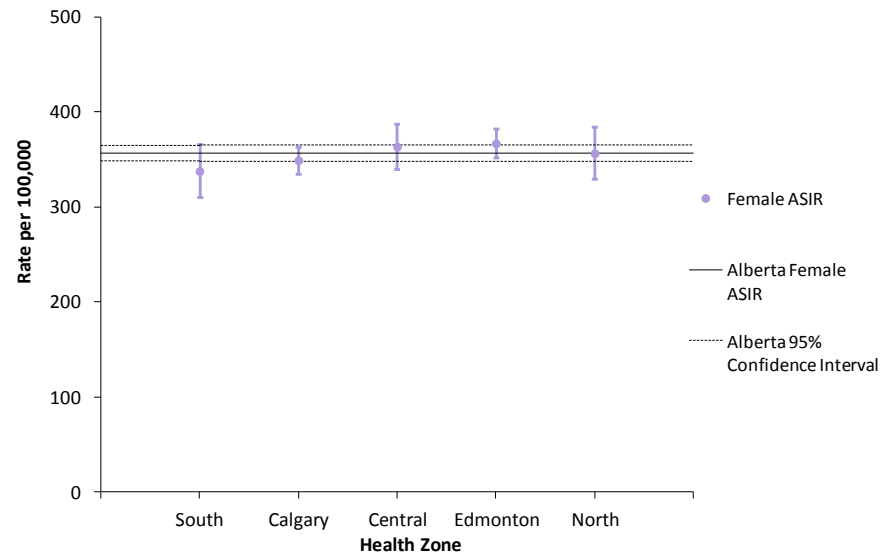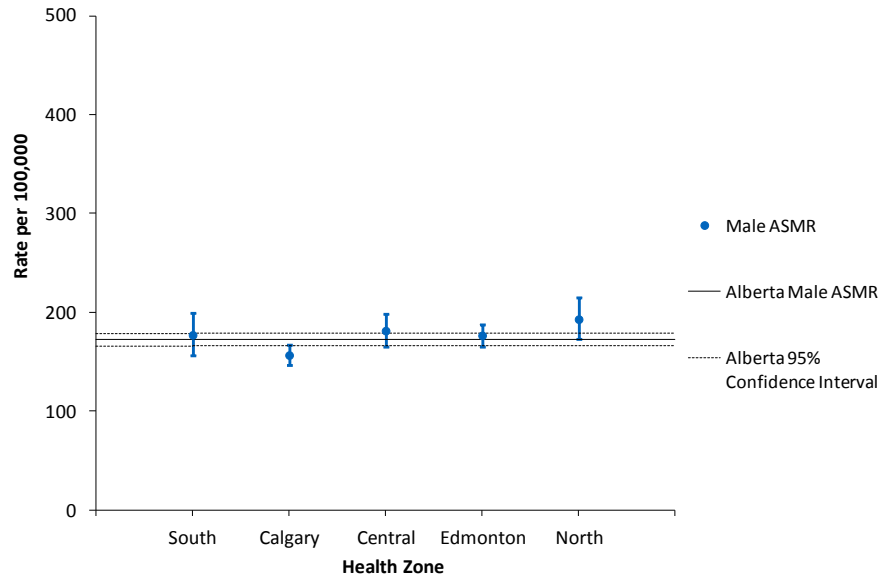

* Three-year average.
† Standardized to 1991 Canadian population.
‡ Excludes basal and squamous skin cancers.

Data Sources: Alberta Cancer Registry, Alberta Health

There is no evidence that male ASIRs in each zone is significantly higher or lower than the provincial average (*Figure 2-24*).

Figure 2-25: Age-Standardized Incidence Rates (ASIRs)[*†‡] and 95% Confidence Intervals (CI) for All Cancers by Zone, Females, Alberta, 2008-2010

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

Data Sources: Alberta Cancer Registry, Alberta Health

There is no evidence that female ASIRs in each zone is significantly higher or lower than the provincial average (*Figure 2-25*).

Figure 2-26: **Age-Standardized Mortality Rates (ASMRs)[*†‡] and 95% Confidence Intervals (CI) for All Cancers by Zone, Males, Alberta, 2008-2010**
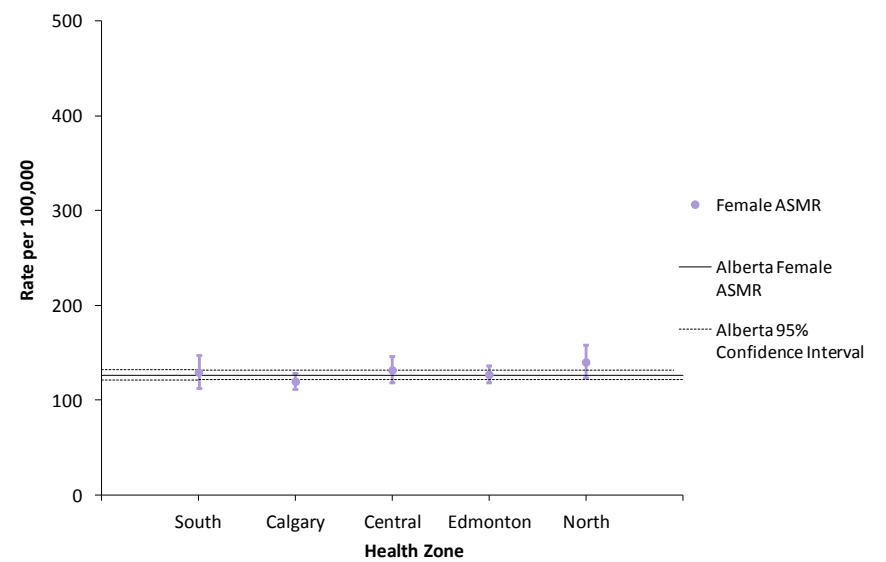

* Three-year average.
† Standardized to 1991 Canadian population.
‡ Excludes basal and squamous skin cancers.

Data Sources: Alberta Cancer Registry, Alberta Health

There is no evidence that male ASMRs in each zone is significantly higher or lower than the provincial average (*Figure 2-26*).

Figure 2-27: **Age-Standardized Mortality Rates (ASMRs)[*†‡] and 95% Confidence Intervals (CI) for All Cancers by Zone, Females, Alberta, 2008-2010**

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

Data Sources: Alberta Cancer Registry, Alberta Health

There is no evidence that female ASMRs in each zone is significantly higher or lower than the provincial average (*Figure 2-27*).

Further Information

Further information is available on a separate document, the **Appendix**:

Appendix 1: Glossary

Appendix 2: Cancer Definitions

Appendix 3: Data Notes

References

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