Alberta Health Services

Cancer Care

Cancer Surveillance

Prostate Cancer

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 prostate cancer statistics in Alberta. Details about other 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.

For detailed descriptions about data sources and how they affect data presented in this report, please see the **Appendix** document.

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Summary

- Approximately **1 in 6** men will develop invasive prostate cancer within their lifetime.
- In 2010, **2,961** potential years of life were lost due to prostate cancer.
- As of December 31, 2010, approximately **22,350** Albertans were alive who had previously been diagnosed with prostate cancer.
- From 2001-2010*, prostate cancer **incidence rates have decreased**.
- From 1995 to 2010*, prostate cancer **mortality rates have decreased**.
- In 2010, there were **2,073** new cases of prostate cancer in Alberta and **349** deaths due to the disease.
- Approximately **2,700** cases of prostate cancer are expected to be diagnosed in 2015.
- The five-year relative survival ratio for prostate cancer in Alberta is approximately **96%** for those diagnosed between 2008 and 2010.

In 2010, there were 2,073 new cases of prostate cancer in Alberta and 349 deaths due to the disease.

The five-year relative survival ratio for prostate cancer in Alberta is approximately 96% for those diagnosed between 2008 and 2010.

*Year range represents the period over which the most recent significant trend was observed.

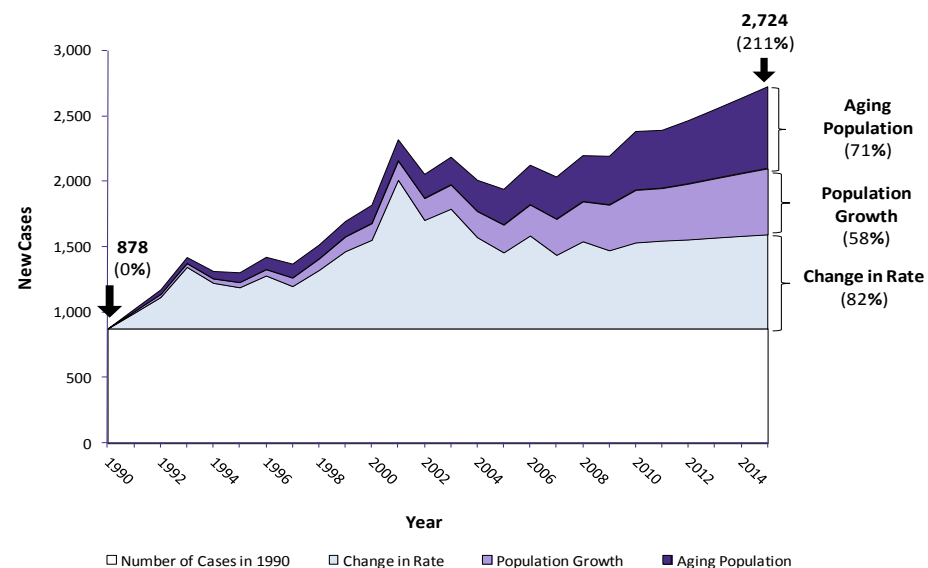**Cancer Care**
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Demography

The increase in the number of new cases of prostate cancer over the last two decades is mainly attributable to changes in demography (aging of the population and population growth), and the increase in the prostate cancer incidence rate (*Figure 3-1*).

The horizontal black line indicating 878 new cases in *Figure 3-1* represents the number of prostate cancer cases that occurred in 1990. In 2015, approximately 2,700 new prostate cancer cases are projected to occur, accounting for a 211% increase in cases from 1990. The line at the top of the dark purple-shaded area of the graph represents the number of new cases that actually occurred between 1990 and 2009, projected to 2015. Between these two lines, the three colored areas reflect the increase in prostate cancer 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 prostate cancer cases that would have occurred each year if prostate cancer incidence rates alone had changed but the population size and age structure had remained the same as in 1990. This will account for an approximately 82% in the total new prostate cancer cases in 2015.

The light purple shaded area (middle) represents the number of new prostate cancer cases that would have occurred each year if the population alone had grown larger, assuming the age distribution and prostate cancer incidence rates had remained the same as in 1990. This will account for an approximately 58% in the total new prostate cancer cases in 2015.

Figure 3-1: **Trends in New Cases of Prostate Cancer Attributed to Aging Population, Population Growth and Change in Prostate Cancer Rate, Alberta, 1990-2015**

Data Source: Alberta Cancer Registry, Alberta Health

The dark purple shaded area (top) represents the number of new prostate cancer cases attributed to increases in the older adult population - the aging population, assuming the population size and prostate cancer incidence rate had remained the same as in 1990.   This will account for an approximately 71% in the total new prostate cancer cases in 2015.

Probability of Developing and Dying from Prostate 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 prostate cancer-free prior to the beginning of that age range.

It is important to note that the probabilities of developing and dying of cancer represent all of Alberta's population on average and should be interpreted with caution at the individual level 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.[1]

The probability of developing prostate cancer increases with age (***Table 3-1***). Approximately 1 in 6 males will develop invasive prostate cancer in their lifetime. On a population basis the probability of developing prostate cancer by the end of the age range for a prostate cancer-free individual at the beginning of the age range are shown in the bottom eight rows of ***Table 3-1***. For instance, a prostate cancer-free male representative of the general population at age 50 has a 1 in 46 chance of developing prostate cancer by the time he is 60.

The probability of dying from prostate cancer increases with age (***Table 3-2***). Approximately 1 in 26 males will die of invasive prostate cancer. On a population basis the probability of a cancer-free individual at the beginning of the age range dying from prostate cancer by the end of the age range are shown in the bottom eight rows of ***Table 3-2***. For example, a cancer-free male representative of the general population at age 50 has a 1 in 1,532 chance of dying from prostate cancer by the time he is 60.

Table 3-1: **Probability of Developing Prostate Cancer by Age, Alberta, 2006-2010**

Age Group (Years)	Males
Lifetime Risk (all ages)	1 in 6
0 - 20	Less than 1 in 10,000
20 - 30	Less than 1 in 10,000
30 - 40	Less than 1 in 10,000
40 - 50	1 in 341
50 - 60	1 in 46
60 - 70	1 in 17
70 - 80	1 in 14
80+	1 in 14

Data Sources: Alberta Cancer Registry, Alberta Health

Table 3-2: **Probability of Dying from Prostate Cancer by Age, Alberta, 2006-2010**

| Age Group (Years)	Males
Lifetime Risk (all ages)	1 in 26
0 - 20	Less than 1 in 10,000
20 - 30	Less than 1 in 10,000
30 - 40	Less than 1 in 10,000
40 - 50	Less than 1 in 10,000
50 - 60	1 in 1,532
60 - 70	1 in 292
70 - 80	1 in 77
80+	1 in 23

Data Sources: Alberta Cancer Registry, Alberta Health

Potential Years of Life Lost

One frequently used measure of premature death is ***potential years of life lost (PYLL)***. PYLL due to cancer is an estimate of the number of years that people would have lived had they not died from cancer. PYLL due to cancer has been calculated 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. PYLL is one way to measure the impact, or burden, of a disease on a population.

In 2010, **2,961** potential years of life were lost due to prostate cancer, which constitutes about 4% of PYLL for all cancers (***Figure 3-2***).

Figure 3-2: **Potential Years of Life Lost (PYLL) from Prostate Cancer Compared with Lung[†], Colorectal[†] and Breast[‡] Cancer, Alberta, 2010**

[†] Male and Female
[‡] Female only
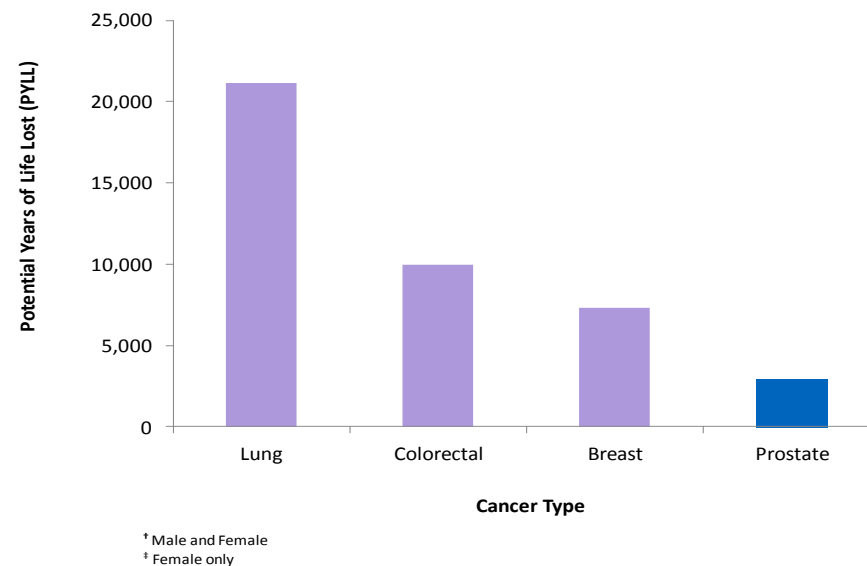
Data Source: Alberta Cancer Registry

Prevalence

The *prevalence* of a disease is defined as the number of people alive at a given time point who had been previously diagnosed with that disease.

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

In this section of the report, both limited-duration and complete prostate cancer prevalence are presented; the latter describing the number of people alive as of December 31, 2010 who had ever been diagnosed with prostate 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 3-3: **Limited-Duration and Complete Prevalence for Prostate Cancer, Alberta, 2010**

Duration	Males
2-Year	4,055
5-Year	9,488
10-Year	16,923
20-Year	21,908
Complete	22,356

Data Source: Alberta Cancer Registry

As of December 31, 2010, approximately **22,350** Albertans were alive who had previously been diagnosed with prostate cancer (*Table 3-3*) out of which approximately **4,050** Albertans were alive on the same date who had been diagnosed with prostate cancer in the previous two years, the period during which cases are more likely to receive definitive treatments.

Prostate 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 prostate cancer diagnoses in Albertan residents in a calendar year. Incidence rates are the number of new prostate 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 prostate 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 prostate cancer 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[3] method 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).

Figure 3-3: **Age-Standardized Incidence Rates (ASIRs)[*†] and Mortality Rates (ASMRs)[*†] and 95% Confidence Intervals (CI) for Prostate Cancer, Alberta, 1990-2010**
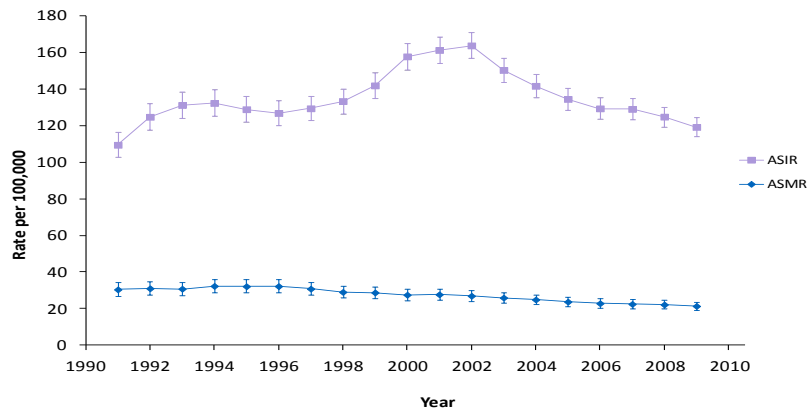
* Three-year moving average.
† Standardized to 1991 Canadian population.

Data Sources: Alberta Cancer Registry, Alberta Health

Since 1990 there have been two peaks in prostate cancer ASIRs (*Figure 3-3*). The peaks for prostate cancer incidence occurred in 1993 and 2002. The first peak in incidence may be attributed to the introduction of prostate specific antigen (PSA) testing for prostate cancer that occurred in the early 1990s[4]. 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[5]. Prostate cancer ASIRs increased significantly by 12.5% annually between 1990 and 1993, remained stable between 1993 and 1997, and increased significantly again by 8.0% annually between 1997 and 2001. However, from 2001 to 2010 prostate cancer ASIRs decreased significantly by 4.4% annually. In 2010, the ASIR for prostate cancer was 108 per 100,000 male population.

Prostate cancer mortality rates have been much lower and more stable than incidence rates. Prostate cancer mortality rates were stable between 1990 and 1995. However, from 1995 to 2010, prostate cancer ASMRs decreased

significantly by 3.1% annually (*Figure 3-3*). In 2010, the ASMR for prostate cancer was 19 per 100,000 male population.

Prostate Cancer Incidence

The following three figures (*Figures 3-4* to *3-6*) provide information on prostate cancer incidence in Alberta. The number of new cancer cases in Alberta is affected not only by changes in the incidence rates, but also by the changes in the age structure and growth of the population. In order to compare trends over time, age-standardized incidence rates (ASIRs) are also provided.

In *Figure 3-4* observed age standardized incidence rates are shown for 1990-2009, and *projected* rates for 2010 -2015, and observed numbers of new prostate cancer cases are shown for the years 1990-2010 and projected numbers for 2011-2015.

The projected cancer numbers were calculated by applying the estimated age-specific cancer incidence rates to the projected age-specific population figures provided by Alberta Health[6]. These were observed up to 2009 and estimated for 2010-2015. Caution should be exercised when comparing Canada[7] and Alberta rates as Canadian rates are yearly rates while Alberta rates are three-year moving averages.

The estimated prostate cancer incidence rates were calculated by extrapolating the historical trends in age-specific rate based on data for 1985-2009.

Figure 3-4: **Actual and Projected Number of New Cases and Age-Standardized Incidence Rates (ASIRs)**[*†] **for Prostate Cancer, Alberta, 1990-2015**
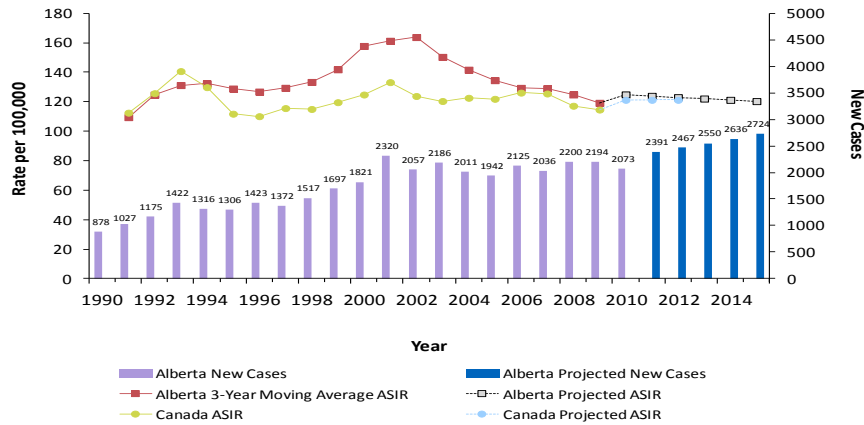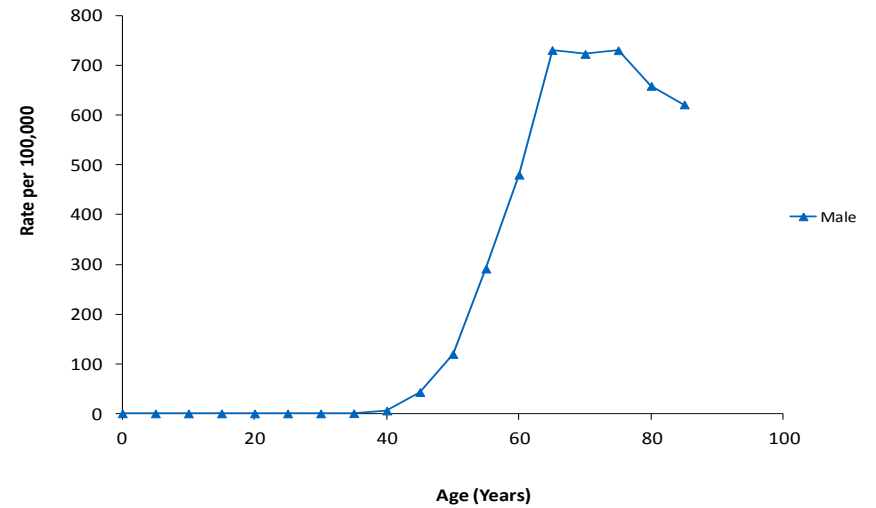

* Three-year moving average.
† Standardized to 1991 Canadian population.

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

In 2010, 2,073 cases of prostate cancer were diagnosed in Alberta (*Figure 3-4*). Overall, ASIRs for prostate cancer in Alberta were generally higher than ASIRs in Canada over the period 1994 to 2009. However the ASIRs peaked in the same time period for both Alberta and Canada.

Approximately 2,700 prostate cancer cases will be diagnosed in Alberta in 2015.

Figure 3-5: **Age-Specific Incidence Rates for Prostate Cancer, Alberta, 2006-2010**

Data Sources: Alberta Cancer Registry, Alberta Health

Age-specific prostate cancer incidence rates remain low until about the age of 40, when they begin rising rapidly and peak at approximately age 65 (*Figure 3-5*) and then decrease slightly afterwards. The highest prostate cancer incidence rates occur in the older age groups.

Figure 3-6: **Age-Standardized Incidence Rates (ASIRs)[*†] and 95% Confidence Intervals (CI) for Prostate Cancer, Age Groups <60, 60-69, 70-79, and 80+,Alberta, 1990-2010**
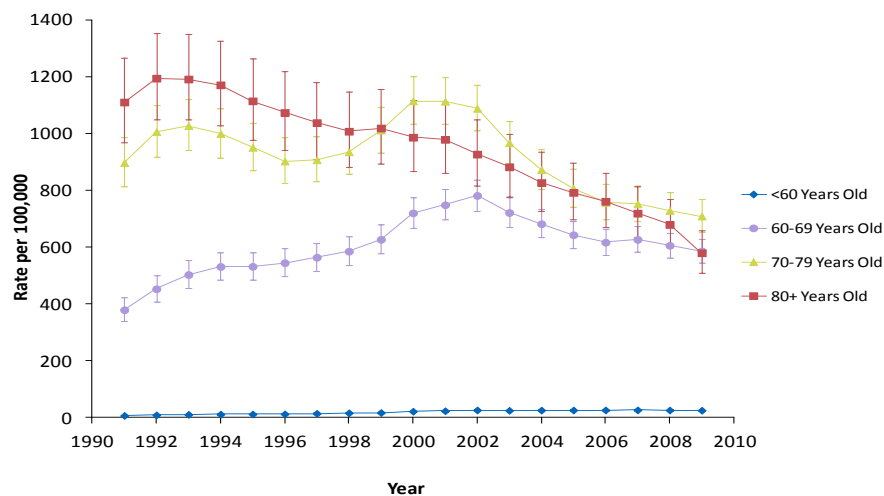
[*] Three-year moving average.
[†] Standardized to 1991 Canadian population.

Data Sources: Alberta Cancer Registry, Alberta Health

The trends in age-standardized prostate cancer incidence rates differ across age groups (*Figure 3-6*).

Incidence rates for prostate cancer in the <60 year age group increased significantly between 1990 and 2001 by 13.5% annually with no significant change after 2001.

Prostate cancer incidence rates for the 60-69 year age group increased significantly between 1990 and 2001 by 6.6% annually and decreased significantly between 2001 and 2010 by 3.5% annually.

Prostate cancer incidence rates for the 70-79 year age group increased significantly between 1990 and 1993 by 10.5% annually and did not significantly change between 1993 and 1997. Between 1997 and 2001, the rates increased significantly by 9.0% annually followed by a significant

decrease between 2001 and 2005 of 10.1% annually. The rates remained stable between 2005 and 2010.

Prostate cancer incidence rates for the 80+ year age group remained stable between 1990 and 1992, but decreased significantly between 1992 and 2008 by 3.4% annually followed by a sharp decrease from 2008 to 2010 by 18.7% annually.

The rates for the <60 year age group were lower than those for all other age groups.

Prostate Cancer Mortality

The following three figures (**Figures 3-7 to 3-9**) provide information on prostate cancer mortality in Alberta. The number of deaths in Alberta is affected not only by changes in the mortality rates, but also by the changes in the age structure and growth of the population. In order to compare trends over time, age-standardized mortality rates (ASMRs) are also provided.

In **Figure 3-7** observed age standardized mortality rates are shown for 1990-2009, and *projected* rates for 2010 -2015, and observed numbers of cancer deaths are shown for the years 1990-2010 and projected numbers for 2011-2015.

The projected numbers of cancer deaths were calculated by applying the estimated age-specific cancer mortality rates to the age-specific population figures provided by Alberta Health[6]. These were observed up to 2009 and estimated for 2010-2015. Caution should be exercised when comparing Canada[7] and Alberta rates as Canadian rates are yearly rates while Alberta rates are three-year moving averages.

The estimated prostate cancer mortality rates were calculated by extrapolating the historical trends in age-specific rate based on data in 1985-2009.

Figure 3-7: **Actual and Projected Number of Deaths and Age-Standardized Mortality Rates (ASMRs)[*†] for Prostate Cancer, Alberta, 1990-2015**
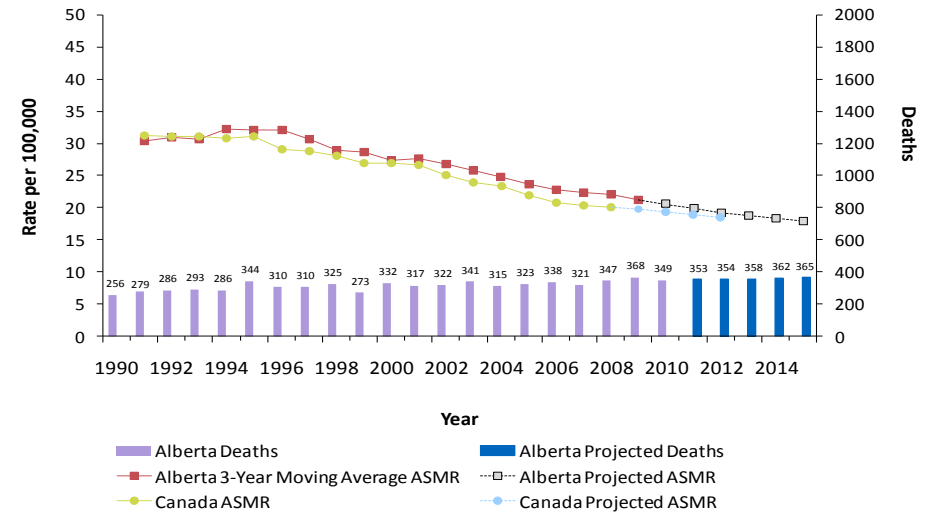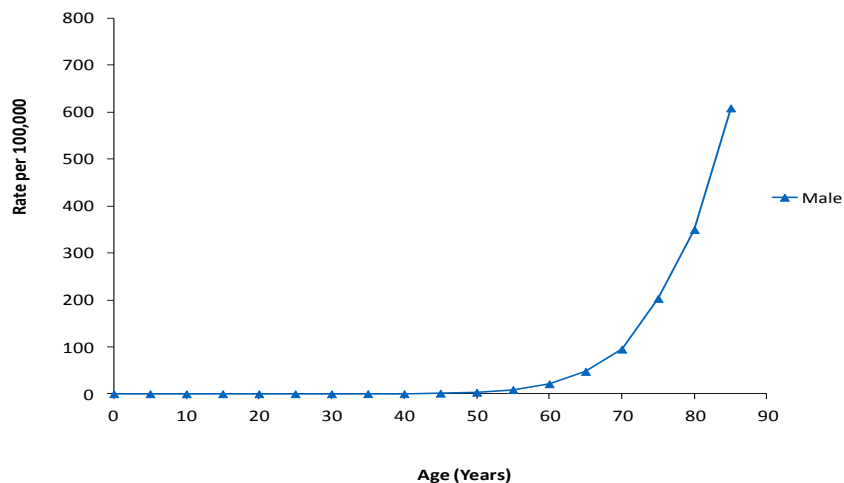

* Three-year moving average.
† Standardized to 1991 Canadian population.

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

In 2010, 349 males died of prostate cancer in Alberta (*Figure 3-7*). Alberta ASMRs for prostate cancer were similar to those in Canada over the period 1991 to 1993 and were generally higher than ASMRs in Canada over the period 1994 to 2008.

Approximately 360 males are expected to die from prostate cancer in Alberta in 2015.

Figure 3-8: Age-Specific Mortality Rates for Prostate Cancer, Alberta, 2006-2010
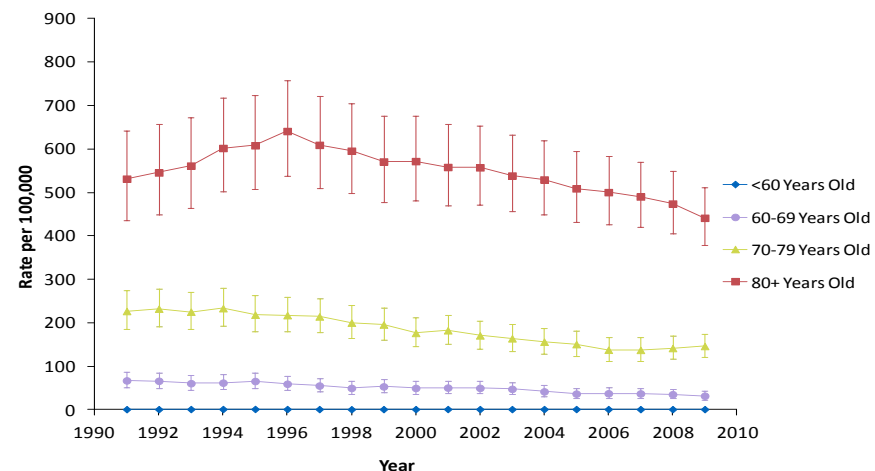

Data Sources: Alberta Cancer Registry, Alberta Health

Prostate cancer mortality rates remain low until about the age of 55 and begin to rise rapidly thereafter (*Figure 3-8*). The highest prostate cancer mortality rates occur in the older age groups.

The trends in age-standardized prostate cancer mortality rates vary over time and with age (*Figure 3-9*).

Figure 3-9: Age-Standardized Mortality Rates (ASMRs)[*†] and 95% Confidence Intervals (CI) for Prostate Cancer, Ages <60, 60-69, 70-79, and 80+, Alberta, 1990-2010

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

Data Sources: Alberta Cancer Registry, Alberta Health Prostate cancer mortality rates in the age group <60 did not significantly change between 1990 and 2010.

Mortality rates for prostate cancer in the age group 60-69 decreased significantly between 1990 and 2010 by 4.0% annually.

Mortality rates for prostate cancer in the age group 70-79 decreased significantly between 1990 and 2010 by 3.0% annually.

Mortality rates for prostate cancer in the age group 80+ increased significantly between 1990 and 1996 by 3.7% annually, but decreased significantly by 2.7% annually between 1996 and 2010.

The older the age group, the higher the mortality rate.

Prostate Cancer Survival

Cancer survival ratios indicate the proportion of people who will be alive at a given time after they have been diagnosed with cancer. Survival is an important outcome measure and is used for evaluating the effectiveness of cancer control programs. Survival depends on several factors including the cancer type (most importantly site, 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. In this section of the report, 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.

RSRs are estimated by the *cohort method*[8] 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*.[9] 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 3-10: **Age-Standardized One, Three and Five-Year Relative Survival Ratios and 95% Confidence Intervals (CI) for Prostate Cancer, Alberta, 1991-1993**[*]**, 1998-2000**[*] **and 2008-2010**[†]
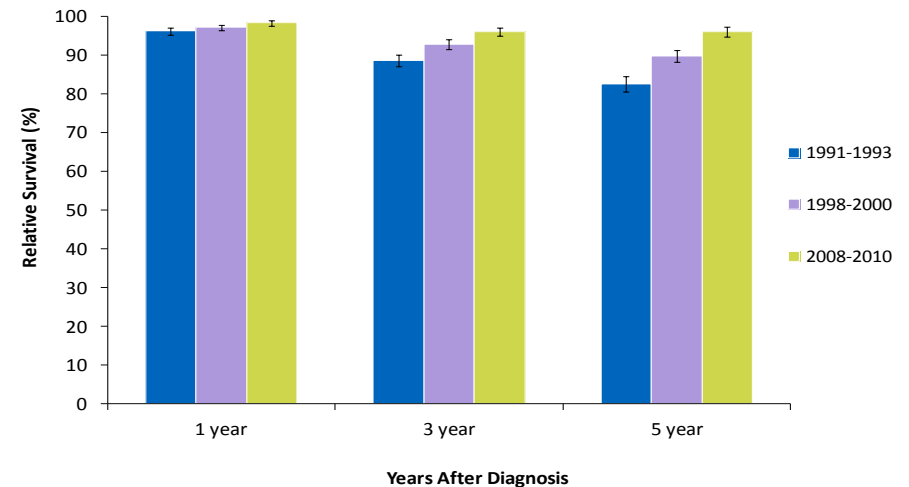
* Ratios calculated by cohort method, where complete follow-up data are available.
† Ratios calculated by period method, where complete follow-up data are not available.

Data Sources: Alberta Cancer Registry, Statistics Canada

The five-year relative survival ratio for males diagnosed with prostate cancer in the period 2008-2010 is an estimated 96% indicating that out of all males diagnosed with this 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.

The five-year relative survival ratio for males diagnosed with prostate cancer in Alberta has improved in 2008-2010 compared to those diagnosed in 1991-1993 (*Figure 3-10*).

Geographic Variation

The geographic variation section illustrates how the observed prostate cancer rates in each health zone compare with the provincial average. These rates are three-year averages. The age standardized incidence and mortality prostate cancer rates for each zone and the province are presented with their corresponding 95% *confidence intervals*.[10] Any observed differences in rates may be due to several factors such as regional differences in:
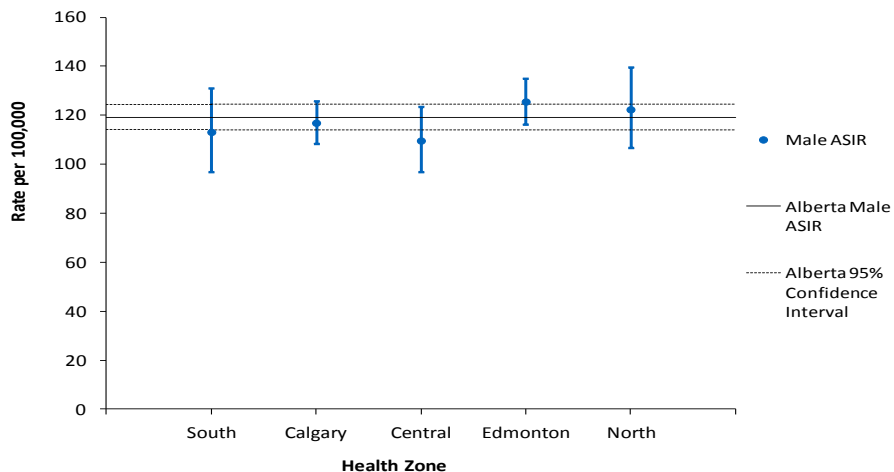
- risk factors such as smoking and obesity rates
- prevention efforts
- cancer screening
- diagnostic activity
- access to cancer care.[11]

Figure 3-11: **Five Health Zones in Alberta, 2010**

Source: Alberta Health Services

Figure 3-12: **Age-Standardized Incidence Rates (ASIRs)[*†] and 95% Confidence Intervals (CI) for Prostate Cancer by Zones, Alberta, 2008-2010**

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

Data Sources: Alberta Cancer Registry, Alberta Health

There is no evidence that male prostate cancer ASIRs in each zone is significantly higher or lower than the provincial average (*Figure 3-12*).

Figure 3-13: **Age-Standardized Mortality Rates (ASMRs)[*†] and 95% Confidence Intervals (CI) for Prostate Cancer by Zones, Alberta, 2008-2010**
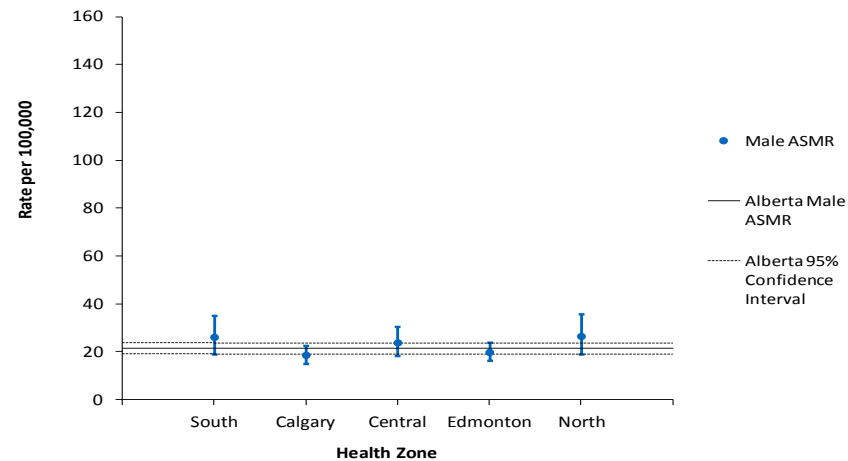

* Three-year average.
† Standardized to 1991 Canadian population.

Data Sources: Alberta Cancer Registry, Alberta Health

There is no evidence that male prostate cancer ASMRs in each zone is significantly higher or lower than the provincial average (*Figure 3-13*).

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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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