



**Alberta Health  
Services**

# **2012 Report on Cancer Statistics in Alberta**

## **Prostate Cancer**

*Surveillance & Reporting*

*CancerControl AB*

*February 2015*



## Acknowledgements

---

This report was made possible through Surveillance & Reporting, Cancer Measurement Outcomes Research and Evaluation (C-MORE), CancerControl AB, Alberta Health Services, and the many contributions of individuals across Alberta Health Services as well as external agencies and individuals.

The authors wish to thank individuals working in the following AHS departments and partner agencies for their contributions to this report: Alberta Cancer Registry; Population, Public and Aboriginal Health; Alberta Health and Statistics Canada. Contributions included provision of information, analysis and interpretation, and assistance with consultation sessions and communication of the report.

- *Report Editor:*  
**Dr. Lorraine Shack**, *Director, Surveillance & Reporting*
- *Project Coordinator:*  
**Bethany Kaposhi**, *Epidemiologist*
- *Analysis and Review:*  
**Dr. Zhenguo Qiu**, *Biostatistician*  
**Li Huang**, *Senior Surveillance Analyst*  
**Jingyu Bu**, *Senior Surveillance Analyst*  
**Anthony Karosas**, *Surveillance Analyst*  
**Andrew Min**, *Assistant Programmer Analyst*  
**Lee-Anne Weeks**, *Analyst*  
**Michael Taylor**, *Senior Analyst*  
**Shuang Lu**, *Senior Surveillance Analyst*  
**Ting Liu**, *Programmer*
- *Design Assistance:*  
**Kira Kulicki**, *Communications Coordinator, Alberta Cancer Clinical Trials*

### **Suggested Citation:**

Surveillance & Reporting: *2012 Report on Cancer Statistics in Alberta*. Edmonton: CancerControl AB, Alberta Health Services, 2015.

### **For More Information:**

Visit our website: <http://www.albertahealthservices.ca/1703.asp>

## Table of Contents

---

<b>Purpose of the Report .....</b>	<b>4</b>
<b>Navigating the Report.....</b>	<b>4</b>
<b>Data Notes.....</b>	<b>4</b>
<b>Summary .....</b>	<b>5</b>
<b>Demography .....</b>	<b>6</b>
<b>Probability of Developing or Dying from Prostate Cancer .....</b>	<b>8</b>
<b>Potential Years of Life Lost.....</b>	<b>10</b>
<b>Prevalence .....</b>	<b>11</b>
<b>Prostate Cancer Incidence and Mortality .....</b>	<b>12</b>
<b>Prostate Cancer Incidence .....</b>	<b>14</b>
<b>Prostate Cancer Mortality.....</b>	<b>19</b>
<b>Prostate Cancer Survival.....</b>	<b>23</b>
<b>Geographic Variation.....</b>	<b>26</b>
<b>Further Information .....</b>	<b>29</b>
<b>References .....</b>	<b>30</b>
<b>Contact Information .....</b>	<b>31</b>

## 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 and the goal to make Alberta a place where most cancers are prevented, more 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 prostate (see **Appendix** for cancer definitions) 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 14, 2014.

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

## Summary

---

- Prostate cancer is the most commonly diagnosed cancer in males. Approximately **1 in 6** men will develop invasive prostate cancer within their lifetime.
- Survival for prostate cancer is very good. The five-year relative survival for prostate cancer in Alberta is approximately **93%** for those diagnosed between 2010 and 2012 which is a significant improvement over those diagnosed in 1992-1994 (**83%**). This means that those diagnosed in 2010 to 2012 are about 93% as likely to be alive 5 years after their diagnoses as men of the same age who has not been diagnosed with cancer.
- Generally, cancers diagnosed in earlier stages (I & II) have better survival. Almost **80%** of prostate cancer cases were diagnosed in stage I or II from 2010-2012. Three year relative survival is **100%** for males diagnosed in stages I, II or III and **52%** for those diagnosed in stage IV.
- The high survival for prostate cancer and commonality of prostate cancer means that for males this cancer type has the most survivors. As of December 31, 2012, approximately **24,850** Albertans were alive who had previously been diagnosed with prostate cancer.
- In 2012, there were **2,338** new cases of prostate cancer in Alberta and **344** deaths due to the disease. Prostate cancer incidence has remained stable while mortality has consistently decreased between 1992 and 2012. It is estimated there will be approximately **2,500** cases of prostate cancer diagnosed in 2017. The majority of the increase in the number of cases diagnosed since 1992 will be due to aging (**82%**) and population growth (**62%**).
- Prostate cancer incidence rates remain low until age 40, when they begin rising rapidly and peak at approximately age 65 and decrease afterwards. There are no significant differences in the incidence or mortality of Prostate cancer between the five Alberta Health Zones.
- 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, **3,209** potential years of life were lost due to prostate cancer.

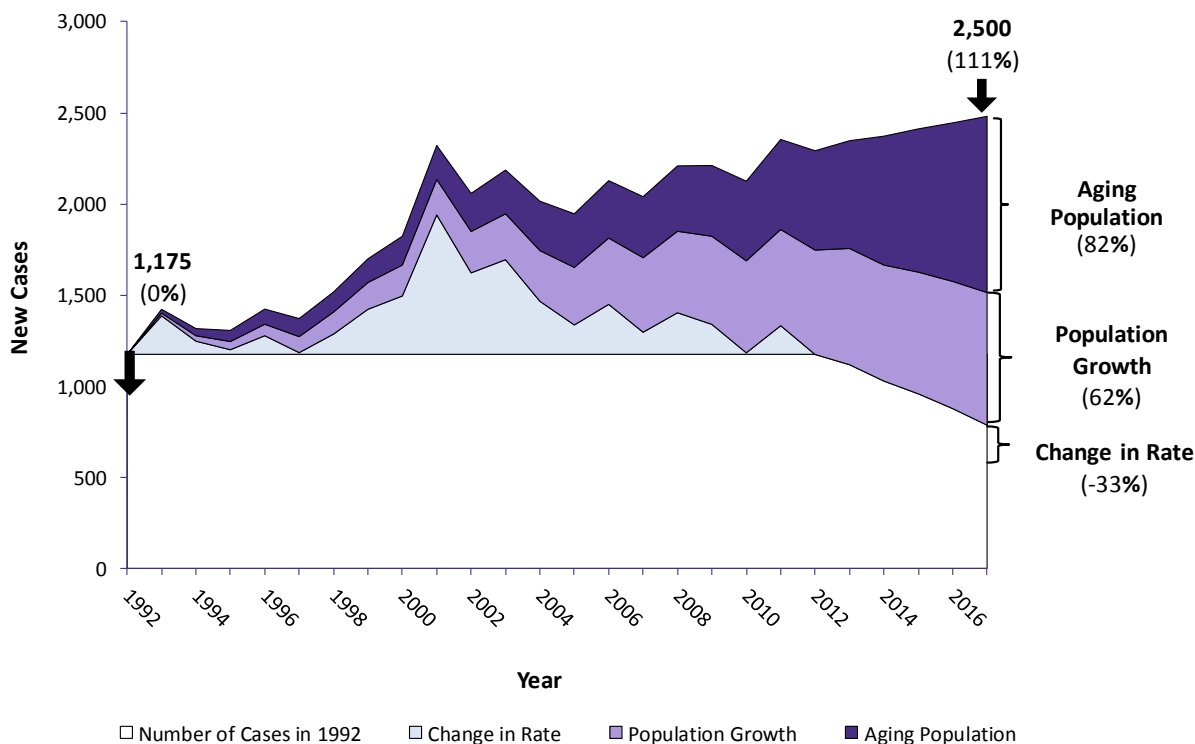
---

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

## Demography

A large reduction in the prostate cancer rate has resulted in a reduction of the total number of new cases of prostate cancer since 2010 in opposition to the increasing effects of population growth and population ageing (**Figure 4-1**).

**Figure 4-1: Trends in New Cases of Prostate Cancer Attributed to Aging Population, Population Growth and Change in Prostate Cancer Rate, Alberta, 1992-2017**



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

The horizontal black line indicating 1,175 new cases in **Figure 4-1** represents the number of prostate cancer cases that occurred in 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 prostate cancer cases due to the impact of rate change, population growth and aging population.

The light blue shaded area (immediately above the horizontal black line and overlapped by the light purple shaded area in 2012-2017) represents the total number of new prostate cancer 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 a 33% decrease in new prostate cancer cases in 2017.

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 but the population age distribution had remained the same as in 1992. This will account for approximately 62% of the total increase in new

prostate cancer cases in 2017.

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. This will account for approximately 82% of the total increase in new prostate cancer cases in 2017.

## Probability of Developing or 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 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 the risk behaviours and exposures of the individual. In addition, someone diagnosed with cancer has a higher probability of developing another cancer in the future.<sup>1</sup>

**Table 4-1: Probability of Developing Prostate Cancer by Age, Alberta, 2008-2012**

Age Group	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 324
50 - 60	1 in 48
60 - 70	1 in 17
70 - 80	1 in 14
80+	1 in 15

---

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

The probability of developing prostate cancer increases with age (**Table 4-1**). 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 **Table 4-1**. For instance, a prostate cancer-free male at age 50 has a 1 in 48 chance of developing prostate cancer by the time he is 60.



**Table 4-2: Probability of Dying from Prostate Cancer by Age, Alberta, 2008-2012**

Age Group	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 1,797
60 - 70	1 in 317
70 - 80	1 in 78
80+	1 in 23

---

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

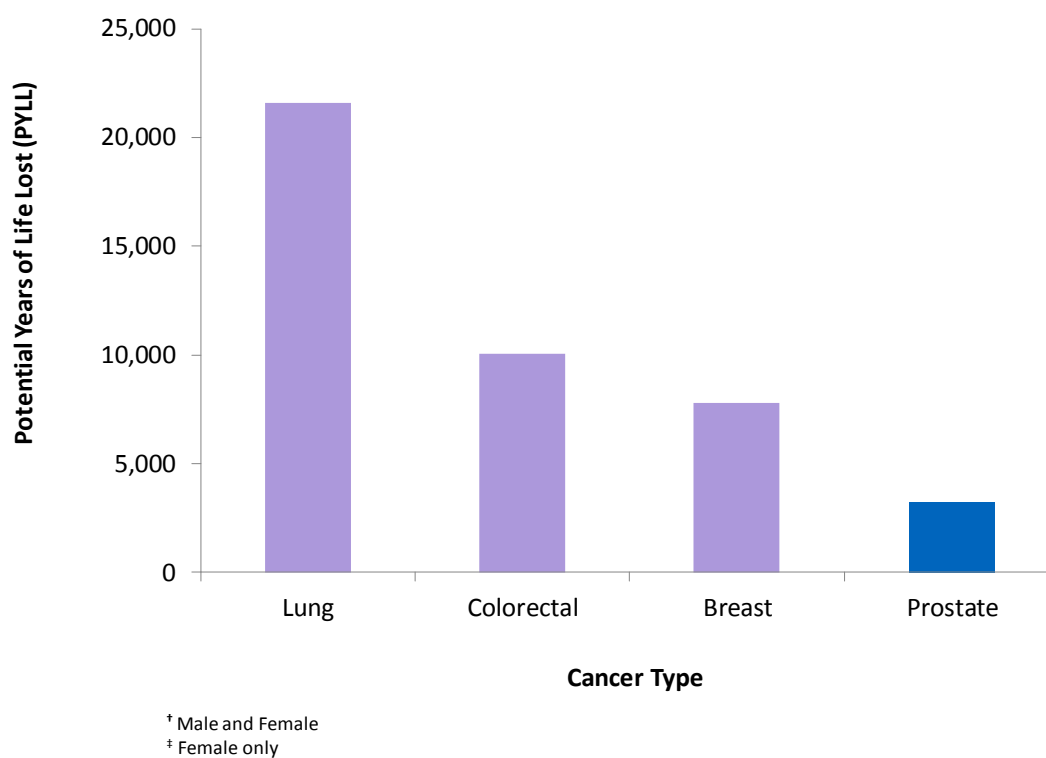
The probability of dying from prostate cancer varies by age (**Table 4-2**). Approximately 1 in 26 males will die of invasive prostate cancer.

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 **Table 4-2**. For example, a cancer-free male at age 50 has a 1 in 1,797 chance of dying from prostate cancer by the time he is 60.

## 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.

**Figure 4-2: Potential Years of Life Lost (PYLL) from Prostate Cancer Compared with Lung<sup>†</sup>, Colorectal<sup>†</sup> and Breast<sup>‡</sup> Cancer, Alberta, 2012**



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

In 2012, **3,209** potential years of life were lost due to prostate cancer, which constitutes 3.5% of PYLL for all cancers (**Figure 4-2**). While survival for prostate cancer is relatively high, it is the most frequently diagnosed cancer in males and therefore accounts for a higher number of potential years of life lost than many other cancers.

## Prevalence

---

The **prevalence** of a disease is defined as the number of people alive 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 number of years (e.g. 2, 5, 10 or 20 years) while complete prostate cancer prevalence represents the proportion of people alive on a certain day who had previously been diagnosed with prostate cancer, regardless of how long ago the diagnosis was.<sup>2</sup>

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, 2012 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.

As of December 31, 2012, approximately **24,850** Albertans were alive who had previously been diagnosed with prostate cancer (**Table 4-3**). In addition, there were **4,500** Albertans alive who had been diagnosed with prostate 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 4-3: Limited-Duration and Complete Prevalence for Prostate Cancer, Alberta, 2012**

Duration	Prevalence (#)
2-Year	4,500
5-Year	10,150
10-Year	17,600
20-Year	24,250
Complete (Ever Diagnosed)	24,850

---

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

# Prostate Cancer Incidence and Mortality

---

## Introduction

**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 Alberta 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 prostate cancer in Alberta 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. These rates are useful because they are adjusted for differences in age distributions in a population over time, which permits 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.

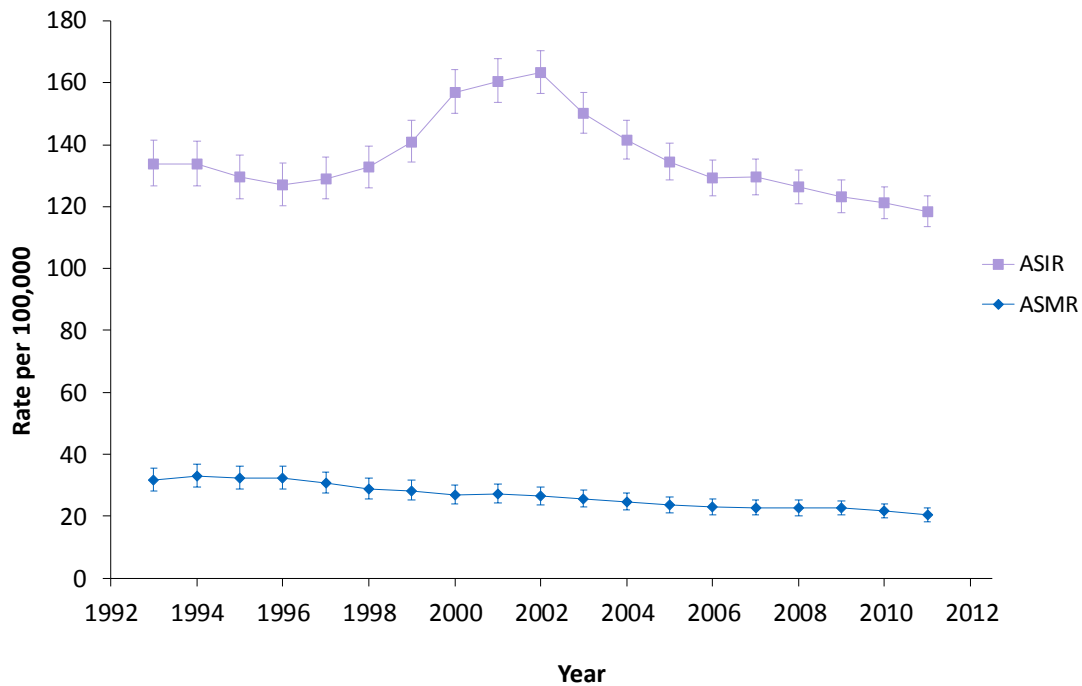
Incidence and mortality can be affected by the implementation of public health prevention or screening strategies that either prevent disease or find cancer in its early **stages** when treatment is generally more successful, the development of cancer treatment programs that may impact chances of survival 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 Joinpoint<sup>3</sup> 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).

---

\* 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 4-3: Age-Standardized Incidence Rates (ASIRs)<sup>†</sup> and Mortality Rates (ASMRs)<sup>†</sup> with 95% Confidence Intervals (CI) for Prostate Cancer, Alberta, 1992-2012**



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

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

The peak for prostate cancer incidence occurred in 2001 (**Figure 4-3**). It has been speculated that this peak was the result of increased PSA screening test activity after the former Federal Minister of Health, Allan Rock, was diagnosed with prostate cancer in 2001<sup>4,5</sup>. Prostate cancer ASIRs have not changed significantly from 1992 to 2012. In 2012, the ASIR for prostate cancer was 116.6 per 100,000 male population.

Prostate cancer mortality rates have been much lower and more stable than incidence rates. Between 1992 and 2012, prostate cancer mortality significantly decreased by 2.6% annually (**Figure 4-3**). In 2012, the ASMR for prostate cancer was 19.2 per 100,000 male population.

## Prostate Cancer Incidence

The following four figures (**Figures 4-4 to 4-7**) provide information on prostate cancer incidence in Alberta. The number of new cancer cases in Alberta is affected not only by changes in the underlying risk of developing prostate cancer, 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 4-4** observed age standardized incidence rates are shown for 1992 to 2011, and **projected** rates for 2012 to 2017, and observed numbers of new prostate cancer cases are shown for the years 1992 to 2012 and projected numbers for 2013 to 2017.

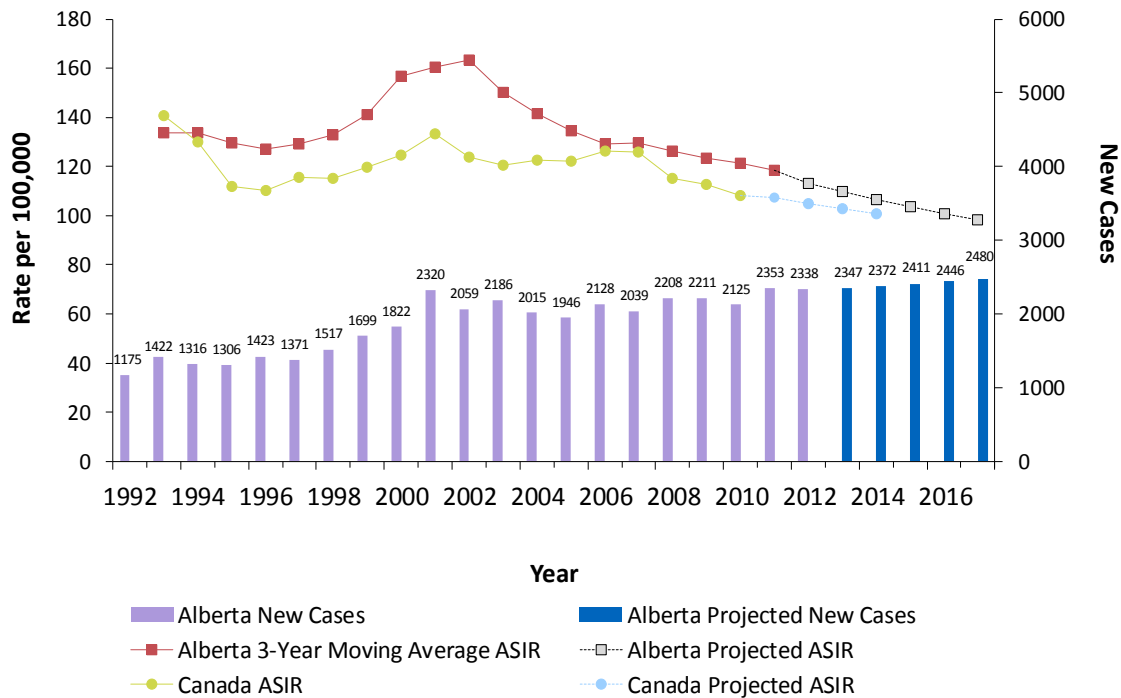
The projected cancer numbers were calculated by applying the estimated age-specific cancer incidence rates to the projected age-specific population figures provided by Alberta Health<sup>6</sup>. These were observed up to 2011 (due to the use of three-year moving averages) and estimated for 2012 to 2017. Caution should be exercised when comparing Canada<sup>7</sup> 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 from 1987 to 2011.

Cancer **stage** is an important factor in determining treatment and **prognosis**; generally, the earlier the diagnosis, the better the outcome. The American Joint Committee on Cancer (AJCC) classification defines cancer stage based on the knowledge that cancers of the same anatomic site and histology share similar patterns of growth and similar outcomes. The Alberta Cancer Registry started to record the stage at diagnosis for prostate cancer in 2005 using the collaborative staging system which is based on AJCC, 6<sup>th</sup> Edition.<sup>8</sup>

**Figure 4-7** provides information on the proportion of new cases diagnosed at each stage in three cohorts: 2005-2006, 2007-2009 and 2010-2012. Proportional and multiplicative odds models<sup>9</sup> are employed to analyze the annual change of cancer stage distribution.

**Figure 4-4: Actual and Projected Number of New Cases and Age-Standardized Incidence Rates (ASIRs)\*\*† for Prostate Cancer, Alberta, 1992-2017**



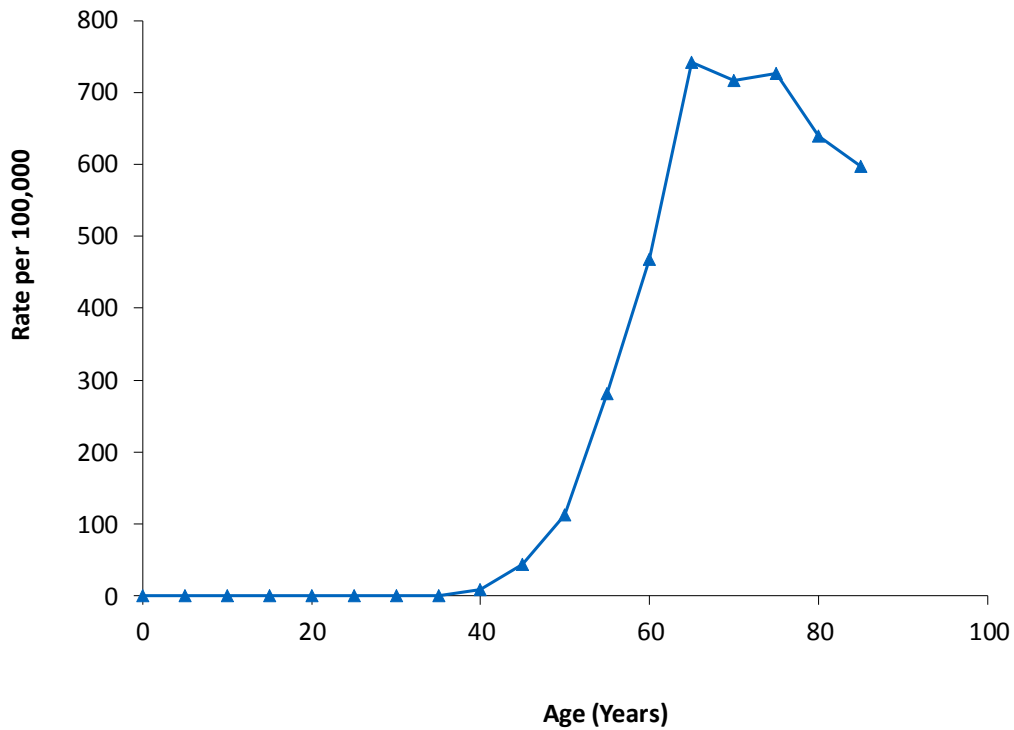
\* Three-year moving average.  
 † Standardized to 1991 Canadian population.

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

In 2012, 2,338 cases of prostate cancer were diagnosed in Alberta (**Figure 4-4**). This represents approximately two times more cases than diagnosed in 1992. Overall, ASIRs for prostate cancer in Alberta were generally higher than ASIRs in Canada.

It is estimated that 2,500 cases of prostate cancer will be diagnosed in Alberta in 2017.

**Figure 4-5: Age-Specific Incidence Rates for Prostate Cancer, Alberta, 2008-2012**

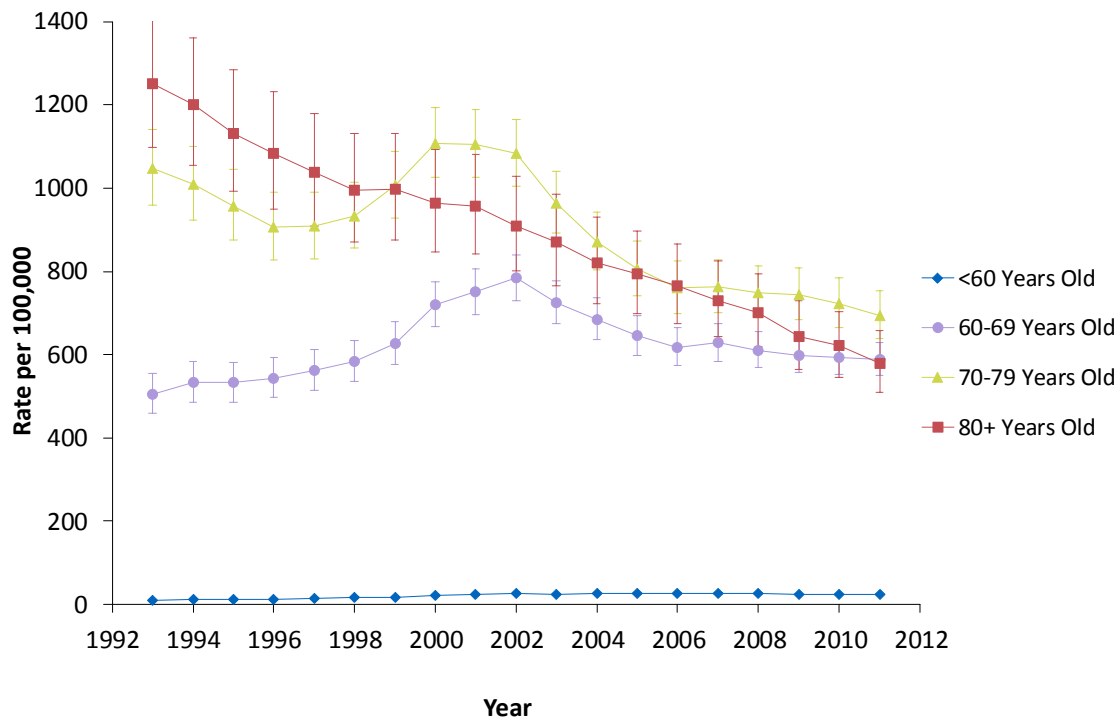


**Data Source:** Alberta Cancer Registry, Alberta Health Services; Alberta Health

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 4-5**) and then decrease slightly afterwards. The highest prostate cancer incidence rates occur in the older age groups.



**Figure 4-6: Age-Standardized Incidence Rates (ASIRs)<sup>†</sup> with 95% Confidence Intervals (CI) for Prostate Cancer, Age Groups <60, 60-69, 70-79, and 80+, Alberta, 1992-2012**



\* Three-year moving average.

† Standardized to 1991 Canadian population.

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

Age-standardized prostate cancer incidence rates differ across age groups (**Figure 4-6**).

Incidence rates for prostate cancer in the <60 year age group significantly increased between 1992 and 2001 by 13.1% annually with no significant change after 2001.

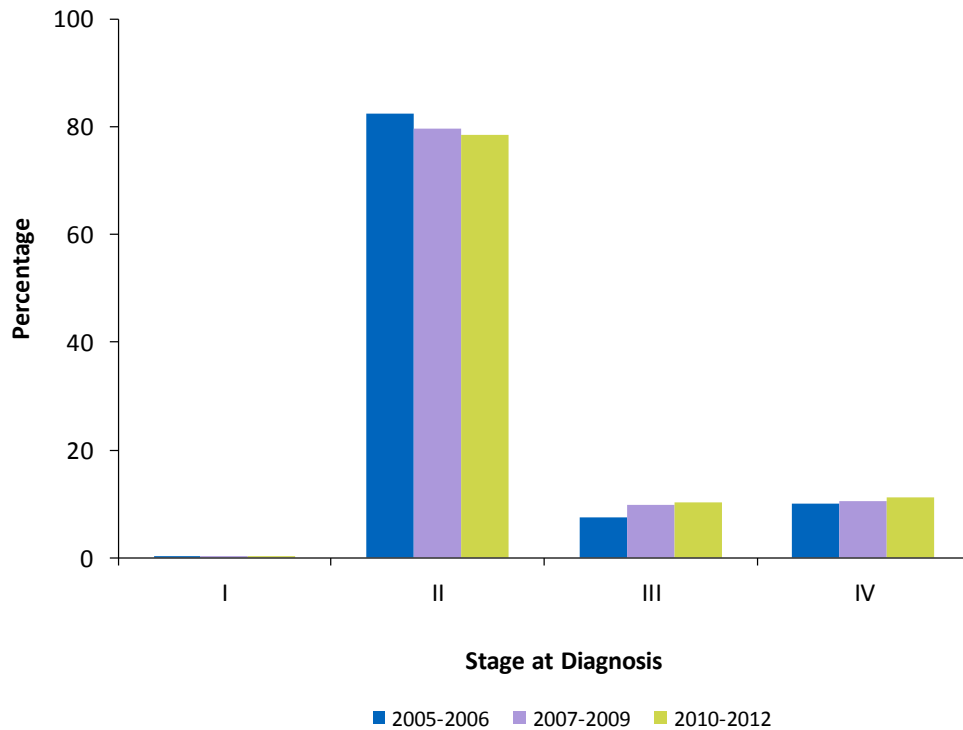
Prostate cancer incidence rates for the 60-69 year age group significantly increased between 1992 and 2001 by 5.6% annually and significantly decreased between 2001 and 2012 by 2.4% annually.

Prostate cancer incidence rates for the 70-79 year age group significantly decreased between 1992 and 1997 by 4.5% annually and did not significantly change between 1997 and 2001. Between 2001 and 2005, the rates significantly decreased by 9.8% annually. The rates remained stable between 2005 and 2012.

Prostate cancer incidence rates for the 80+ year age group significantly decreased between 1992 and 2012 by 3.9% annually.

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

**Figure 4-7: Relative Distribution of New Cases by Stage at Diagnosis and Cohort for Prostate Cancer, Alberta, 2005-2006, 2007-2009, 2010-2012**



\* Stage at diagnosis based on AJCC 6th Ed.; Stage 0 was combined with Stage I.

Approximately 80% of prostate cancer cases were diagnosed in stage II (**Figure 4-7**). Over the 8 years from 2005 to 2012, the early detection of prostate cancer has declined with more cases being diagnosed in later stages. This may reflect the reduction of PSA screening leading to fewer cases being diagnosed in early stages; however, the majority of prostate cancer is still detected at stage II.

## Prostate Cancer Mortality

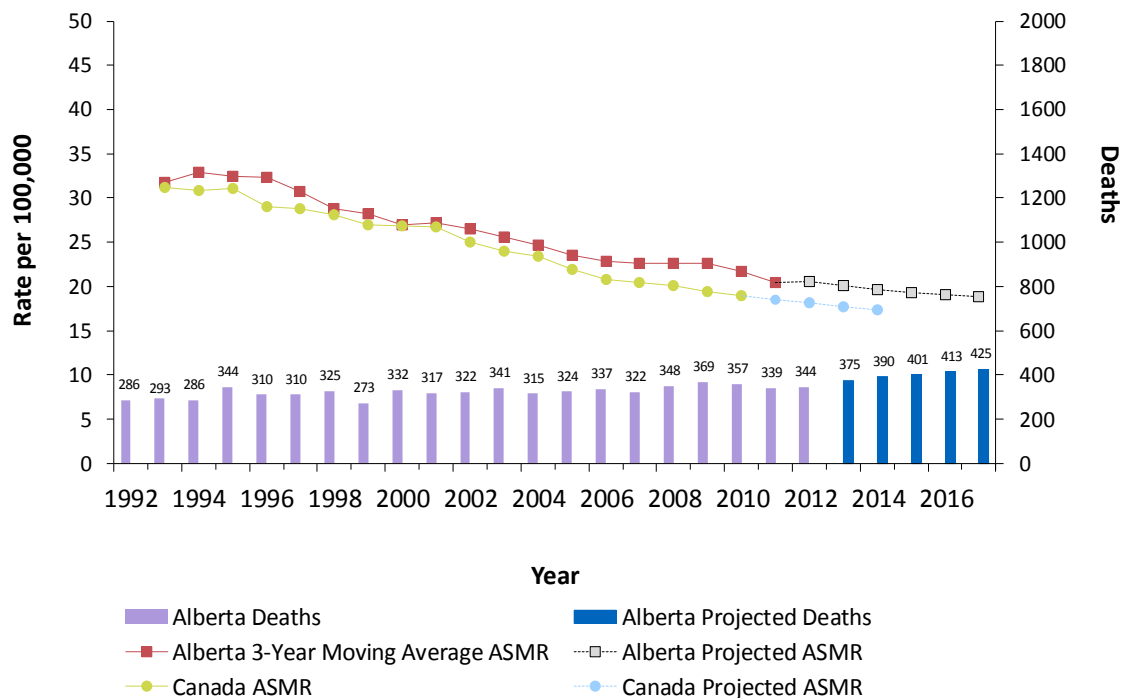
The following three figures (**Figures 4-8 to 4-10**) provide information on prostate cancer mortality in Alberta. The number of deaths in Alberta is affected not only by changes in the underlying risk of dying from prostate cancer, but also by the changes in the age structure and growth of the population. In order to compare trends over time, age-standardized mortality rates (ASMRs) are also provided.

In **Figure 4-8** observed age standardized mortality rates are shown for 1992 to 2011, and **projected** rates for 2012 to 2017, and observed numbers of prostate cancer deaths are shown for the years 1992 to 2012 and projected numbers for 2013 to 2017.

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<sup>6</sup>. These were observed up to 2011 (due to the use of three-year moving averages) and estimated for 2012 to 2017. Caution should be exercised when comparing Canada<sup>7</sup> 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 from 1987 to 2011.

**Figure 4-8: Actual and Projected Number of Deaths and Age-Standardized Mortality Rates (ASMRs)<sup>†</sup> for Prostate Cancer, Alberta, 1992-2017**



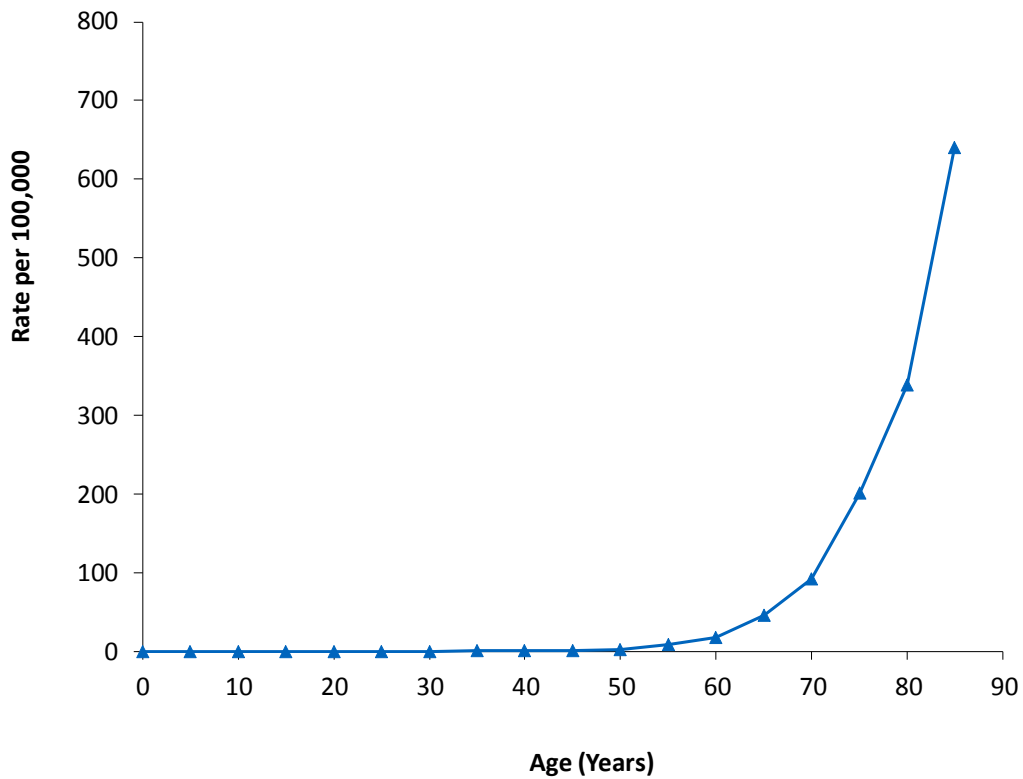
\* Three-year moving average.  
<sup>†</sup> Standardized to 1991 Canadian population.

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

In 2012, 344 males died of prostate cancer in Alberta (**Figure 4-8**). ASMRs for prostate cancer in Alberta were generally higher than ASMRs in Canada.

It is estimated that 430 males will die from prostate cancer in Alberta in 2017.

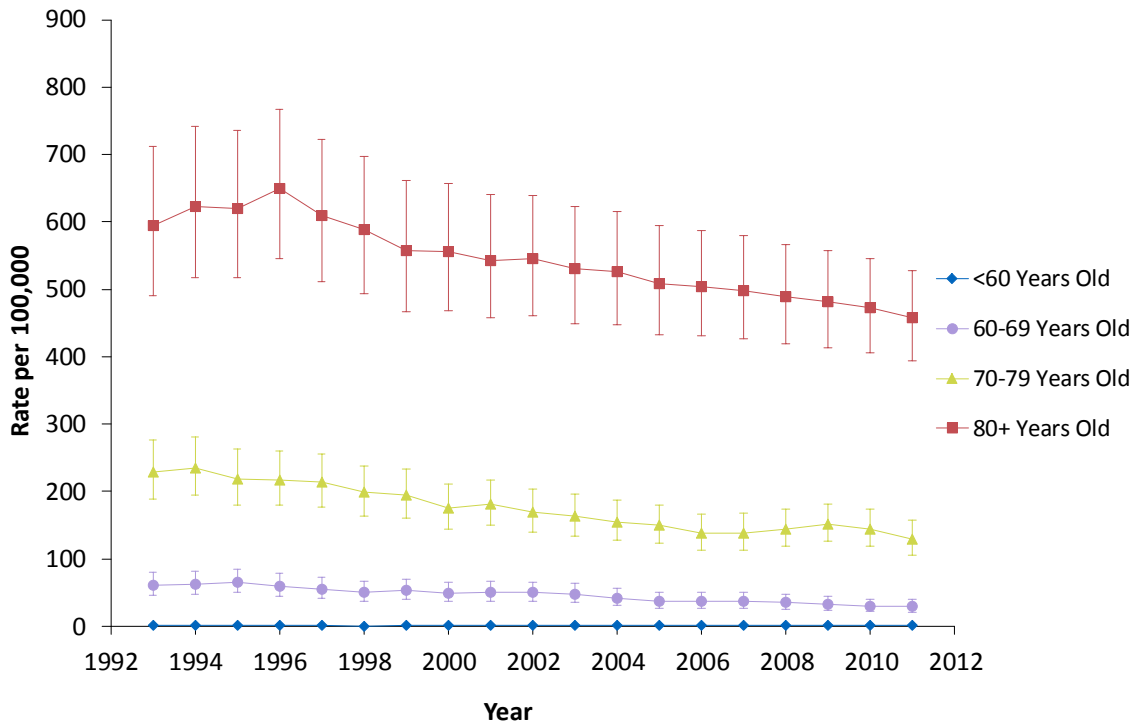
**Figure 4-9: Age-Specific Mortality Rates for Prostate Cancer, Alberta, 2008-2012**



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

Prostate cancer mortality rates remain low until about the age of 55 and begin to rise rapidly thereafter (**Figure 4-9**). The highest prostate cancer mortality rates occur in the older age groups.

**Figure 4-10: Age-Standardized Mortality Rates (ASMRs)<sup>†</sup> with 95% Confidence Intervals (CI) for Prostate Cancer, Ages <60, 60-69, 70-79, and 80+, Alberta, 1992-2012**



\* Three-year moving average.

† Standardized to 1991 Canadian population.

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

Age-standardized prostate cancer mortality rates vary over time and with age (**Figure 4-10**).

Prostate cancer mortality rates in the age group <60 did not significantly change between 1992 and 2012.

Mortality rates for prostate cancer in the age group 60-69, 70-79 and 80+ significantly decreased between 1992 and 2012 by 4.2%, 3.3% and 1.7% annually respectively.

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.

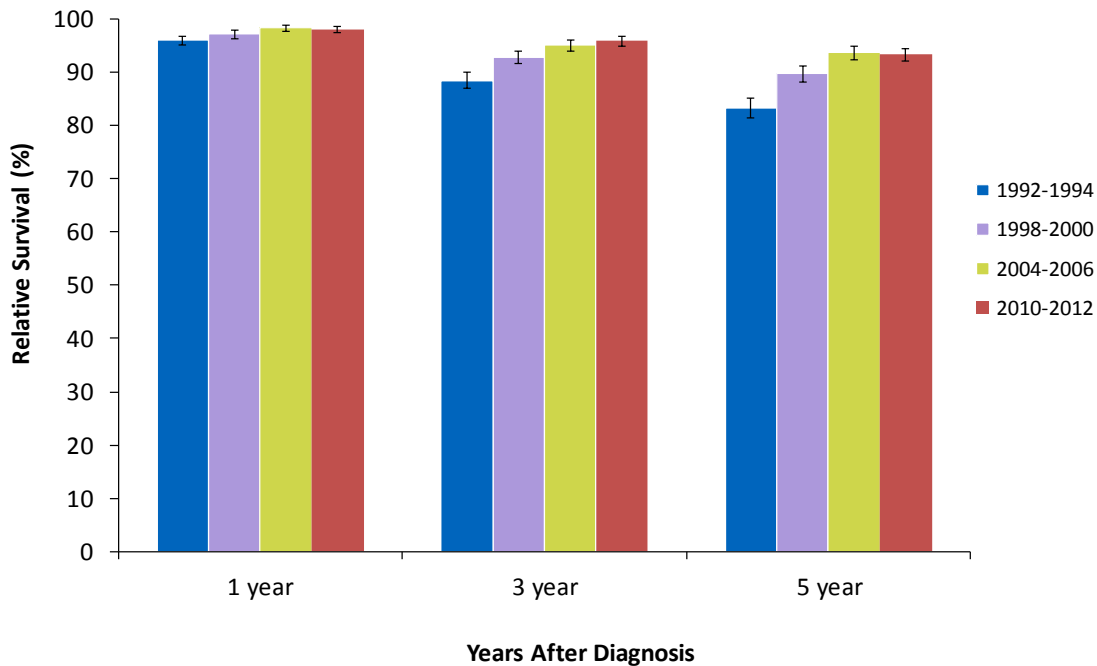
Survival depends on several factors including the cancer type (most importantly site, stage and morphology at diagnosis), sex, age at diagnosis, health status and available treatments for that cancer. While **relative survival ratios** (RSRs) give a general expectation of survival over the whole province, 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 year<sup>10</sup>. In this section of the report, 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.

RSRs are estimated by the **cohort method**<sup>10</sup> 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**<sup>11</sup>. 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 4-11: Age-Standardized One, Three and Five-Year Relative Survival Ratios with 95% Confidence Intervals (CI) for Prostate Cancer, Alberta, 1992-1994<sup>^</sup>, 1998-2000<sup>^</sup>, 2004-2006<sup>^</sup>, 2010-2012<sup>\*</sup>**



<sup>^</sup> Ratios calculated by cohort method, where complete follow-up data are available.

<sup>\*</sup> 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 ratio for males diagnosed with prostate cancer in the period 2010-2012 is estimated to be 93%.

The five-year relative survival ratio for males diagnosed with prostate cancer in Alberta improved significantly in 2010-2012 compared to those diagnosed in 1998-2000 cohort years (**Figure 4-11**).



**Table 4-4: One-, Two- and Three-Year Relative Survival Ratios<sup>†</sup> (%) for Prostate Cancer\* by Stage, Alberta, 2009-2012.**

Stage <sup>‡</sup>	Number of Cases	One-year Survival Rate (95% CI)	Two-year Survival Rate (95% CI)	Three-year Survival Rate (95% CI)
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)

<sup>†</sup> Ratios calculated by period method, where complete follow-up data are not available.

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

<sup>‡</sup> 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.

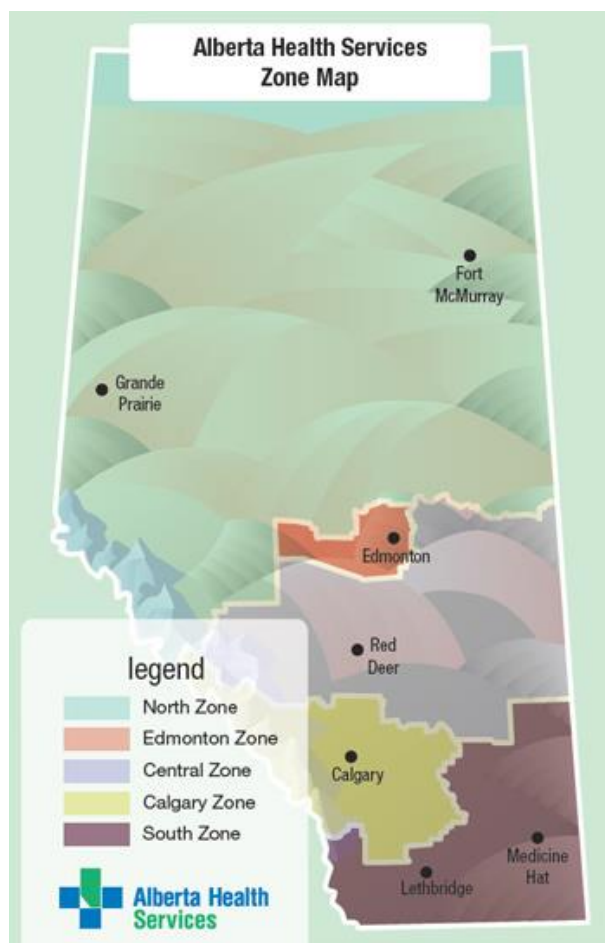
In 2009 to 2012, the majority of prostate cancer cases were diagnosed at stage II and all males who were diagnosed at stage I, II and III were alive three years after diagnosis. Even though the three-year relative survival ratio for males diagnosed with prostate cancer at stage IV (52%) is lower than that for those diagnosed at an earlier stage, it is higher than the survival ratios for other major cancers (**Table 4-4**).

## 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*<sup>12</sup>. The overall age standardized incidence and mortality rates for all of Alberta are presented with their corresponding 95% confidence intervals as horizontal lines on each graph. Any observed differences in rates may be due to several factors such as regional differences in:

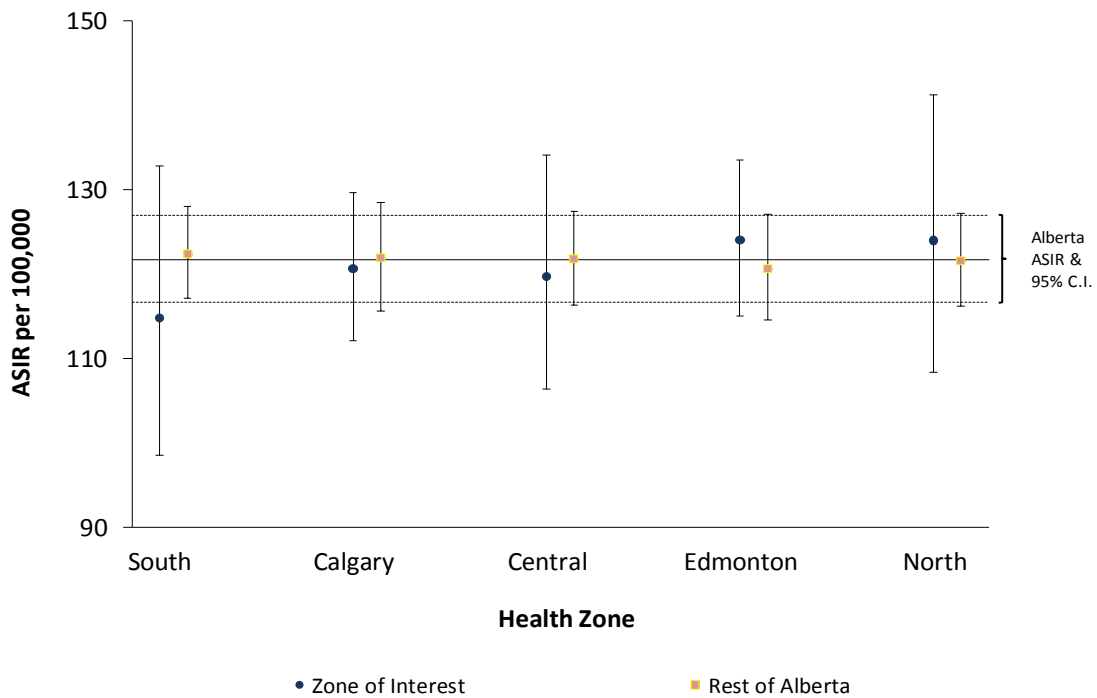
- individual risk factors
- prevention efforts
- cancer screening
- diagnostic activity
- access to cancer care.<sup>13</sup>

**Figure 4-12: Five Health Zones in Alberta, 2012**



Source: Alberta Health Services

**Figure 4-13: Age-Standardized Incidence Rates (ASIRs)<sup>†</sup> with 95% Confidence Intervals (CI) by Zone for Prostate Cancer, Alberta, 2008-2012**

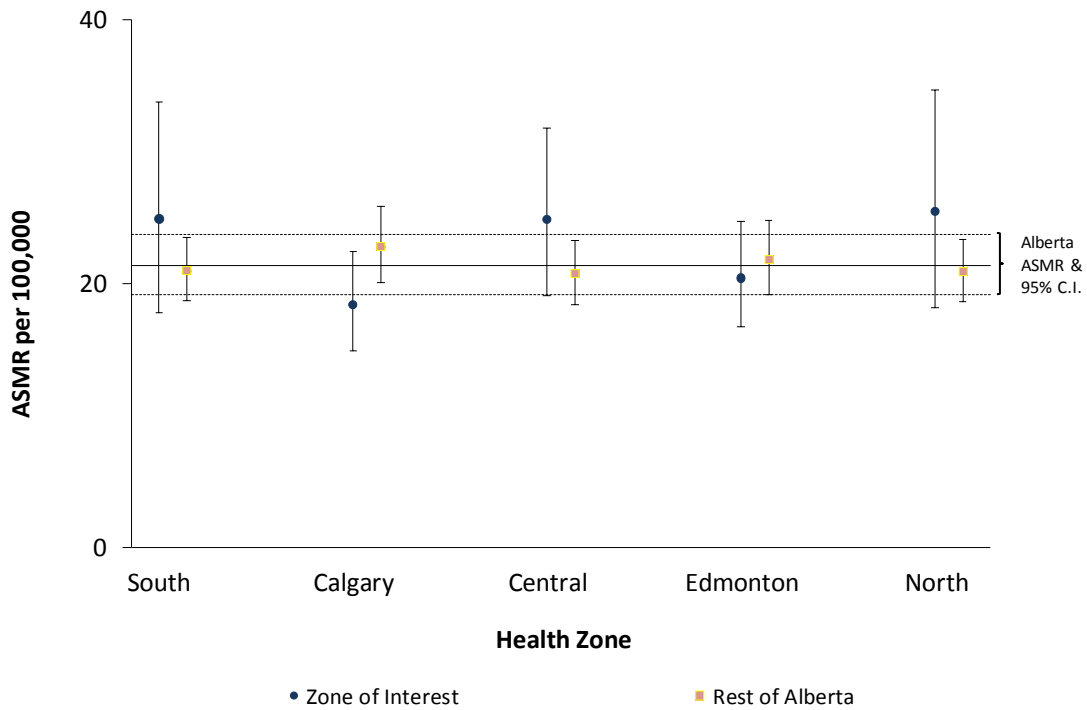


<sup>†</sup> Standardized to 1991 Canadian population for age-specific rates in 2008-2012.

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

There is no evidence that male prostate cancer ASIRs in the zones are higher or lower than the provincial average or the “rest of Alberta” (excluding the zone of interest) (**Figure 4-13**).

**Figure 4-14: Age-Standardized Mortality Rates (ASMRs)<sup>†</sup> with 95% Confidence Intervals (CI) by Zone for Prostate Cancer, Alberta, 2008-2012**



<sup>†</sup> 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 prostate cancer ASMRs in the zones are higher or lower than the provincial average or the “rest of Alberta” (excluding the zone of interest) (**Figure 4-14**).

## 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. Okamoto N, Morio S, Inoue R and Akiyama K. The risk of a second primary cancer occurring in five-year survivors of an initial cancer. *Jpn. J Clin Oncol*, 1987; 17(3):205-213.
2. National Cancer Institute - Surveillance Epidemiology and End Results [Internet]. USA. National Institutes of Health; Cancer Prevalence Statistics Overview; 2014 Apr 10 [cited 2014 Nov 6]; Available from: <http://surveillance.cancer.gov/prevalence/>
3. Kim H-J, Fay M and Feuer E. Permutation tests for JoinPoint regression with applications to cancer rates. *Stat Med*, 2000; 19:335-351.
4. Fradet Y, Klotz L, Trachtenberg J and Zlotta A. The burden of prostate cancer in Canada. *Can Urol. Assoc J*. 2009; 3(3 suppl 2):S92-S100.
5. Neutel CI, Gao R, Blood PA and Gaudette LA. Trends in prostate cancer incidence, hospital utilization and surgical procedures, Canada, 1981-2000. *Can J Public Health*. 2006; 97(3):177-182.
6. 2012 Alberta Population Data [Excel Spreadsheet]. Edmonton (Alberta): Alberta Health; 2014.
7. Canadian Cancer Society's Steering Committee: Canadian Cancer Statistics 2014. Toronto: Canadian Cancer Society, 2014.
8. Greene FL, Page DL, Fleming ID, Fritz AG, Balch CM, Haller DG and Morrow M (Eds). *AJCC Cancer Staging Manual*, 6<sup>th</sup> ed. Chicago: American Joint Committee on Cancer, 2002. Available from <http://springeronline.com>
9. Agresti A. *Analysis of Ordinal Categorical Data*, 2nd ed. New Jersey: John Wiley & Sons; 2012.
10. Ederer F, Axtell LM and Cutler SJ. The relative survival rate: a statistical methodology. *Natl Cancer Inst Monogr*, 1961; 6: 101-121.
11. Brenner H, Gefeller O and Hakulinen T. Period analysis for 'up-to-date' cancer survival data: theory, empirical evaluation, computational realisation and applications. *European Journal of Cancer*, 2004; 40: 326-335.
12. Fay MP and Feuer EJ. Confidence intervals for directly standardized rates: a method based on the gamma distribution. *Stat Med*, 1997; 16: 791-801.
13. Levi F. Cancer Prevention: Epidemiology and Perspectives. *Eur J Cancer*. 1999; 35(7):1046-1058.

## Contact Information

---

If further information is required, please contact Surveillance & Reporting, C-MORE, Alberta Health Services as follows:

**Mailing Address:** **Alberta Health Services**  
Surveillance & Reporting  
C-MORE  
1400 - 10123-99 Street  
Edmonton, AB, Canada  
T5J 3H1

**Phone:** 780-643-4347  
**Fax:** 780-643-4380  
**Email:** [ACB.cancerdata@albertahealthservices.ca](mailto:ACB.cancerdata@albertahealthservices.ca)