Alberta Health Services

Surveillance and Health Status Assessment

Cancer Surveillance

Lung Cancer

February 2011

2008 Report on Cancer Statistics in Alberta

November 25, 2011

ERRATUM: *Lung Cancer,* 2008 Report on Cancer Statistics in Alberta

There was an error in the title of **Table 5-2** (page 7) where the figure was labeled as lung cancer incidence and mortality rates for males. The figure refers to lung cancer incidence and mortality rates for both sexes.

The title of Figure 5-2 should read:

"*Figure 5-2:* Age-Standardized Incidence Rates (ASIRs)*† and Mortality Rates (ASMRs)*† for Lung Cancer, Both Sexes, Alberta, 1988-2008"

This report has been updated with the correct title.

Acknowledgements

This report was made possible through Alberta Health Services, Surveillance and Health Status Assessment, Cancer Surveillance and the many contributions of staff and management 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: Decision Support Strategies, Alberta Cancer Registry, Alberta Health and Wellness and Statistics Canada. Contributions included provision of information, analysis and interpretation, and assistance with consultation sessions and communication of the report.

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Suggested Citation:
Cancer Surveillance: *2008 Report on Cancer Statistics in Alberta.* Edmonton: Surveillance and Health Status Assessment, Alberta Health Services, 2010.

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Surveillance and Health Status Assessment
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Purpose of the Report

Cancer Surveillance, a specialized team within Surveillance and Health Status Assessment, Alberta Health Services actively contributes to Becoming the Best: Alberta's 5-year Health Action Plan and the goal to create 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 lung cancer statistics in Alberta. Details about individual cancer types are available within separate documents. The words highlighted in ***dark blue*** are terms described in detail within the **Glossary**.

Data 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 August 6, 2010.

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

Summary

- Approximately **1 in 13** males and **1 in 16** females will develop invasive lung cancer within their lifetime.
- In 2008, **21,401** potential years of life were lost due to lung cancer.
- As of December 31, 2008, approximately **3,320** Albertans were alive who had previously been diagnosed with lung cancer.
- From 1988 to 2008*, **male** lung cancer **incidence rates decreased** while **female** lung cancer **incidence rates increased** over the same period.
- From 1988 to 2008*, **male** lung cancer **mortality rates decreased** while **female** lung cancer **mortality rates increased** over the period 1988 to 1999*.
- In 2008, there were **1,787** new cases of lung cancer in Alberta and **1,422** deaths due to the disease.
- If current trends continue, approximately **1,100** male and **1,100** female cases of lung cancer are expected to be diagnosed in 2013.
- The five-year relative survival for lung cancer in Alberta is approximately **15%** for those diagnosed between 2006 and 2008.

From 1988 to 2008*, male lung cancer incidence rates decreased while female lung cancer incidence rates increased over the same period.

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

Probability of Developing and Dying from Lung 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 lung 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]

Table 5-1: **Probability of Developing Lung Cancer by Age and Sex, Alberta, 2006-2008**

Age Group	Males	Females
Lifetime Risk (all ages)	1 in 13	1 in 16
0 - 20	Less than 1 in 10,000	Less than 1 in 10,000
20 - 30	Less than 1 in 10,000	Less than 1 in 10,000
30 - 40	1 in 8,850	1 in 4,975
40 - 50	1 in 956	1 in 611
50 - 60	1 in 160	1 in 143
60 - 70	1 in 50	1 in 54
70 - 80	1 in 28	1 in 38
80+	1 in 24	1 in 41

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

The probability of developing lung cancer increases with age (***Table 5-1***). Approximately 1 in 13 males and 1 in 16 females will develop invasive lung cancer in their lifetime.

On a population basis the probability of developing lung cancer by the end of the age range for a lung cancer-free individual at the beginning of the age range are shown in the bottom eight rows of ***Table 5-1***. For instance, a lung cancer-free female representative of the general population at age 40 has a 1 in 611 chance of developing lung cancer by the time she is 50.

The probability of dying from lung cancer varies by age and sex (***Table 5-2***). Approximately 1 in 16 males and 1 in 19 females will die of invasive lung cancer.

On a population basis the probability of a cancer-free individual at the beginning of the age range dying from lung cancer by the end of the age range are shown in the bottom eight rows of the ***Table 5-2***. For example, a cancer-free female representative of the general population at age 40 has a 1 in 941 chance of dying from lung cancer by the time she is 50.

Potential Years of Life Lost

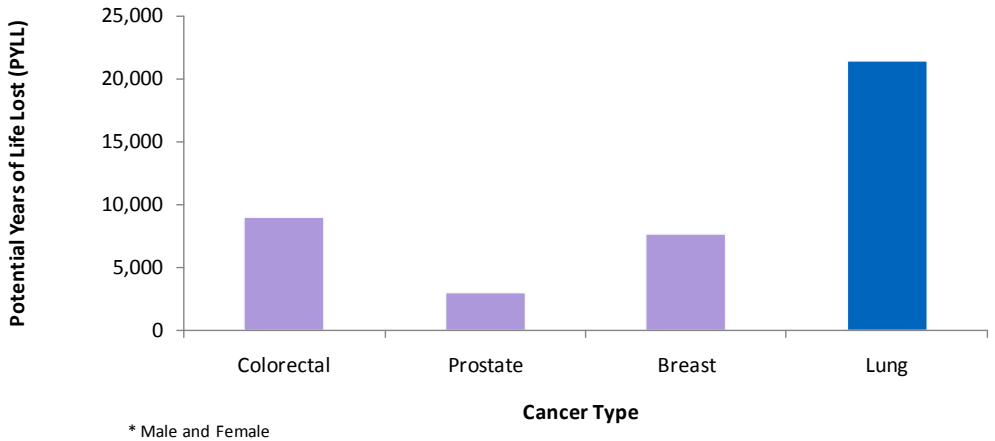
One frequently used measure of premature death is ***potential years of life lost (PYLL)***. PYLL due to cancer is an estimate of the number of years that people would have lived had they not died from cancer. PYLL due to cancer has been calculated by multiplying the number of deaths in each age group 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.

Table 5-2: **Probability of Dying from Lung Cancer by Age and Sex, Alberta, 2006-2008**

Age Group	Males	Females
Lifetime Risk (all ages)	1 in 16	1 in 19
0 - 20	Less than 1 in 10,000	Less than 1 in 10,000
20 - 30	Less than 1 in 10,000	Less than 1 in 10,000
30 - 40	Less than 1 in 10,000	Less than 1 in 10,000
40 - 50	1 in 1,311	1 in 941
50 - 60	1 in 219	1 in 217
60 - 70	1 in 66	1 in 72
70 - 80	1 in 34	1 in 47
80+	1 in 24	1 in 41

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

Figure 5-1: **Potential Years of Life Lost (PYLL) from Lung* Cancer Compared with Colorectal*, Breast† and Prostate‡, Alberta, 2008**



* Male and Female
† Female only
‡ Male only

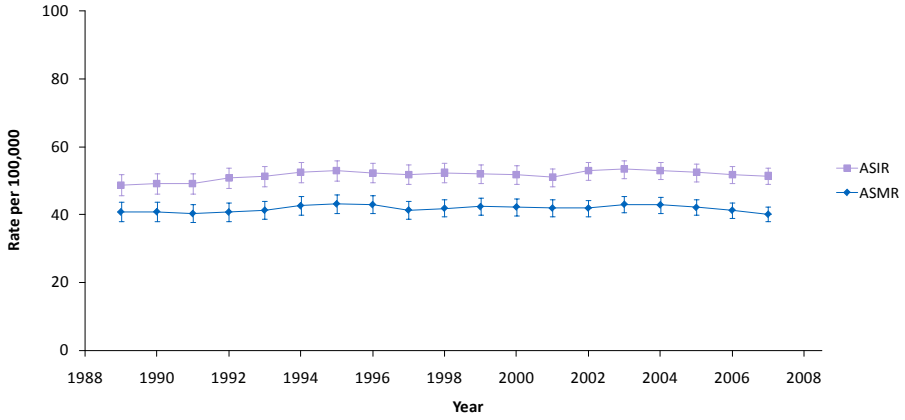
Data Source: Alberta Cancer Registry

Table 5-3: **Limited-Duration and Complete Prevalence for Lung Cancer, Both Sexes, Alberta, 2008**

Age Group	Prevalence
2-Year	1,528
5-Year	2,304
10-Year	2,819
20-Year	3,213
Complete	3,319

Data Source: Alberta Cancer Registry

Figure 5-2: **Age-Standardized Incidence Rates (ASIRs)[*†] and Mortality Rates (ASMRs)[*†] for Lung Cancer, Both Sexes, Alberta, 1988-2008**



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

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

In 2008, **21,401** potential years of life were lost due to lung cancer, which constitutes 24.6% of PYLL for all cancers (***Figure 5-1***). Lung cancer is the largest single site contributor to PYLL.

Prevalence

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

Limited-duration lung cancer prevalence represents the number of people alive on a certain day who had previously been diagnosed with lung cancer within a specified number of years (e.g. 2, 5, 10 or 20 years) while complete lung cancer prevalence represents the proportion of people alive on a certain day who had previously been diagnosed with lung cancer, regardless of how long ago the diagnosis was.[11]

In this section of the report, both limited-duration and complete lung cancer prevalence are presented; the latter describing the number of people alive as of December 31, 2008 who had ever been diagnosed with lung 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, 2008, approximately **3,320** Albertans were alive who had previously been diagnosed with lung cancer (***Table 5-3***). Approximately **1,530** Albertans were alive on the same date

who had been diagnosed with lung cancer in the previous two years, the period during which cases receive definitive treatments.

Lung 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 lung cancer diagnoses in Alberta in a calendar year. Incidence ***rates*** are the number of new cancer cases diagnosed per 100,000 population in a specific time period.

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

In order to compare cancer incidence or cancer mortality over time or between populations, ***age-standardized incidence rates (ASIRs)*** or ***age-standardized mortality rates (ASMRs)*** are presented. These are weighted averages of ***age-specific rates*** using a standard population. These rates are useful because they are adjusted for differences in age distributions in a population over time, which permit comparisons of cancer incidence or mortality 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. Age-standardized incidence rates (ASIRs) and age-standardized mortality rates (ASMRs) are presented as three-year moving averages. This smoothing of trends is especially important when the number of cancer cases per year is relatively small, where year-to-year variability can be quite large.

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

The following figures show incidence and mortality trends in Alberta. Separate analyses for both incidence and mortality are shown in subsequent sections. The statistical significance of the trends was determined by using Joinpoint[2] 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).

ASIRs for lung cancer have not changed significantly since 1988 (***Figure 5-2***). In 2008, the ASIR for lung cancer for both males and females combined was 50.1 per 100,000 population.

Mortality rates are lower than incidence rates. ASMRs for lung cancer for both males and females have not changed significantly since 1988 (***Figure 5-2***). In 2008, the ASMR for lung cancer for both males and females was 39.5 per 100,000 population.

These data do not reflect the different trend between males (decreasing) and females (increasing).

Male lung cancer ASIRs decreased significantly between 1988 and 2008 corresponding to an average annual decrease in lung cancer rates of 1.2% between 1988 and 2008 (***Figure 5-3***). In 2008, the ASIR for lung cancer in males was 55.2 per 100,000 male population.

Male mortality rates are lower than male incidence rates. Male lung cancer ASMRs decreased significantly between 1988 and 2008 (**Figure 5-3**). Between 1988 and 2008 male lung cancer ASMRs decreased by an average annual reduction of 1.4%. In 2008, the ASMR for lung cancer in males was 44.7 per 100,000 male population.

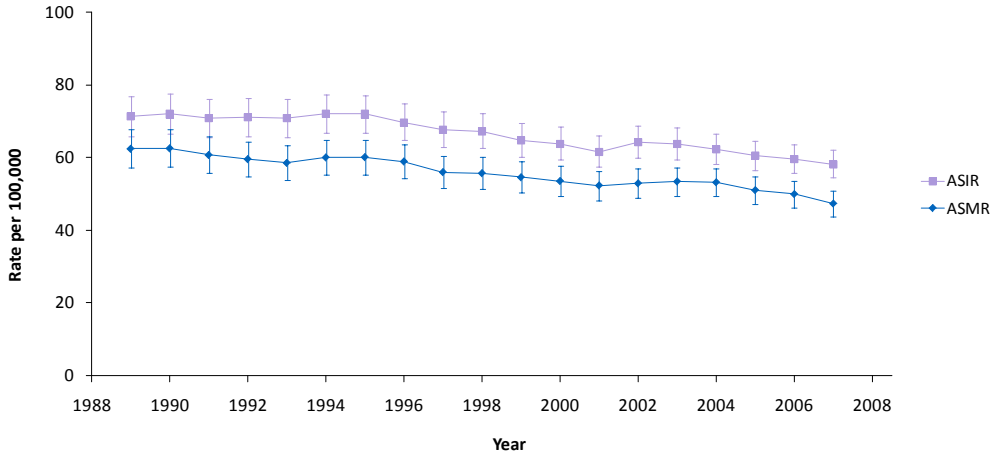
Female lung cancer ASIRs increased significantly between 1988 and 1999 (***Figure 5-4***) by an average annual increase of 3.2% and between 1999 and 2008 by an annual average increase of 1.1%. In 2008, the ASIR for lung cancer in females was 46.6 per 100,000 female population.

Female mortality rates are lower than incidence rates. Over the period 1988 to 1999, female lung cancer ASMRs increased corresponding to an average annual increase of 3.7% (***Figure 5-4***). Between 1999 and 2008 female lung cancer ASMRs did not change significantly. In 2008, the ASMR for lung cancer in females was 35.7 per 100,000 female population.

Lung Cancer Incidence

The following five figures (***Figures 5-5*** to ***5-9***) provide information on lung cancer incidence in Alberta. The number of new cancer cases in Alberta is affected not only by changes in

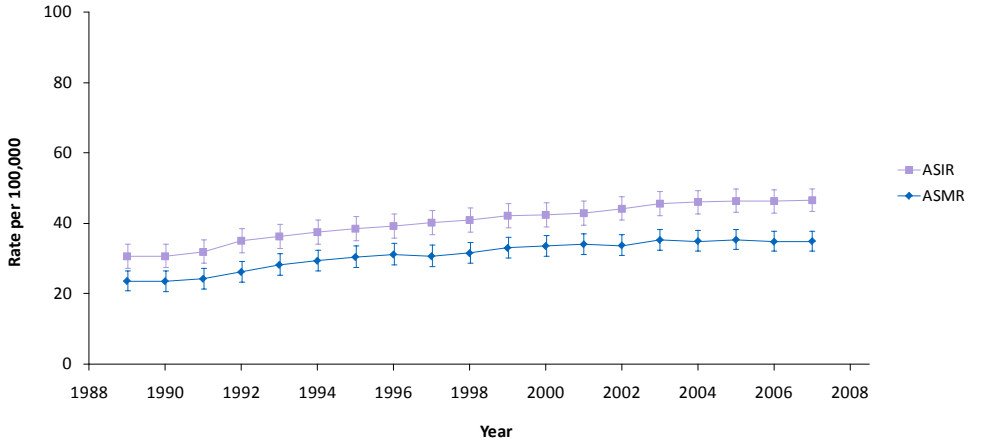
Figure 5-3: **Age-Standardized Incidence Rates (ASIRs)[*†] and Age-Standardized Mortality Rates (ASMRs)[*†] for Lung Cancer, Males, Alberta, 1988-2008**



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

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

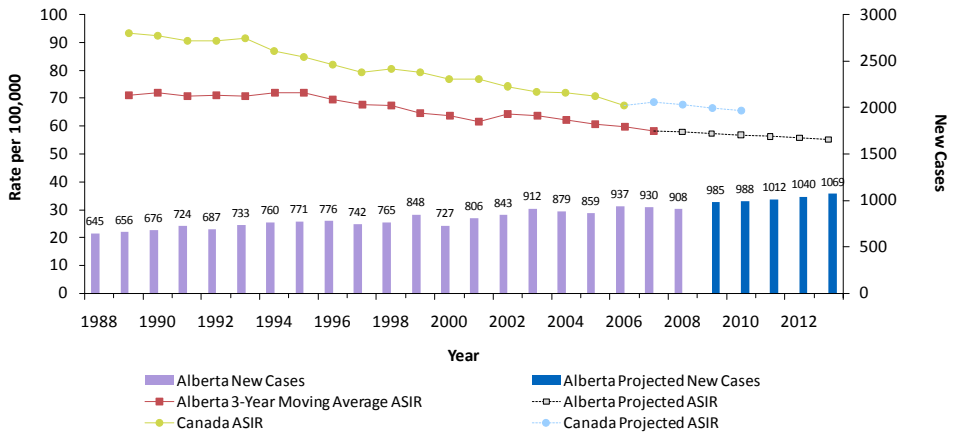
Figure 5-4: **Age-Standardized Incidence Rates (ASIRs)[*†] and Age-Standardized Mortality Rates (ASMRs)[*†] for Lung Cancer, Females, Alberta, 1988-2008**



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

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

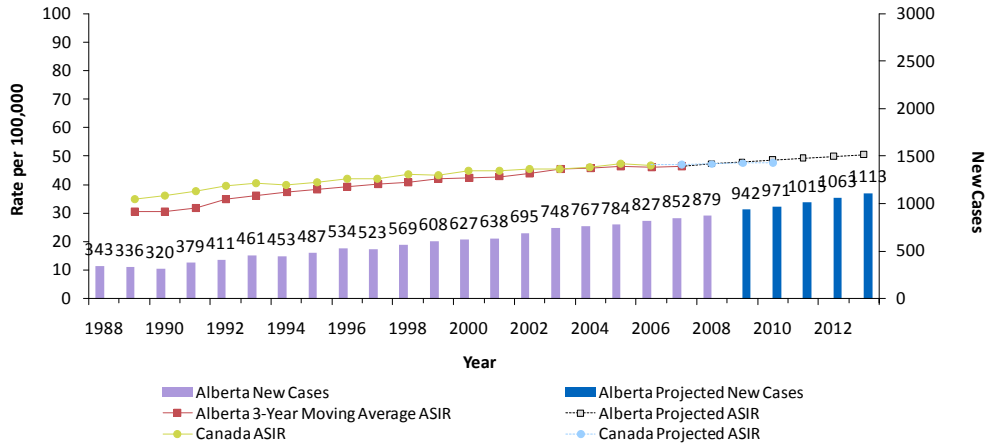
Figure 5-5: **Actual and Projected Number of New Cases and Age-Standardized Incidence Rates (ASIRs)*† for Lung Cancer, Males, Alberta, 1988-2013**



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

Data Source: Alberta Cancer Registry, Alberta Health and Wellness, Canadian Cancer Society

Figure 5-6: **Actual and Projected Number of New Cases and Age-Standardized Incidence Rates (ASIRs)*† for Lung Cancer, Females, Alberta, 1988-2013**



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

Data Source: Alberta Cancer Registry, Alberta Health and Wellness, Canadian Cancer Society

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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.

Years 2008-2011 in ***Figures 5-5*** and ***5-6*** are shown as ***projections***, which are estimates of new cancer cases and cancer rates that may occur in the future. The projected cancer numbers were calculated by applying the estimated five-year age-specific cancer incidence rates to the projected age-specific population figures (observed up to 2008 and estimated for 2009-2011) provided by Alberta Health and Wellness[3]. Caution should be exercised when comparing Canada and Alberta rates.

The estimated cancer incidence rates were calculated by extrapolating the recent trends in observed five-year age-specific rates, which were modeled using log-linear regression[5]. For those age groups where there were few cancers for most of the years, the average rates for the most recent five years were used.

In 2008, 908 cases of male lung cancer were diagnosed in Alberta (***Figure 5-5***). ASIRs for lung cancer in Alberta were lower than ASIRs in Canada.

If current trends continue, about 1100 cases of male lung cancer will be diagnosed in Alberta in 2013.

In 2008, 879 cases of female lung cancer were diagnosed in Alberta (***Figure 5-6***). This was more than double cases as were diagnosed in 1988. Overall, ASIRs for female lung cancer in Alberta were slightly lower than ASIRs in Canada.

If current trends continue, about 1100 cases of female lung cancer will be diagnosed in Alberta in 2013, the same number as for males.

Male and female lung cancer incidence rates differ by age (***Figure 5-7***). Age-specific incidence rates for lung cancer in both sexes increase rapidly after the age of 45. Female rates are similar to male rates until the age of 60 after which female incidence rates are lower compared to incidence rates in males.

Male incidence rates peaks at around age 80 and then decline, whereas female incidence rates peak at around age 75 and decline thereafter (***Figure 5-7***).

Age-standardized lung cancer incidence rates in males differ across all four age groups (***Figure 5-8***).

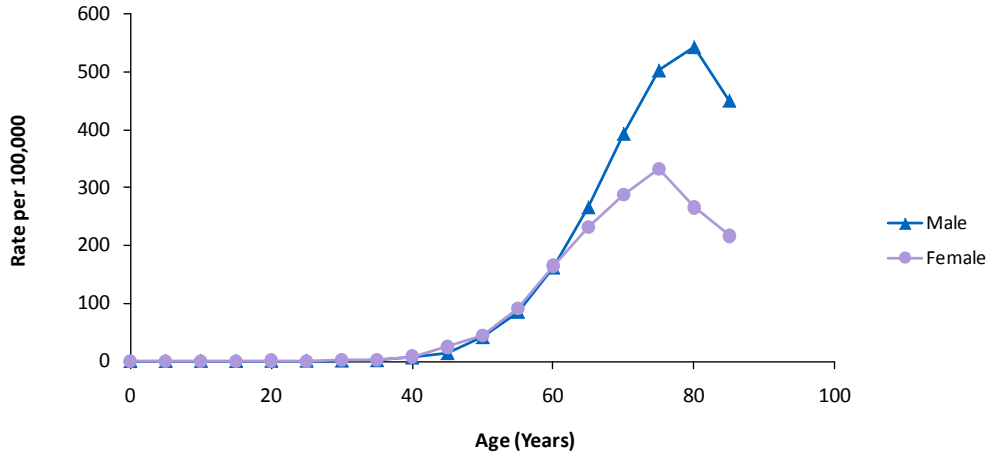
Lung cancer incidence rates for males significantly decreased over the period 1988 to 2008 for the age groups <50, 50-64 and 65-74 by an annual average of 3.3%, 2.6% and 1.2% respectively.

Male lung cancer incidence rates for 75+ age group fluctuated but did not significantly vary between 1988 and 2008.

Age-standardized lung cancer incidence rates for females differ across age groups (***Figure 5-9***).

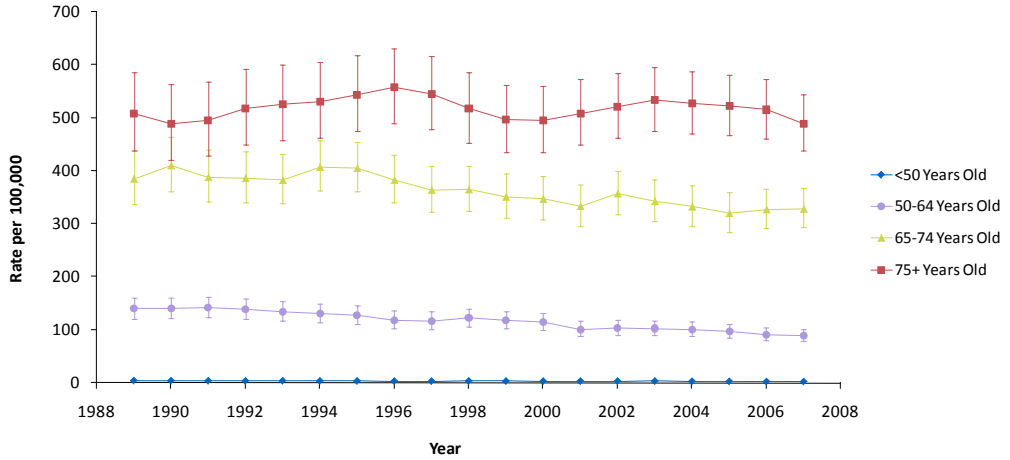
Between 1988 and 2008, the lung cancer incidence rates of females significantly decreased for the age group <50 by an annual average of 1.6%, significantly increased for the age groups 50-64 and 65-74 by an annual average of 0.8% and 2.6% respectively. For the age group 75+, female lung cancer incidence rates significantly increased by an annual average of 6.2% between 1988 and 2001, but did not significantly change between 2001 and 2008.

Figure 5-7: **Age-Specific Incidence Rates for Lung Cancer by Sex, Alberta, 2004-2008**



Data Source: Alberta Cancer Registry, Alberta Health and Wellness

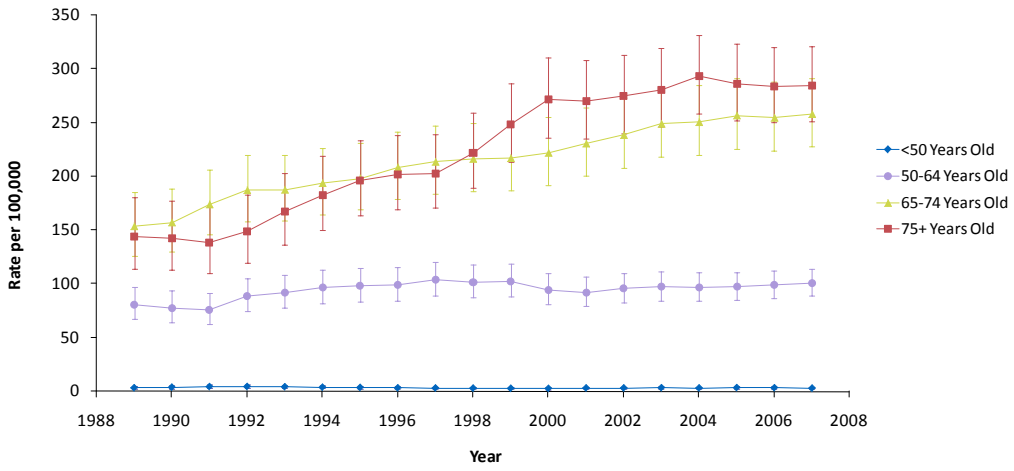
Figure 5-8: **Age-Standardized Incidence Rates (ASIRs)[*†] for Lung Cancer, Ages <50, 50-64, 65-74, and 75+, Males, Alberta, 1988-2008**



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

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

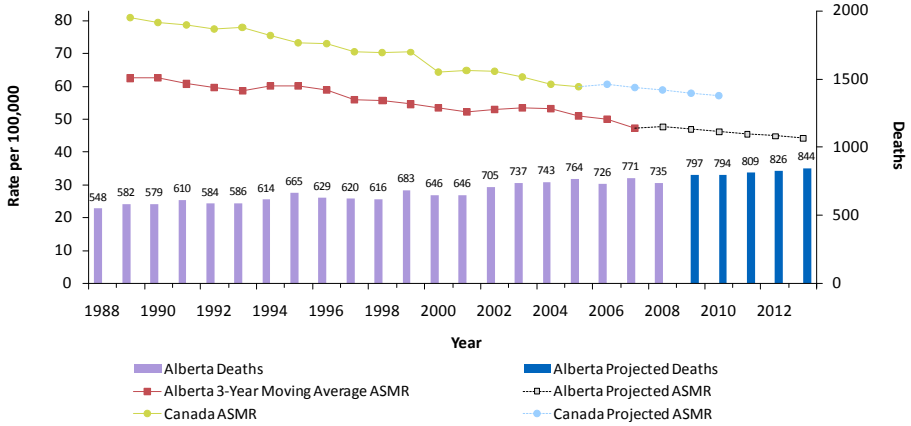
Figure 5-9: **Age-Standardized Incidence Rates (ASIRs)*† for Lung Cancer, Ages <50, 50-64, 65-74, and 75+, Females, Alberta, 1988-200808**



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

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

Figure 5-10: **Actual and Projected Number of Deaths and Age-Standardized Mortality Rates (ASMRs)*† for Lung Cancer, Males, Alberta, 1988-2013**



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

Data Source: **Data Source**: Alberta Cancer Registry, Alberta Health and Wellness, Canadian Cancer Society

Lung Cancer Mortality

The following five figures (***Figures 5-10*** to ***5-14***) provide information on lung 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.

Years 2007-2011 in ***Figures 5-10*** and ***5-11*** are shown as ***projections***, which are estimates of the number of cancer deaths and cancer mortality rates that may occur in the future. The projected numbers of cancer deaths were calculated by applying the estimated five-year age-specific cancer mortality rates to the projected age specific population figures (observed up to 2008 and estimated for 2009-2011) provided by Alberta Health and Wellness[3]. Caution should be exercised when comparing Canada and Alberta rates.

The estimated cancer mortality rates were calculated by extrapolating the recent trends in observed five-year age-specific rates, which were modeled using log-linear regression[5]. For those age groups where there were few cancers deaths for most of the years, the average rates for the most recent five years were used.

In 2008, 735 males died of lung cancer in Alberta (**Figure 5-10**). ASMRs for male lung cancer in Alberta were lower than ASMRs in Canada.

If current trends continue, about 840 males are expected to die from lung cancer in Alberta in 2013.

In 2008, 687 females died of lung cancer in Alberta (***Figure 5-11***). Overall, ASMRs for female lung cancer in Alberta were slightly lower than ASMRs in Canada.

If current trends continue, about 800 females are expected to die from lung cancer in Alberta in 2013.

Male and female lung cancer mortality rates differ by age (***Figure 5-12***). Age-specific mortality rates for lung cancer in both sexes increase rapidly after the age of 45. Female rates are similar to male rates until the age of 55 after which female mortality rates are lower compared to mortality rates in males.

Male mortality rates peaks at around age 80 and then decline, whereas female mortality rates peak at around age 75 and decline thereafter.

Age-standardized lung cancer mortality rates in males vary over time and by age group (***Figure 5-13***).

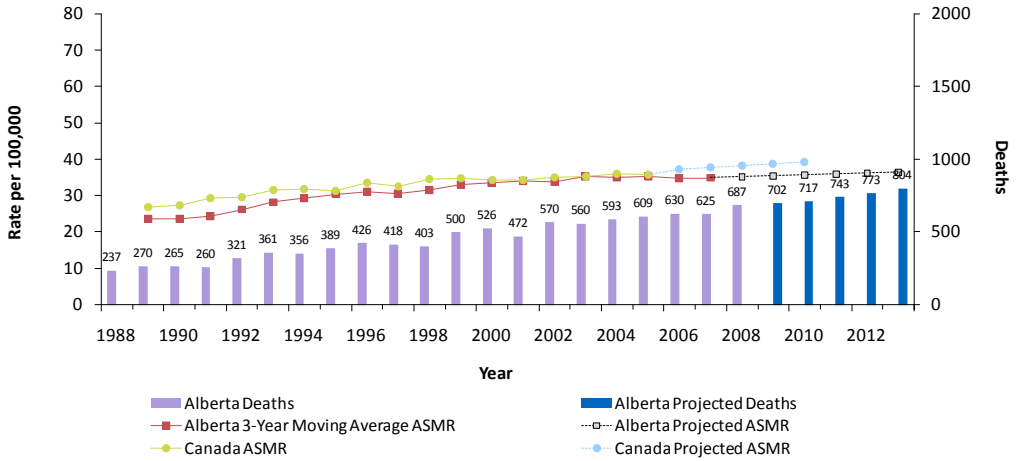
Male lung cancer mortality rates in the <50, 50-64 and 65-74 age groups decreased significantly between 1988 and 2008 by an annual average of 3.0%, 2.8% and 1.6% respectively.

Lung cancer mortality rates for those over 75, did not significantly change between 1988 and 2003, but significantly decreased between 2003 and 2008 by an annual average of 2.9%.

Age-standardized lung cancer mortality rates for females vary over time and by age group (***Figure 5-14***).

Between 1988 and 2008**,** female mortality rates for lung cancer did not significantly change in the <50 and 50-64 age groups,

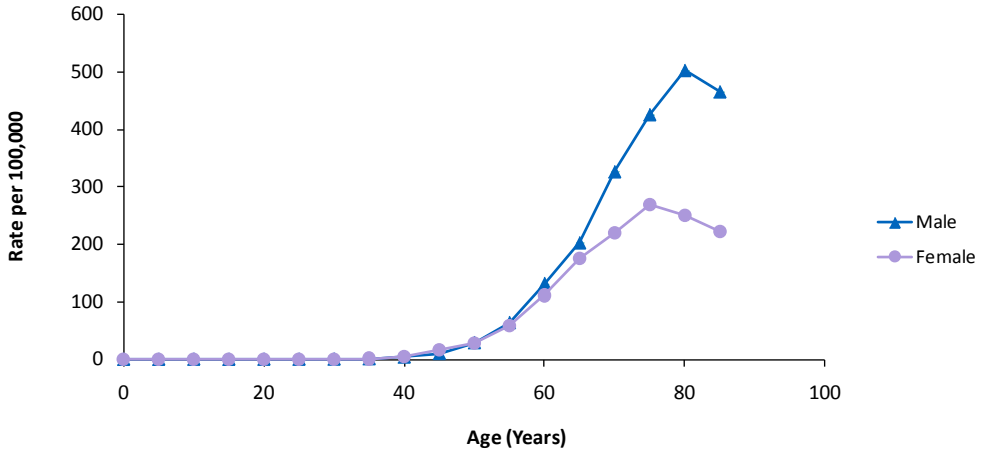
Figure 5-11: **Actual and Projected Number of Deaths and Age-Standardized Mortality Rates (ASMRs)*† for Lung Cancer, Females, Alberta, 1988-2013**



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

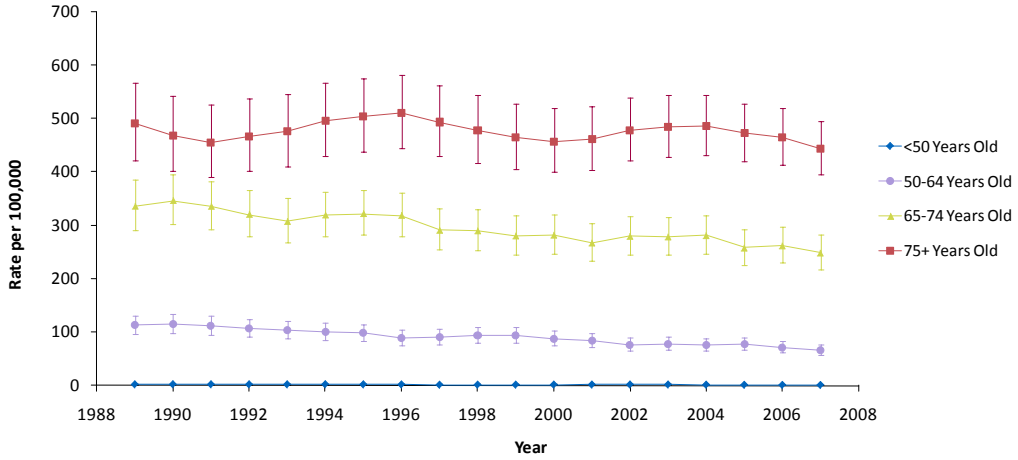
Data Source: Data Source: Alberta Cancer Registry, Alberta Health and Wellness, Canadian Cancer Society

Figure 5-12: **Age-Specific Mortality Rates for Lung Cancer by Sex, Alberta, 2004-2008**



Data Source: Alberta Cancer Registry, Alberta Health and Wellness

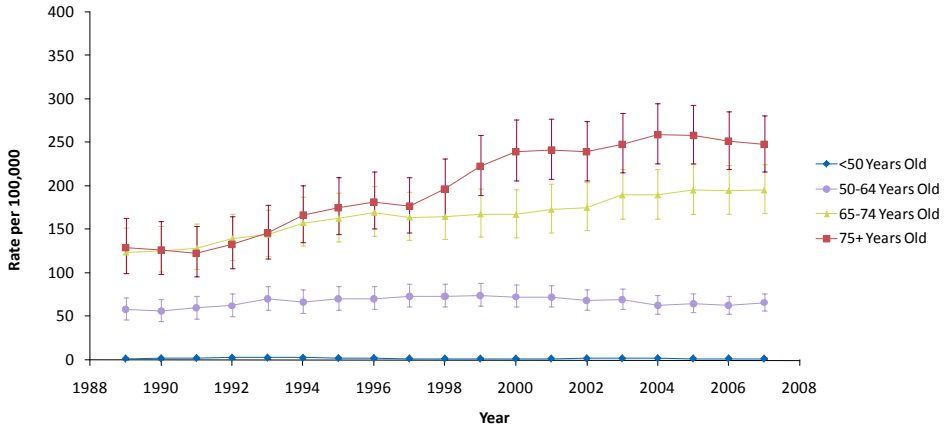
Figure 5-13: **Age-Standardized Mortality Rates (ASMRs)[*†] for Lung Cancer, Ages <50, 50-64, 65-74, and 75+, Males, Alberta, 1988-2008**



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

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

Figure 5-14: **Age-Standardized Mortality Rates (ASMRs)[*†] for Lung Cancer, Ages <50, 50-64, 65-74, and 75+, Females, Alberta, 1988-2008**



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

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

but significantly increased in the 65-74 age group by an annual average of 2.4%.

Female lung cancer mortality rates in the 75+ age group increased significantly between 1988 and 2000 by an annual average of 6.4%, but did not change significantly since 2000.

Lung 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. 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*** 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***. However, comparison between cohort and period RSRs should be interpreted with caution because of the two different methods used to derive the respective ratios.

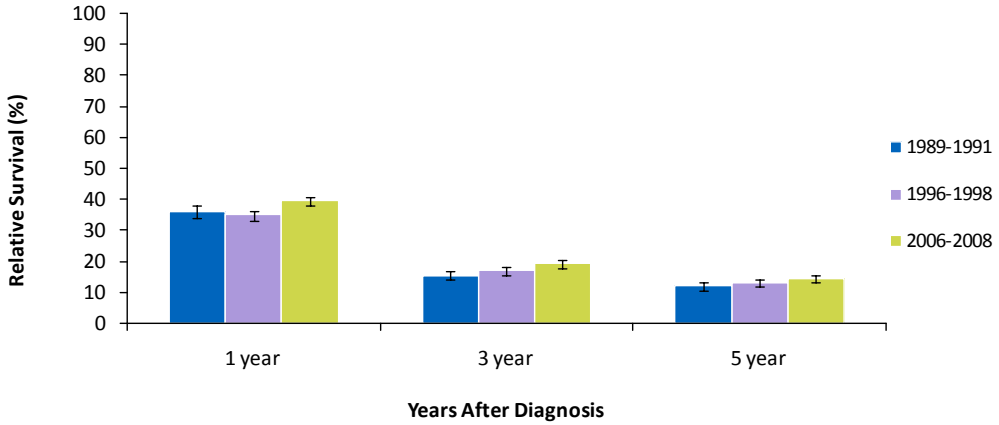
The relative survival ratio is usually expressed as a percentage (%) and the closer the value is to 100%, the more similar the survival pattern is to the general population.

The five-year relative survival ratio for individuals diagnosed with lung cancer in the period 2006-2008 is an estimated 15% indicating that out of all individuals diagnosed with this cancer between 2006 and 2008, around 15% are as likely to be alive five years after diagnosis as individuals from the general population of the same age.

There has been little improvement in the five-year relative survival ratios for individuals diagnosed with lung cancer in 2006-2008 compared to those diagnosed in 1989-1991 cohort years (***Figure 5-15***).

The five-year relative survival ratio for males diagnosed with lung cancer in the period 2006-2008 is an estimated 12% indicating that out of males diagnosed with this cancer between 2006 and 2008, around 12% are as likely to be alive five years after diagnosis as males from the general population of the same age.

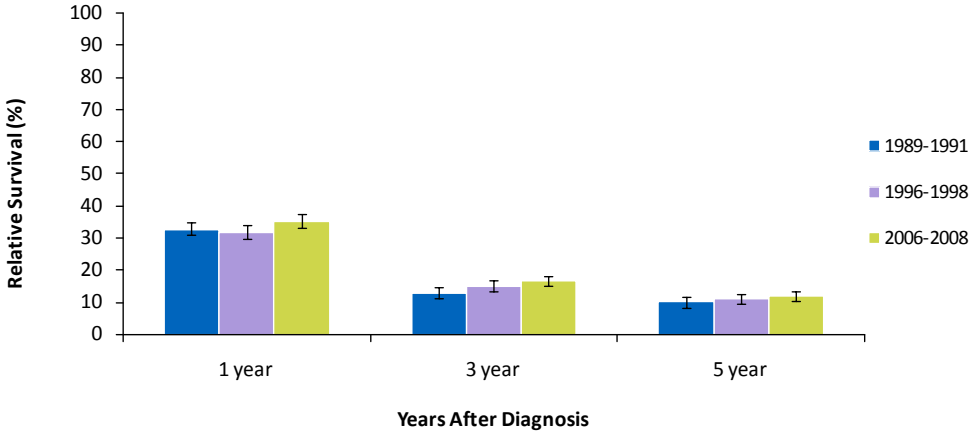
Figure 5-15: **Age-Standardized One, Three and Five-Year Relative Survival Ratios for Lung Cancer, Both Sexes, Alberta, 1989-1991*, 1996-1998* and 2006-2008†**



* 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 Source: Alberta Cancer Registry, Statistics Canada

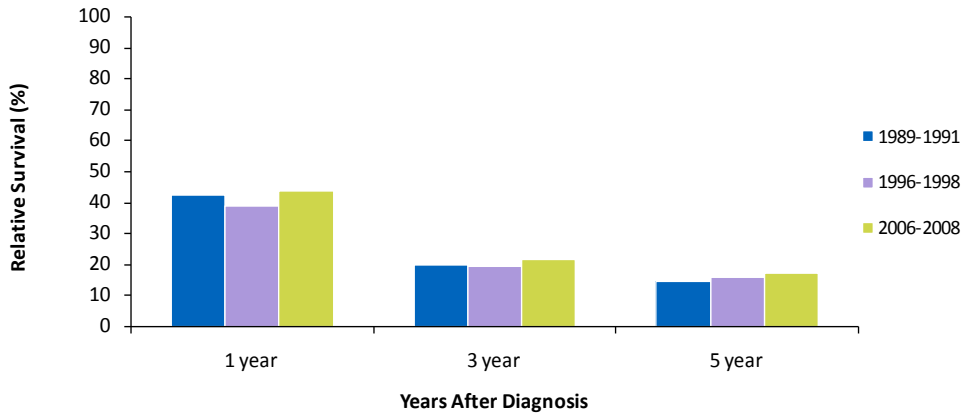
Figure 5-16: **Age-Standardized One, Three and Five-Year Relative Survival Ratios for Lung Cancer, Males, Alberta, 1989-1991*, 1996-1998* and 2006-2008†**



* 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 Source: Alberta Cancer Registry, Statistics Canada

Figure 5-17: **Age-Standardized One, Three and Five-Year Relative Survival Ratios for Lung Cancer, Females, Alberta, 1989-1991*, 1996-1998* and 2006-2008†**



* 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 Source: Alberta Cancer Registry, Statistics Canada

There has been little improvement in the five-year relative survival ratios for males diagnosed with lung cancer in 2006-2008 compared to those diagnosed in 1989-1991 cohort years (***Figure 5-16***).

The five-year relative survival ratio for females diagnosed with lung cancer in the period 2006-2008 is an estimated 17% indicating that out of females diagnosed with this cancer between 2006 and 2008, around 17% are as likely to be alive five years after diagnosis as females from the general population of the same age.

There has been little improvement in the five-year relative survival ratios for females diagnosed with lung cancer in 2006-2008 compared to those diagnosed in 1989-1991 cohort years (***Figure 5-17***).

Figure 5-18: **Five Health Zones in Alberta, 2010**

Data Source: Alberta Health Services

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 are presented with their corresponding 95% ***confidence intervals***. 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
- diagnostic activity
- access to cancer care.[7]

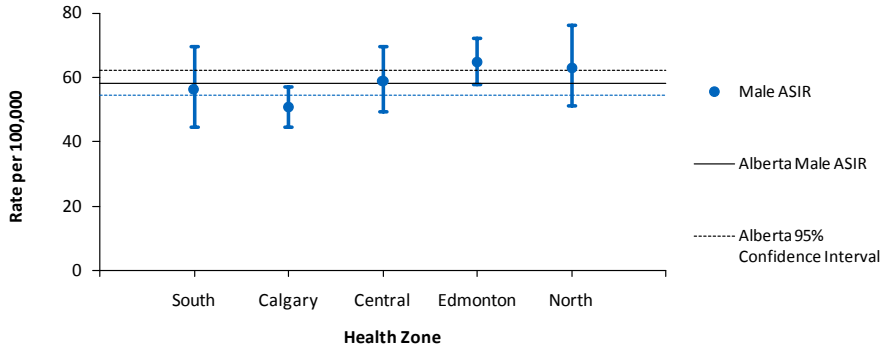
There is no evidence that male lung cancer ASIRs in the zones are higher or lower than the provincial average (***Figure 5-19***).

There is no evidence that female lung cancer ASIRs in the Zones are higher or lower than the provincial average (***Figure 5-20***).

There is no evidence that male lung cancer ASMRs in the zones are higher or lower than the provincial average (***Figure 5-21***).

There is no evidence that female lung cancer ASMRs in the zones are higher or lower than the provincial average (***Figure 5-22***).

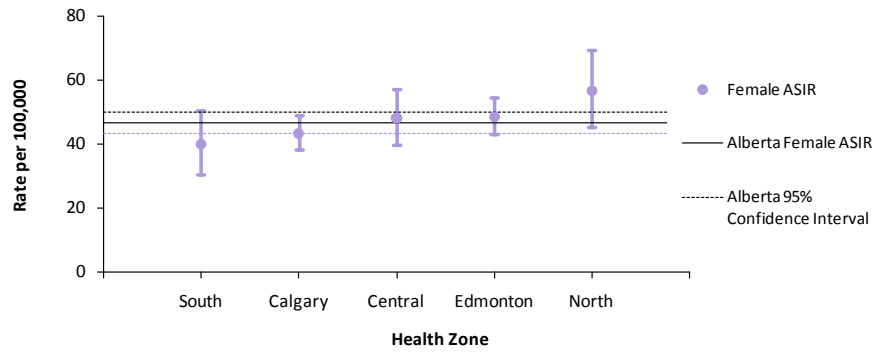
Figure 5-19: **Age-Standardized Incidence Rates (ASIRs)[*†] for Lung Cancer by Zones, Males, Alberta, 2006-2008[‡]**



[*] Three-year average.
[†] Standardized to 1991 Canadian population.
[‡] Error bars represent 95% ***confidence intervals***.

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

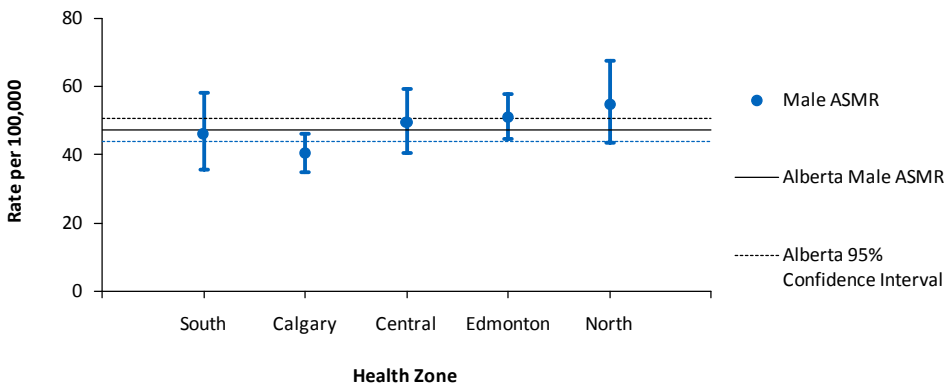
Figure 5-20: **Age-Standardized Incidence Rates (ASIRs)[*†] for Lung Cancer by Zones, Females, Alberta, 2006-2008[‡]**



[*] Three-year average.
[†] Standardized to 1991 Canadian population.
[‡] Error bars represent 95% ***confidence intervals***.

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

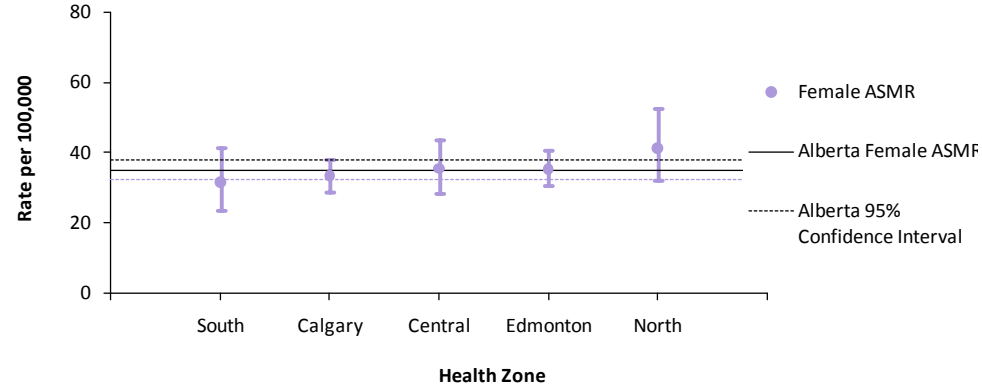
Figure 5-21: **Age-Standardized Mortality Rates (ASMRs)[*†] for Lung Cancer by Zones, Males, Alberta, 2006-2008[‡]**



[*] Three-year average.
[†] Standardized to 1991 Canadian population.
[‡] Error bars represent 95% ***confidence intervals***.

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

Figure 5-22: **Age-Standardized Mortality Rates (ASMRs)[*†] for Lung Cancer by Zones, Females, Alberta, 2006-2008[‡]**



[*] Three-year average.
[†] Standardized to 1991 Canadian population.
[‡] Error bars represent 95% ***confidence intervals***.

Data Source: Alberta Cancer Registry, Alberta Health and Wellness

Further Information

Data Sources and Quality

Most of the data presented within this report are derived from the Alberta Cancer Registry (ACR). The ACR is responsible for recording and maintaining data on all new ***primary cancers***, as well as all cancer deaths occurring within the province of Alberta, as mandated by the Regional Health Authorities (RHA) Act of Alberta.[8]

The quality of data collected by any registry is dependent on three factors: comparability, completeness and validity. Firstly, comparability is accomplished by applying standard practices regarding classification and coding of new cases and by using consistent definitions, such as the coding of multiple primaries. To achieve comparability, the ACR employs the International Classification for Oncology (ICD-O-2 for 1988-2000 data and ICD-O-3 for 2001 onwards) to classify all cancers by site and morphology. Cancer deaths are coded using the International Statistical Classification of Diseases and Related Health Problems (ICD-9 for 1988-2000 data and ICD-10 for 2001 onwards).

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

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

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

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

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

Glossary of Terms

Age-specific rates:

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

Age-standardized (incidence/mortality) rates:

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

Benign:

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

Carcinoma:

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

Confidence intervals:

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

Count:

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

Incidence count:

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

Invasive cancer:

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

Life table:

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

Lymphatic system:

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

Malignant:

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

Median Age:

The age at which half of the population is older and half is younger.[9]

Metastasis:

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

Mortality count:

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

Potential years of life lost (PYLL):

PYLL is the total number of years of life lost and is obtained by multiplying, for each age group, the number of deaths by the life expectancy of survivors. The indicator was calculated by obtaining the number of deaths and mean life expectancy for each age group.[4]

Prevalence:

The number of people alive at a specific point in time with cancer. Complete prevalence is the number of people alive today who have *ever* been diagnosed with cancer. Limited-duration prevalence represents the number of people alive on a certain day who had previously been diagnosed with lung cancer within a specified number of years (e.g. 2, 5, 10 or 20 years) In this document, we report both complete and limited-duration prevalence.

Primary Site of Cancer:

The tissue or organ in which the cancer originates.[10]

Probability of developing/dying of cancer:

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

Prognosis:

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

Projection:

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

Rate:

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

Relative survival:

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

Stage of cancer:

Refers to the degree of cancer progression and the size of tumor at the time of diagnosis. If the cancer has spread, the stage describes how far it has spread from the original site to other parts of the body.[9]

Surveillance:

Cancer surveillance includes the collection of data, and the review, analysis and dissemination of findings on incidence (new cases), prevalence, morbidity, survival and mortality. Surveillance also serves to collect information on the knowledge, attitudes and behaviours of the public with respect to practices that prevent cancer, facilitate screening, extend survival and improve quality of life.[11]

Survival - Cohort method:

The cohort method provides survival estimates of cases having complete follow-up for the number of years of survival of interest. For example, cases diagnosed in 2001, for which vital status data are available to the end of year 2008, the cohort method may be used to obtain an estimate of five-year survival. The cohort survival represents the actual survival experience of individuals.

Survival - Period analysis:

The period method provides up-to-date survival estimates of recently diagnosed cases considering the survival experience of those cases within the most recent calendar period that allows for the estimation of a given period of survival. For example, to estimate the five year survival for cases diagnosed in 2004-2008, this method considers zero to one year survival experience for cases diagnosed in 2004-2008, one to two year survival experience for cases diagnosed in 2003-2005 who survived at least one year, and so on up to four to five year survival experience for cases diagnosed in 2000-2002 who survived at least four years.

Three-year moving average:

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

Tumour:

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

References

1. Okamoto N, Morio S, Inoue R, 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. Kim H-J, Fay M, Feuer E. Permutation tests for JoinPoint regression with applications to cancer rates. Stat. Med. 2000; 19:335-351.
3. 2008 Alberta Population Data [Excel Spreadsheet]. Edmonton (Alberta): Alberta Health and Wellness; 2009.
4. Canadian Cancer Society's Steering Committee: Canadian Cancer Statistics 2009. Toronto: Canadian Cancer Society, 2009.
5. Dyba T, Hakulinen T. Comparison of different approaches to incidence prediction based on simple interpolation techniques. Stat. Med. 2000; 19:1741-1752.
6. Levi F. Cancer Prevention: Epidemiology and Perspectives. Eur J Cancer. 1999;35(7):1046-1058.
7. Regional Health Authorities Act Cancer Registry Regulation, Alberta Regulation. 71/2009.
8. National Cancer Institute - Surveillance Epidemiology and End Results [Internet]. USA. National Institutes of Health; c2009.Cancer Statistics. Glossary of Statistical Terms; 2009 [cited 2009 Nov 5]; Available from: http://seer.cancer.gov/cgi-bin/glossary/glossary.pl
9. Annual Report on Cancer Statistics 2005. Edmonton (AB): Alberta Cancer Board (Canada), Alberta Cancer Registry; 2008 Apr. 6p.
10. Public Health Agency of Canada [Internet]. Canada. Government of Canada; c2009-10-07.Cancer Surveillance On-Line. Glossary; 2004 [cited 2009 Oct 7]; Available from: http://dsol-smed.phac-aspc.gc.ca/dsol-smed/cancer/glossa_e.html
11. National Cancer Institute - Surveillance Epidemiology and End Results [Internet]. USA. National Institutes of Health; c2010.Cancer Prevalence Statistics Overview; 2010 [cited 2010 Nov 23]; Available from: http://surveillance.cancer.gov/prevalence/]

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