Alberta Health Services

Cancer Care

Cancer Surveillance

Liver Cancer

December 2012

2010 Report on Cancer Statistics in Alberta

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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 male liver cancer statistics in Alberta. Details about individual cancer types are available within separate documents. The words highlighted in *dark blue* are terms described in detail in the Glossary within the **Appendix** document.

Data Notes

In this document, the term "cancer" refers to *invasive cancers* unless otherwise specified. It is important to note that this document contains both actual and estimated data; distinctions are made where applicable. The numbers published in this report should be considered provisional, as a few cases and deaths may be registered in subsequent years. The data in this report reflect the state of the Alberta Cancer Registry as of July 31, 2012.

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

Summary

- Approximately **1 in 126** men will develop invasive liver cancer within their lifetime.
- In 2010, **1,290** potential years of life were lost due to male liver cancer.
- As of December 31, 2010, approximately **400** male Albertans were alive who had previously been diagnosed with liver cancer.
- From 1990 to 2005*, **male** liver cancer **incidence rates have increased**.
- From 1990 to 2010*, **male** liver cancer **mortality rates have increased**.
- In 2010, there wer**e 117** new cases of male liver cancer in Alberta and **72** deaths in males due to the disease.
- Approximately **180** cases of liver cancer are expected to be diagnosed in males in 2015.
- The five-year relative survival ratio for male liver cancer in Alberta is approximately **20%** for those diagnosed between 2008 and 2010.

In 2010, there were 117 new cases of male liver cancer in Alberta and 72 deaths due to the disease.

The five-year relative survival ratio for male liver cancer in Alberta is approximately 20% for those diagnosed between 2008 and 2010.

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

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Probability of Developing and Dying from Liver 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 liver 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 male liver cancer increases with age (**Table 15-1**). Approximately 1 in 126 males will develop invasive liver cancer in their lifetime.

On a population basis the probability of developing male liver cancer by the end of the age range for a liver cancer-free individual at the beginning of the age range are shown in the bottom eight rows of **Table 15-1**. For instance, a liver cancer-free male representative of the general male population at age 40 has a 1 in 2,866 chance of developing liver cancer by the time he is 50.

The probability of dying from male liver cancer increases with age (**Table 15-2**). Approximately 1 in 194 males will die of invasive liver cancer.

On a population basis the probability of a cancer-free male at the beginning of the age range dying from liver cancer by the end of the age range are shown in the bottom eight rows of **Table 15-2**. For example, a cancer-free male representative of the general male population at age 40 has a 1 in 6,315 chance of dying from liver cancer by the time he is 50.

Table 15-1: **Probability of Developing Liver Cancer by Age, Males, Alberta, 2006-2010**

Age Group (Years)	Males
Lifetime Risk (all ages)	1 in 126
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 2,866
50 - 60	1 in 551
60 - 70	1 in 498
70 - 80	1 in 406
80+	1 in 284

Data Sources: Alberta Cancer Registry, Alberta Health

Table 12-2: **Probability of Dying from Liver Cancer by Age, Males, Alberta, 2006-2010**

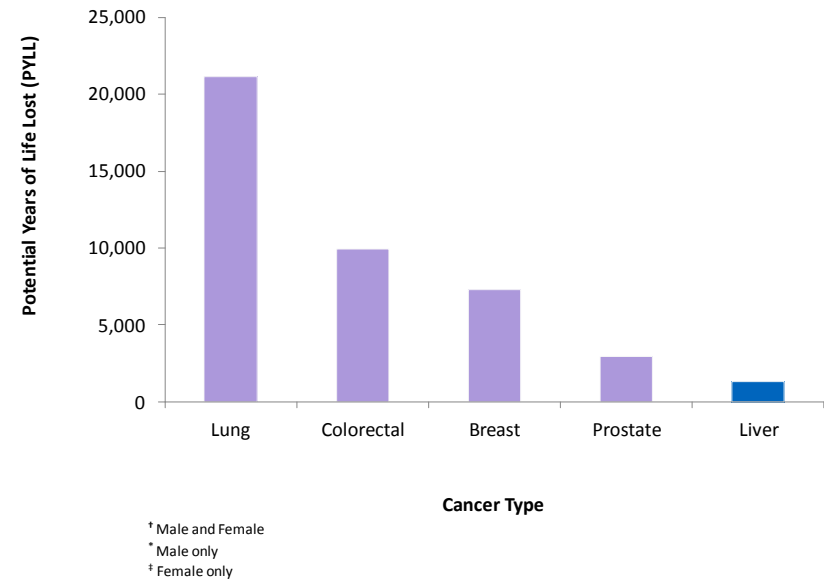| Age Group (Years)	Males
Lifetime Risk (all ages)	1 in 194
0 - 20	Less than 1 in 10,000
20 - 30	Less than 1 in 10,000
30 - 40	Less than 1 in 10,000
40 - 50	1 in 6,315
50 - 60	1 in 1,099
60 - 70	1 in 814
70 - 80	1 in 548
80+	1 in 356

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, 1290 potential years of life were lost due to male liver cancer, which constitutes about 2% of PYLL for all cancers (**Figure 15-1**).

Figure 15-1: **Potential Years of Life Lost (PYLL) from Liver[*] Cancer Compared with Lung[†], Colorectal[†], Breast[‡] and Prostate Cancers, Alberta, 2010**

[†] Male and Female
[*] Male only
[‡] 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 liver cancer prevalence represents the number of people alive on a certain day who had previously been diagnosed with liver cancer within a specified time period (e.g. 2, 5, 10 or 20 years) while complete liver cancer prevalence represents the number of people alive on a certain day who had previously been diagnosed with liver cancer, regardless of how long ago the diagnosis was.[2]

In this section of the report, both limited-duration and complete liver cancer prevalence are presented; the latter describing the number of people alive as of December 31, 2010 who had ever been diagnosed with liver 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 15-3: **Limited-Duration and Complete Prevalence for Liver Cancer, Males, Alberta, 2010**

Duration	Prevalence
2-Year	157
5-Year	262
10-Year	329
20-Year	377
Complete	401

Data Source: Alberta Cancer Registry

As of December 31, 2010, approximately **400** male Albertans were alive who had previously been diagnosed with liver cancer (*Table 15-3*) out of which approximately **160** male Albertans were alive on the same date who had been diagnosed with liver cancer in the previous two years, the period during which cases are more likely receive definitive treatments.

Liver 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 male liver cancer diagnoses in Albertan residents in a calendar year. Incidence rates are the number of new male liver 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 male liver 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.
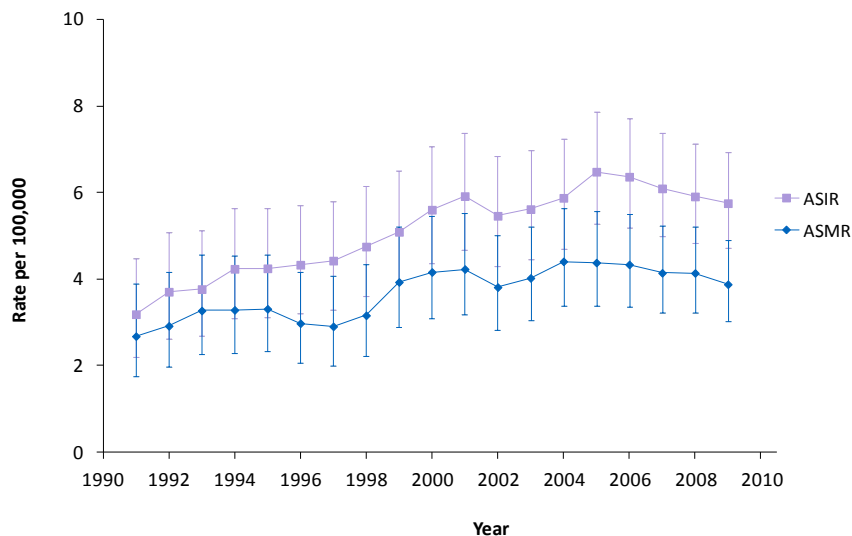
In order to compare cancer incidence or cancer mortality over time or between populations, *age-standardized incidence rates (ASIRs)* or *age-standardized mortality rates (ASMRs)* are presented. These are weighted averages of *age-specific rates* using a standard population to determine the weights. 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 male liver 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).

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Figure 15-2: **Age-Standardized Incidence Rates (ASIRs)**[*†] **and Mortality Rates (ASMRs)**[*†] **and 95% Confidence Intervals (CI) for Liver Cancer, Males, Alberta, 1990-2010**

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

Data Sources: Alberta Cancer Registry, Alberta Health

Male liver cancer ASIRs have increased significantly between 1990 and 2005 by 4.6% annually, and remained stable in the period 2005 to 2010 (***Figure 15-2***). In 2010, the ASIR for male liver cancer was 6 per 100,000 population.

Male liver cancer ASMRs have increased significantly between 1990 and 2010 by 2.0% annually (***Figure 15-2***). In 2010, the ASMR for male liver cancer was 4 per 100,000 population.
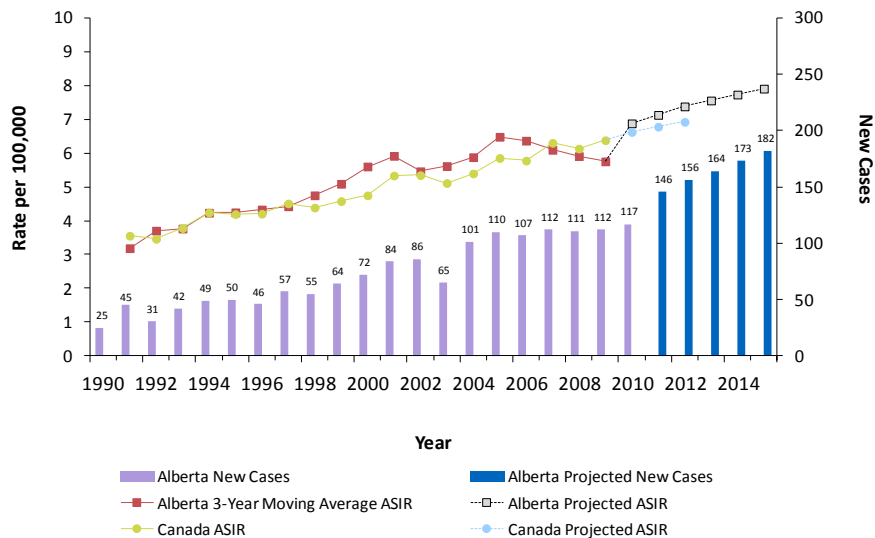
Liver Cancer Incidence

The following two figures (***Figures 15-3*** **to** ***15-4***) provide information on liver 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 15-3*** observed age standardized incidence rates are shown for 1990-2009, and ***projected*** rates for 2010 -2015, and observed numbers of new liver 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.[4] These were observed up to 2009 and estimated for 2010-2015. Caution should be exercised when comparing Canada[5] and Alberta rates as Canadian rates are yearly rates while Alberta rates are three-year moving averages.

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

Figure 15-3: Actual and Projected Number of New Cases and Age-Standardized Incidence Rates (ASIRs)[*†] for Liver Cancer, Males, Alberta, 1990-2015
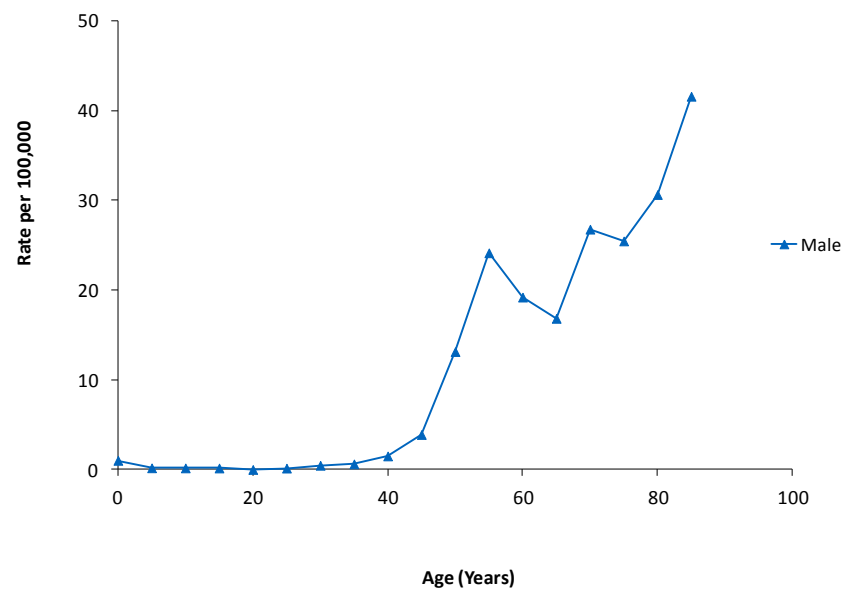

[*] Three-year moving average.
[†] Standardized to 1991 Canadian population.

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

In 2010, 117 cases of male liver cancer were diagnosed in Alberta (***Figure 15-3***). Alberta ASIRs for male liver cancer were similar to those in Canada.

Approximately 180 cases of male liver cancer will be diagnosed in Alberta in 2015.

Figure 15-4: Age-Specific Incidence Rates for Liver Cancer, Males, Alberta, 2006-2010

Data Sources: Alberta Cancer Registry, Alberta Health

Incidence rate of male liver cancer begins rising at age 35 and the oldest age groups have the highest cancer rates (***Figure 15-4***).
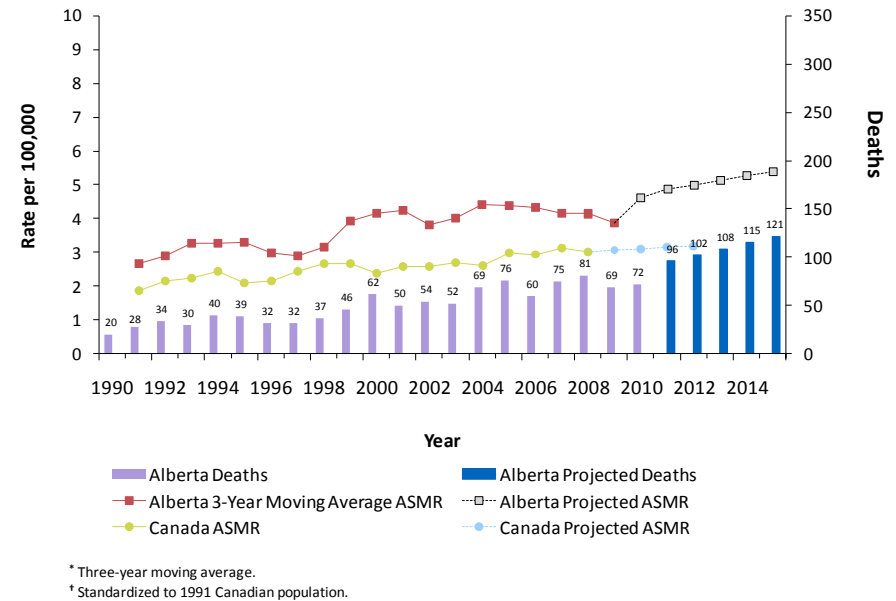
Liver Cancer Mortality

The following two figures (*Figures 15-5* to *15-6*) provide information on liver 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 15-5* 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.[4] These were observed up to 2009 and estimated for 2010-2015. Caution should be exercised when comparing Canada[5] and Alberta rates as Canadian rates are yearly rates while Alberta rates are three-year moving averages.

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

Figure 15-5: **Actual and Projected Number of Deaths and Age-Standardized Mortality Rates (ASMRs)[*+] for Liver Cancer, Males, Alberta, 1990-2015**

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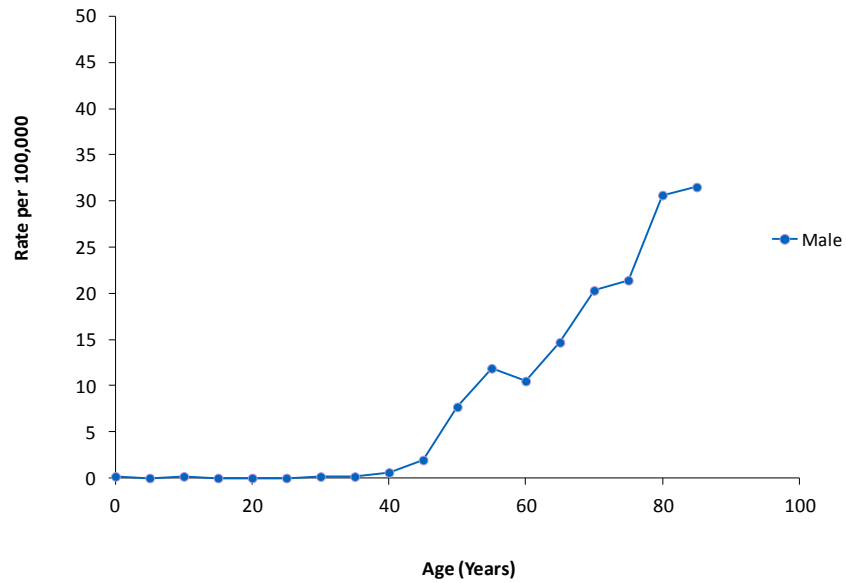[+] Standardized to 1991 Canadian population.

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

In 2010, 72 males died from liver cancer in Alberta (*Figure 15-5*). Alberta ASMRs for male liver cancer were higher than those in Canada.

Approximately 120 males are expected to die from liver cancer in Alberta in 2015.

Figure 15-6: **Age-Specific Mortality Rates for Liver Cancer, Males, Alberta, 2006-2010**

Age-specific liver cancer mortality rates remain low until about the age of 35 (*Figure 15-6*), when they begin to rise. The highest male liver cancer mortality rates in males occur in the older age groups.

Data Sources: Alberta Cancer Registry, Alberta Health

Liver 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.
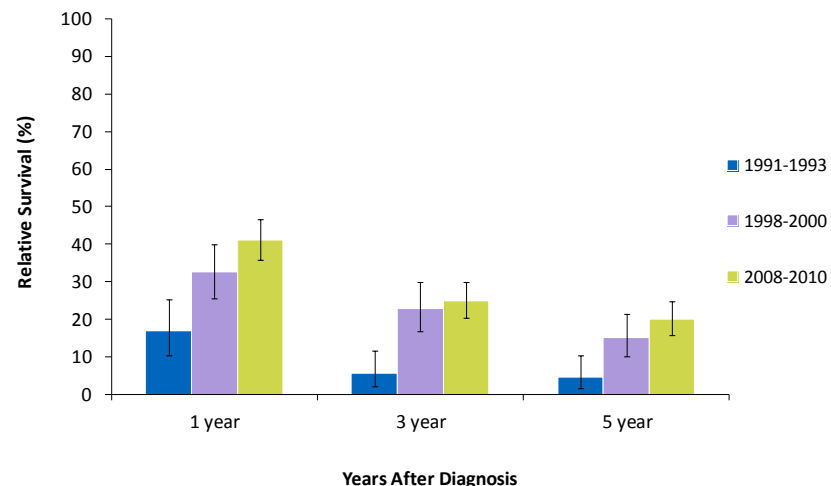
Survival depends on several factors including the cancer type (most importantly site, morphology and stage at diagnosis), sex, age at diagnosis, health status and available treatments for that cancer. While *relative survival ratios* (RSRs) give a general expectation of survival over the whole province, 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 calculated 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 to obtain a crude estimate.

RSRs are estimated by the *cohort method*[6] 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*.[7] 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 15-7: **One, Three and Five-Year Relative Survival Ratios and 95% Confidence Intervals (CI) for Liver Cancer, Males, 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 individuals diagnosed with male liver cancer in the period 2008-2010 is an estimated 20% indicating that out of individuals diagnosed with this cancer between 2008 and 2010, around 20% are as likely to be alive five years after diagnosis as individuals from the general population of the same age.

The five-year relative survival ratio for males diagnosed with liver cancer has improved in 2008-2010 compared to those diagnosed in 1991-1993 (*Figure 15-7*).

Further Information

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

      Appendix 1: Glossary

      Appendix 2: Cancer Definitions

      Appendix 3: Data Notes

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.

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4. 2010 Alberta Population Data [Excel Spreadsheet]. Edmonton (Alberta): Alberta Health; 2009.

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6. Ederer F, Axtell LM and Cutler SJ. The relative survival rate: a statistical methodology. Natl Cancer Inst Monogr, 1961; **6**: 101–121

7. Brennera H, Gefellerb 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

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