Breast Cancer

December 2012

2010 Report on Cancer Statistics in Alberta

Acknowledgements

Suggested Citation:
Cancer Surveillance: *2010 Report on Cancer Statistics in Alberta.* Edmonton: Cancer Care, Alberta Health Services, 2012.

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

Data Notes

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

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

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Summary

- Approximately **1 in 8** women will develop invasive breast cancer within their lifetime.
- In 2010, **7,290** potential years of life were lost due to breast cancer.
- As of December 31, 2010, approximately **25,550** Albertans were alive who had previously been diagnosed with breast cancer.
- From 1990 to 2010*, female breast cancer **incidence rates have remained stable**.
- From 1990 to 2010*, female breast cancer **mortality rates have decreased**.
- In 2010, there were **2,264** new cases of breast cancer in Albertan women and **399** deaths due to the disease.
- Approximately **2,250** cases of breast cancer are expected to be diagnosed in women in 2015.
- The five-year relative survival ratio for breast cancer in Alberta is approximately **89%** for those diagnosed between 2008 and 2010.

In 2010, there were 2,264 new cases of breast cancer in Alberta and 399 deaths due to the disease.

The five-year relative survival ratio for breast cancer in Alberta is approximately 89% for those diagnosed between 2008 and 2010.

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

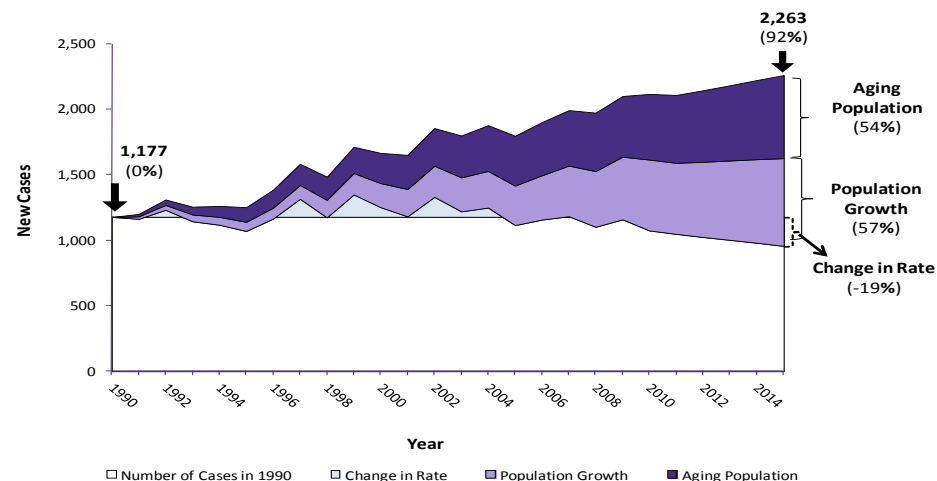**Cancer Care**
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Demography

The increase in the number of new cases of breast cancer over the last two decades is mainly attributable to changes in demography (aging of the population and population growth (*Figure 4-1*). From 2005 to 2015, the change in breast cancer rate reduced the annual number of new cases (*Figure 4-1*).

The horizontal black line indicating 1,177 new cases in *Figure 4-1* represents the number of female breast cancer cases that occurred in 1990. In 2015, approximately 2,250 new breast cancer cases are projected to occur, accounting for a 92% increase in cases from 1990. The line at the top of the dark-purple shaded area of the graph represents the number of new cases that actually occurred between 1990 and 2009, projected to 2015. Between these two lines, the three coloured areas reflect the increase in female breast cancer cases due to the impact of rate change, population growth and aging population.

The light blue shaded area (lower) represents the total number of new female breast cancer cases that would have occurred each year if breast cancer incidence rates alone had changed but the population size and age structure had remained the same as in 1990. This will account for an approximately 19% decrease in the total new female breast cancer cases in 2015.

The light purple shaded area (middle) represents the number of new female breast cancer cases that would have occurred each year if the population alone had grown larger, assuming the age distribution and breast cancer incidence rates had remained the same as in 1990. This will account for an approximately 57% increase in the total new female breast cancer cases in 2015.

Figure 4-1: **Trends in New Cases of Breast Cancer Attributed to Aging Population, Population Growth and Change in Breast Cancer Rate, Females, Alberta, 1990-2015**

Data Source: Alberta Cancer Registry, Alberta Health

The dark purple shaded area (top) represents the number of new female breast cancer cases attributed to increases in the older adult population - the aging population, assuming the population size and breast cancer incidence rate had remained the same as in 1990.   This will account for an approximately 54% increase in the total new female breast cancer cases in 2015.

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Probability of Developing and Dying from Breast 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 breast 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 breast cancer increases with age (*Table 4-1*). Approximately 1 in 8 females will develop invasive breast cancer in their lifetime. On a population basis the probability of developing breast cancer by the end of the age range for a breast cancer-free individual at the beginning of the age range are shown in the bottom eight rows of *Table 4-1*. For instance, a breast cancer-free female representative of the general population at age 40 has a 1 in 71 chance of developing breast cancer by the time she is 50. Male breast cancer is much rarer than female breast cancer and not reported here.

The probability of dying from breast cancer increases with age (*Table 4-2*). Approximately 1 in 31 females are will die of invasive breast cancer, whereas male breast cancer is much less common. On a population basis the probability of a cancer-free individual at the beginning of the age range dying from breast cancer by the end of the age range are shown in the bottom eight rows of *Table 4-2*. For example, a cancer-free female representative of the general population at age 40 has a 1 in 653 chance of dying from breast cancer by the time she is 50.

Table 4-1: **Probability of Developing Breast Cancer by Age, Females, Alberta, 2006-2010**

Age Group (Years)	Females
Lifetime Risk (all ages)	1 in 8
0 - 20	Less than 1 in 10,000
20 - 30	1 in 1,695
30 - 40	1 in 245
40 - 50	1 in 71
50 - 60	1 in 43
60 - 70	1 in 29
70 - 80	1 in 27
80+	1 in 24

Data Sources: Alberta Cancer Registry, Alberta Health

Table 4-2: **Probability of Dying from Breast Cancer by Age, Females, Alberta, 2006-2010**

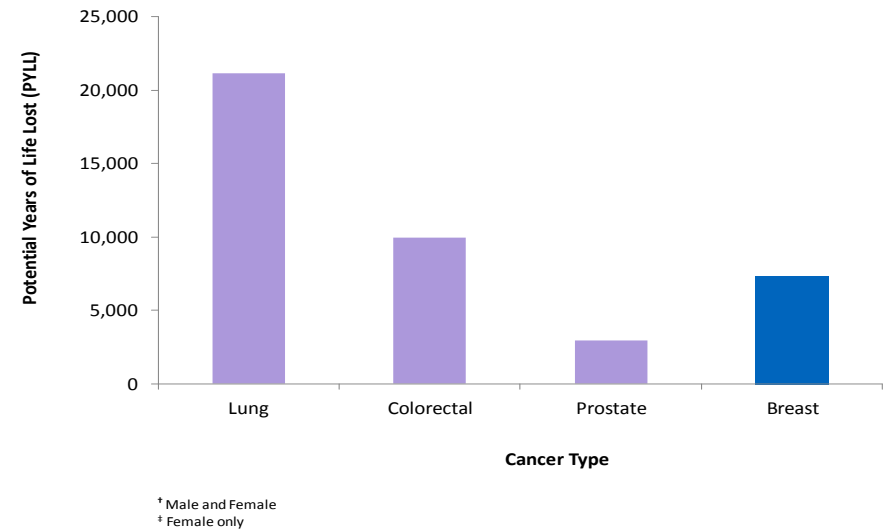| Age Group (Years)	Females
Lifetime Risk (all ages)	1 in 31
0 - 20	Less than 1 in 10,000
20 - 30	Less than 1 in 10,000
30 - 40	1 in 2,303
40 - 50	1 in 653
50 - 60	1 in 291
60 - 70	1 in 173
70 - 80	1 in 112
80+	1 in 51

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, **7,290** potential years of life were lost due to female breast cancer, which constitutes about 9% of PYLL for all cancers (*Figure 4-2*).

Figure 4-2: **Potential Years of Life Lost (PYLL) from Breast Cancer[‡] Compared with Lung[†], Colorectal[†], and Prostate Cancers, Alberta, 2010**

[†] Male and Female
[‡] Female only

Data Source: Alberta Cancer Registry

Prevalence

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

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

In this section of the report, both limited-duration and complete breast cancer prevalence are presented; the latter describing the number of people alive as of December 31, 2010 who had ever been diagnosed with breast 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 4-3: **Limited-Duration and Complete Prevalence for Breast Cancer, Both Sexes Combined, Alberta, 2010**

Duration	Prevalence
2-Year	4,108
5-Year	9,054
10-Year	15,371
20-Year	22,150
Complete	25,547

Data Source: Alberta Cancer Registry

As of December 31, 2010, approximately **25,550** Albertans were alive who had previously been diagnosed with breast cancer (*Table 4-3*) out of which approximately **4,100** Albertans were alive on the same date who had been diagnosed with breast cancer in the previous two years, the period during which cases are more likely to receive definitive treatments.

Breast 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 breast cancer diagnoses in Albertan residents in a calendar year. Incidence rates are the number of new breast 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 breast 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.
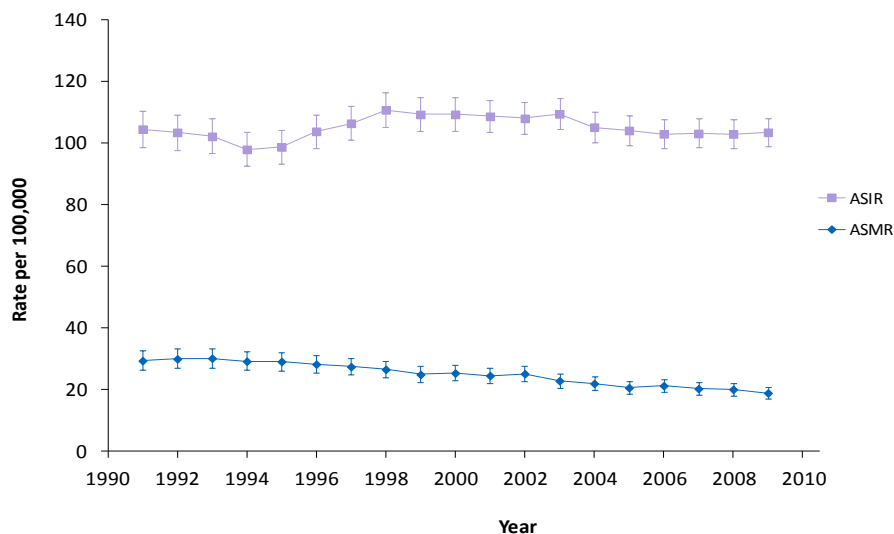
In order to compare cancer incidence or cancer mortality over time or between populations, *age-standardized incidence rates (ASIRs)* or *age-standardized mortality rates (ASMRs)* are presented. These are weighted averages of *age-specific rates* using a standard population to determine the weights. 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 breast cancer in Alberta. Separate analyses for both incidence and mortality are shown in subsequent sections. The statistical significance of the trends was determined by using Joinpoint[3] method and is described in the text accompanying each graph. Joinpoint models are based on yearly rates; hence there may be slight differences in the rates presented in the text (from Joinpoint model) and the graphs (where ASIRs and ASMRs are shown as three-year moving averages).

Figure 4-3: **Age-Standardized Incidence Rates (ASIRs)[*†] and Mortality Rates (ASMRs)[*†] and 95% Confidence Intervals (CI) for Breast Cancer, Females, Alberta, 1990-2010**

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

Data Sources: Alberta Cancer Registry, Alberta Health

Female breast cancer ASIRs did not change significantly between 1990 and 2010 (*Figure 4-3*). In 2010, the ASIR for female breast cancer was 106 per 100,000 female population.

Mortality rates for female breast cancer are lower than incidence rates. Female breast cancer ASMRs decreased significantly since 1990 (*Figure 4-3*). Between 1990 and 2010 breast cancer ASMRs decreased significantly by 2.6% annually. In 2010, the ASMR for female breast cancer was 18 per 100,000 female population.
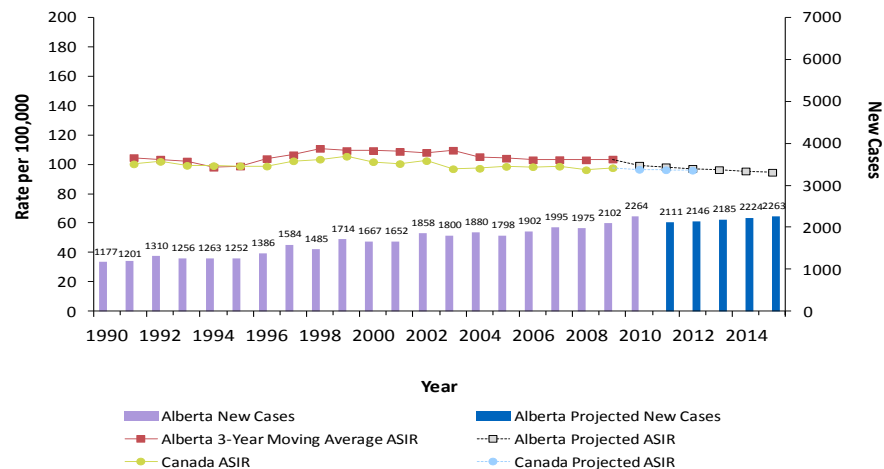
Breast Cancer Incidence

The following three figures (*Figures 4-4* **to** *4-6*) provide information on breast 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 4-4* observed age standardized incidence rates are shown for 1990-2009, and ***projected*** rates for 2010 -2015, and observed numbers of new breast 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 breast cancer incidence rates were calculated by extrapolating the historical trends in age-specific rate based on data for 1985-2009.

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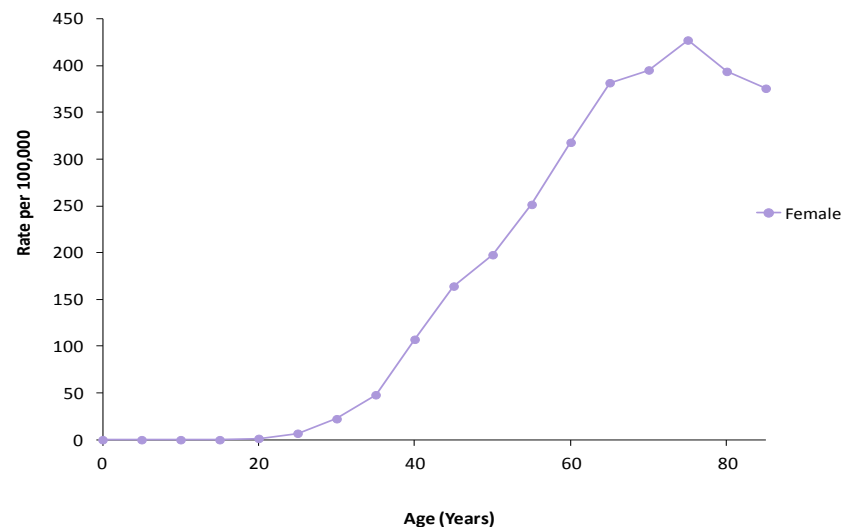

Figure 4-5: **Age-Specific Incidence Rates for Breast Cancer, Females, Alberta, 2006-2010**

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

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

Data Sources: Alberta Cancer Registry, Alberta Health

In 2010, 2,264 cases of breast cancer were diagnosed in Alberta females (*Figure 4-4*). Alberta ASIRs for breast cancer were similar to those in Canada over the period 1990 to 1995 and higher than those in Canada over the period 1995 to 2010.

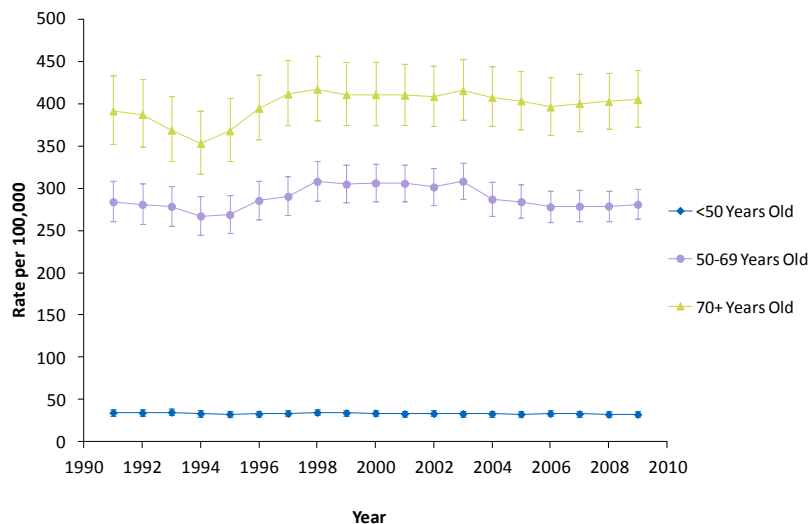Approximately 2,250 cases of breast cancer will be diagnosed in Alberta in 2015.

Breast cancer incidence rates in females remain low until about the age of 25, at which point they begin to increase, peaking at age 75 (*Figure 4-5*). The highest breast cancer incidence rates occur in the older age groups.

Figure 4-6: **Age-Standardized Incidence Rates (ASIRs)[*†] and 95% Confidence Intervals (CI) for Breast Cancer, Ages <50, 50-69, and 70+, Females, Alberta, 1990-2010**

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

Data Sources: Alberta Cancer Registry, Alberta Health

The trends in age-standardized breast cancer incidence rates for females differ across age groups (*Figure 4-6*).

Incidence rates for the youngest age group (<50 years) were the lowest while those for the oldest age group (70+ years) were the highest (*Figure 4-6*).

Incidence rates for all the age groups (<50 years, 50-69 years and 70+ years) did not change significantly over the period of 1990 to 2010.
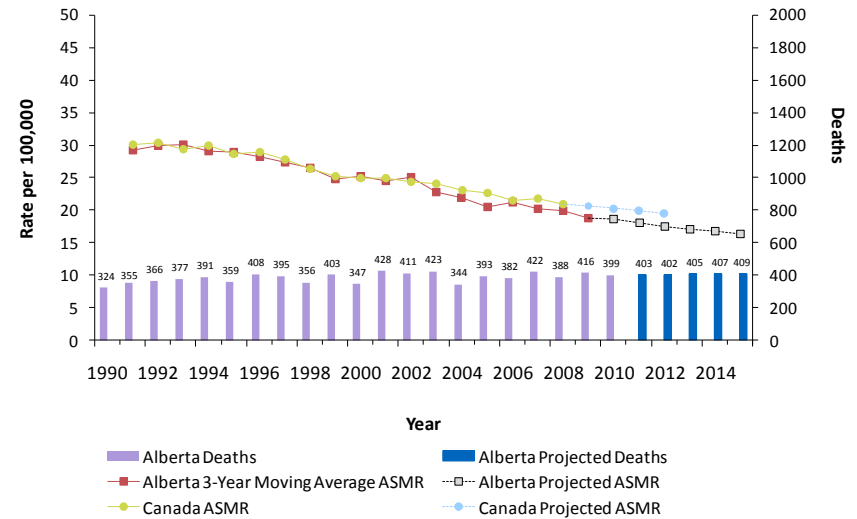
Breast Cancer Mortality

The following three figures (*Figures 4-7* **to** *4-9*) provide information on breast 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 4-7* observed age standardized mortality rates are shown for 1990-2009, and *projected* rates for 2010 -2015, and observed numbers of cancer deaths are shown for the years 1990-2010 and projected numbers for 2011-2015.

The projected numbers of cancer deaths were calculated by applying the estimated age-specific cancer mortality rates to the age-specific population figures provided by Alberta Health[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 breast cancer mortality rates were calculated by extrapolating the historical trends in age-specific rate based on data in 1985-2009.

Figure 4-7: **Actual and Projected Number of Deaths and Age-Standardized Mortality Rates (ASMRs)[*†] for Breast Cancer, Females, Alberta, 1990-2015**
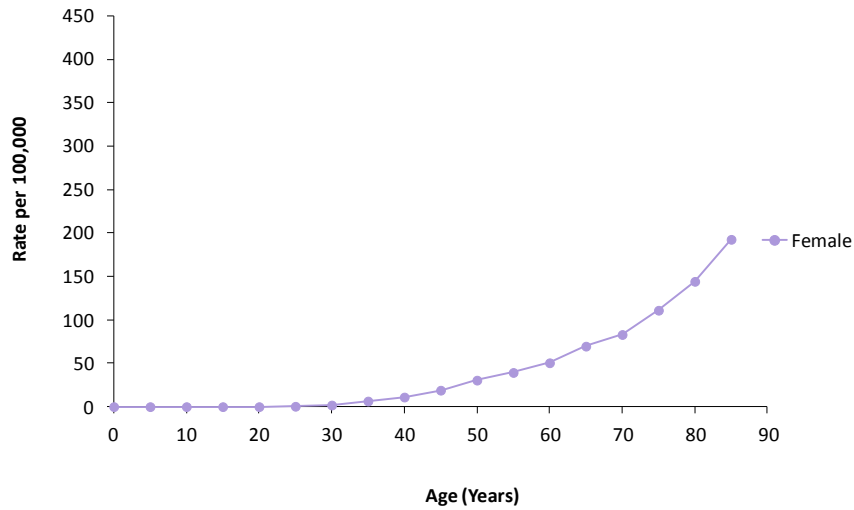

* Three-year moving average.
† Standardized to 1991 Canadian population.

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

In 2010, 399 females died of breast cancer in Alberta (*Figure 4-7*). Alberta ASMRs for breast cancer were generally similar to those in Canada over the period 1991 to 2002 then slightly lower over the period 2002 to 2010.

Approximately 410 females are expected to die from breast cancer in Alberta in 2015.
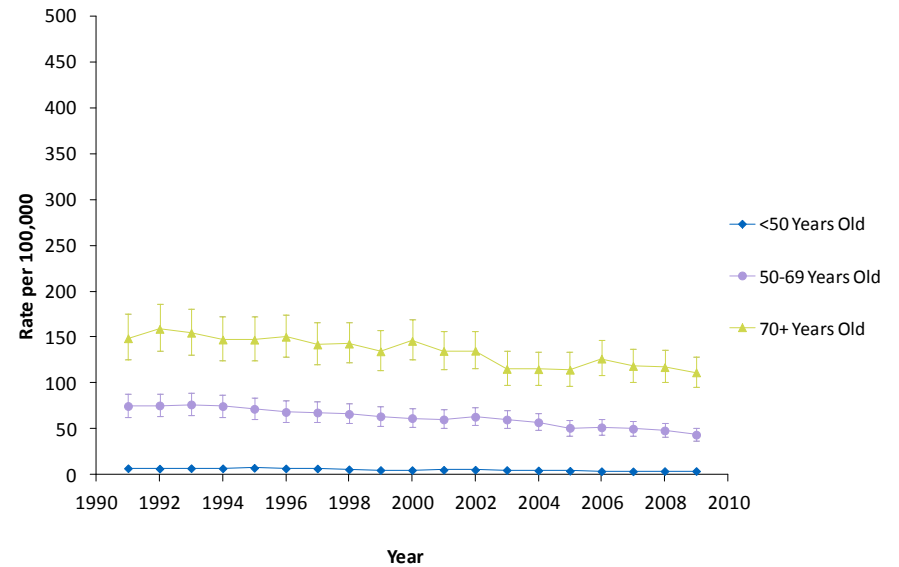
Figure 4-8: Age-Specific Mortality Rates for Breast Cancer, Females, Alberta, 2006-2010

Data Sources: Alberta Cancer Registry, Alberta Health

Female breast cancer mortality rates remain low until about the age of 35 and begin to increase gradually thereafter (*Figure 4-8*). The highest breast cancer mortality rates in females occur in the older age groups.

Figure 4-9: Age-Standardized Mortality Rates (ASMRs)[*†] and 95% Confidence Intervals (CI) for Breast Cancer, Ages <50, 50-69, and 70+, Females, Alberta, 1990-2010

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

Data Sources: Alberta Cancer Registry, Alberta Health

The trends in age-standardized breast cancer mortality rates vary over time and with age (*Figure 4-9*).

Mortality rates for breast cancer in the <50, 50-69, and 70+ age groups decreased significantly between 1990 and 2010 corresponding to a decrease of 3.9%, 2.9% and 1.7% annually respectively.

Like breast cancer incidence rates, mortality rates in females under 50 years of age remained low throughout the period.
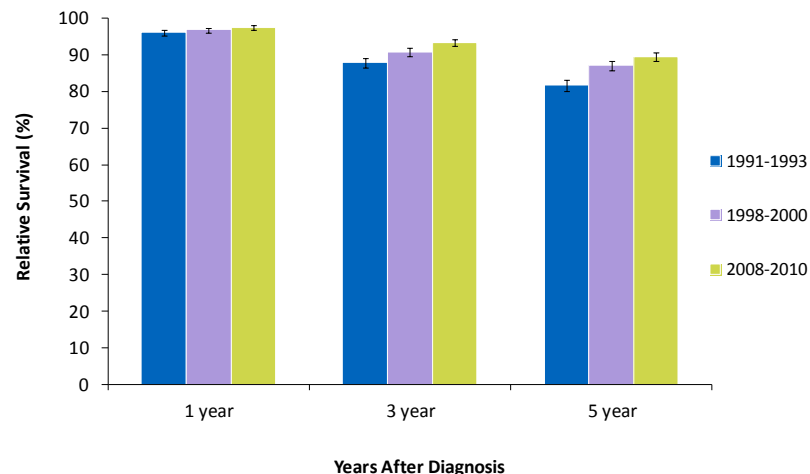
Breast Cancer Survival

Cancer survival ratios indicate the proportion of people who will be alive at a given time after they have been diagnosed with cancer. Survival is an important outcome measure and is used for evaluating the effectiveness of cancer control programs. Survival depends on several factors including the cancer type (most importantly site, morphology and stage at diagnosis), sex, age at diagnosis, health status and available treatments for that cancer. While *relative survival ratios* (RSRs) give a general expectation of survival over the whole province, these ratios may not apply to individual cases. Individual survival outcomes depend on the stage at diagnosis, treatment and other individual circumstances.

Relative survival ratios are estimated by comparing the survival of cancer patients with that expected in the general population of Albertans of the same age, sex and in the same calendar year. In this section of the report, RSRs are standardized by the age structure in the standard cancer patient population (i.e. all persons who were diagnosed with that cancer in Canada between 1992 and 2001) to permit RSRs to be compared over time, independent of differences in age distribution of cancer cases.

RSRs are estimated by the *cohort method*[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 4-10: **Age-Standardized One, Three and Five-Year Relative Survival Ratios and 95% Confidence Intervals (CI) for Breast Cancer, Females, 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 females diagnosed with breast cancer in the period 2008-2010 is an estimated 89% indicating that out of all females diagnosed with this cancer between 2008 and 2010, around 89% are as likely to be alive five years after diagnosis as females from the general population of the same age.

The five-year relative survival ratio for females diagnosed with breast cancer in Alberta has improved in 2008-2010 compared to those diagnosed in 1991-1993 (*Figure 4-10*).

Geographic Variation

The geographic variation section illustrates how the observed breast cancer rates in each health zone compare with the provincial average. These rates are three-year averages. The age standardized incidence and mortality breast cancer rates for each zone and the province are presented with their corresponding 95% *confidence intervals*.[8] Any observed differences in rates may be due to several factors such as regional differences in:
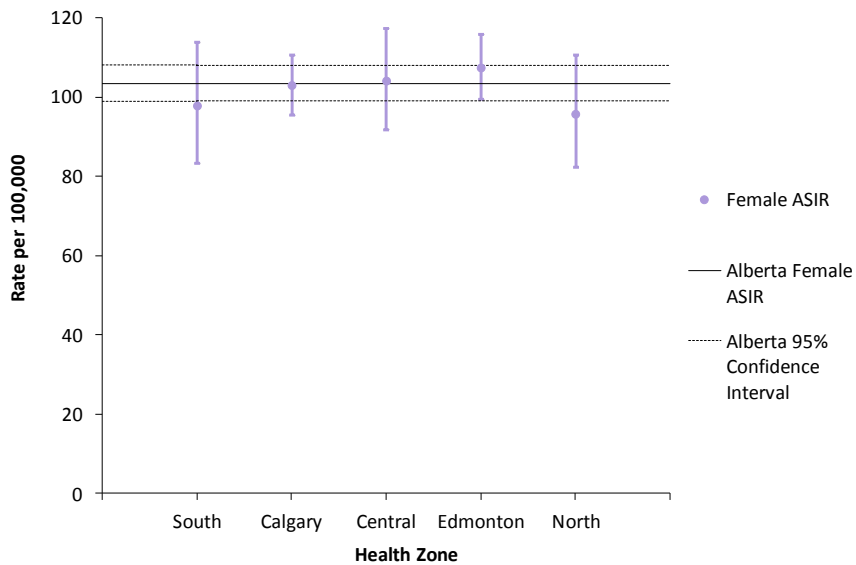
- risk factors such as smoking and obesity rates
- prevention efforts
- cancer screening
- diagnostic activity
- access to cancer care.[9]

Figure 4-11: **Five Health Zones in Alberta, 2010**

Source: Alberta Health Services

Figure 4-12: **Age-Standardized Incidence Rates (ASIRs)[*†] and 95% Confidence Intervals (CI) for Breast Cancer by Zones, Females, Alberta, 2008-2010**

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

Data Sources: Alberta Cancer Registry, Alberta Health

There is no evidence that female breast cancer ASIRs in each zone is significantly higher or lower than the provincial average (*Figure 4-12*).

Figure 4-13: **Age-Standardized Mortality Rates (ASMRs)[*†] and 95% Confidence Intervals (CI) for Breast Cancer by Zones, Females, Alberta, 2008-2010**
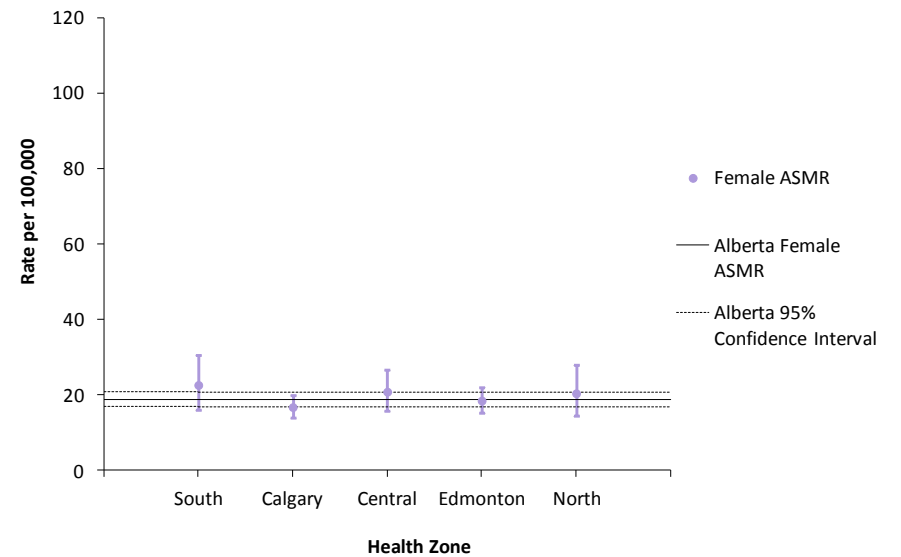

[*] Three-year average.
[†] Standardized to 1991 Canadian population.

Data Sources: Alberta Cancer Registry, Alberta Health

There is no evidence that breast cancer ASMRs in each zone is significantly higher or lower than the provincial average (*Figure 4-13*).

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.

2.   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/]

3.   Kim H-J, Fay M, Feuer E. Permutation tests for JoinPoint regression with applications to cancer rates. Stat. Med. 2000; 19:335-351.

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

5.   Canadian Cancer Society's Steering Committee: Canadian Cancer Statistics 2012. Toronto: Canadian Cancer Society, 2012.

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

8.   Fay MP and Feuer EJ. Confidence intervals for directly standardized rates: a method based on the gamma distribution. Stat Med, 1997; 16: 791 – 801.

9.   Levi F. Cancer Prevention: Epidemiology and Perspectives. Eur J Cancer. 1999;35(7):1046-1058.

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