Alberta Health Services

Cancer Care

Cancer Surveillance

Appendix

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2010 Report on Cancer Statistics in Alberta

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APPENDIX 1: Glossary of Terms

Age-specific rate:
The number of events (e.g. cancer cases or cancer deaths) occurring per 100,000 people per year within a given age group.

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

Benign tumor:
A tumour that does not spread to other parts of the body.

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

Childhood cancer:
Cancers diagnosed and cancer deaths in children aged 0-14 year olds.

Confidence interval:
An indication of the precision of an estimate. A wide confidence interval indicates less precision.

Count:
Count is the number of cases (primaries) or deaths in a given time period.

Incidence count:
The number of new cancer cases during a period of time; often the number of new invasive cases diagnosed in a year. One patient may have multiple primary cancers.

Invasive cancer:
Cancer with a potential to spread beyond its point of origin. Sometimes referred to as malignant cancer.

Life table:
A life table presents the estimates of the likelihood of dying before the next birthday, for each year of age. 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 tumour:
A tumour that invades and destroys surrounding tissues, that 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.[1]

Metastasis:
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.

Observed survival
The proportion of people with a particular disease who are alive after a given length of time calculated from the cohort of cancer cases.[2]

Potential years of life lost (PYLL):
PYLL is the total number of years of life lost due to a specific disease.

There are two methods of calculating PYLL:

1. Multiplying the number of deaths in each age group by the difference between 75 years of age and the mid-point of the age interval. Seventy five years was the average length of life of a Canadian. This is the method used by Alberta Health;
2. Multiplying the number of deaths in each age group by the life expectancy for people at the mid-point of that age group determined from life tables (the preferred method for cancer PYLL).

Prevalence:
The number of people alive at a given time point in time who had been previously diagnosed 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 cancer within a specified time period (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.[3]

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 historical trends.[4]

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.

Stage of cancer:
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.[1]

Surveillance:
Surveillance includes the collection of data, and the review, analysis, interpretation and dissemination of findings on incidence, prevalence, morbidity, survival and mortality. Cancer 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.

Survival - Cohort method:

The cohort method provides population-based survival estimates of cancer cases having complete follow-up for the number of years of survival of interest.[5]

Survival - Period analysis:
The period method provides up-to-date population-based survival estimates of recently diagnosed cases considering the survival experience of the most recent cases who completed follow-up for the number of years of interest, allowing for the estimation of survival of the most recent period.[6]

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

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.

APPENDIX 2: Cancer Definitions

Cancer	ICD-O-3 Site/Histology Type* (Incidence)	ICD-10 (Mortality)
Oral	C00–C14	C00–C14
Esophagus	C15	C15
Stomach	C16	C16
Colorectal	C18–C21, C26.0	C18–C21, C26.0
Liver	C22.0	C22.0, C22.2–C22.7
Pancreas	C25	C25
Larynx	C32	C32
Lung	C34	C34
Melanoma	C44 (Type 8720–8790)	C43
Breast	C50	C50
Cervix	C53	C53
Body of Uterus	C54–C55	C54–C55
Ovary	C56.9	C56
Prostate	C61.9	C61
Testis	C62	C62
Bladder (including *in situ*)	C67	C67
Kidney	C64.9, C65.9	C64–C65
Brain	C70–C72	C70–C72
Thyroid	C73.9	C73
Hodgkin Lymphoma*	Type 9650–9667	C81
Non-Hodgkin Lymphoma*	Type 9590–9596,9670–9719, 9727–9729 Type 9823, all sites except C42.0,.1,.4 Type 9827, all sites except C42.0,.1,.4	C82–C85,C96.3
Multiple Myeloma*	Type 9731,9732,9734	C90.0, C90.2
Leukemia*	Type 9733,9742,9800–9801,9805, 9820,9826,9831–9837,9840, 9860–9861,9863,9866–9867, 9870–9876,9891,9895–9897,9910, 9920,9930–9931,9940,9945–9946, 9948,9963–9964 Type 9823 and 9827, sites C42.0,.1,.4	C91–C95,C90.1
All Other Cancers	All sites C00–C80 excluding non-melanoma skin cancer, not specified in the report	All sites C00–C97 not specified in the report
All Cancers	All invasive sites	All invasive sites

* Histology types 9590–9989 (leukemia, lymphoma and multiple myeloma and other hematopoietic cancers) and 9050–9055 (mesothelioma) and 9140 (Karposi Sarcoma) are excluded from other specific organ sites.
Only invasive cancers were included in the incidence analysis except bladder.
Basal and squamous skin cancers were excluded from incidence analysis, but included in the mortality analysis.

Note:
ICD-O-3 refers to the *International Classification of Diseases for Oncology, 3rd Edition*.[7] ICD-10 refers to the *International Statistical Classification of Diseases and Related Health Problems, 10th Edition*.[8]

APPENDIX 3: Data Notes

Data Sources

Cancer incidence and mortality data were obtained from the Alberta Cancer Registry (ACR), while population data were obtained from Alberta Health (AH). Canadian incidence and mortality rates and projections data were obtained from the Canadian Cancer Society (CCS) through the Chronic Disease Surveillance and Monitoring Division, Public Health Agency of Canada and through their annual Canadian Cancer Statistics 2012 publication.[9] Other data sources that contributed to this report are causes of death data from Surveillance and Health Status Assessment with data obtained from Alberta Vital Statistics, Service Alberta; and Canadian life table from Statistics Canada. Detailed data sources by type of analysis can be found in *Methods and Limitations* section below.

Data 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.[10]

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 allow for 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. For this report, ICD-O-2 cases were converted to ICD-O-3, therefore applying same site definitions across the period 1990-2010. 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). SEER rules are used for the definition of multiple primaries.[11] Collaborative staging rules were used to stage the cancers.[12]

Cancer death numbers in this report are based on coder cause of death information in the Alberta Cancer Registry; this may slightly vary from the Alberta Vitals Statistics official cause of death (when more information is available to the Alberta Cancer Registry).

Childhood cancer is classified using the International Classification of Childhood Cancers (ICCC), 3rd Edition.[13] ICCC classification is based on tumour morphology and cancer site with more emphasis on morphology.

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%.[14]

Lastly, validity depends on the availability of validated rules and the level of expertise in the abstracting, coding and recording of data within a registry, according to these rules. 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). 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.

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 and the data providers 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.

Methods and Limitations

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.

Incidence rates and counts presented in this document exclude basal and squamous skin cancers. Although approximately 30% of the malignant cancers diagnosed among Albertans each year are basal and squamous skin cancers, these tumours are generally not life-threatening and are inconsistently reported and coded across registries; therefore basal and squamous skin cancers are rarely included in cancer registry reports. Actual data in this report cover the period from 1990 to 2010, while short-term projections cover the period from 2010 to 2015.

Analysis	Data Sources	Notes
Demography	Alberta Cancer Registry, Alberta Health, Statistics Canada	Current and historical population data were available from Alberta Health. The projected age-specific population sizes (2010-2030) were estimated by Statistics Canada based on a medium-growth scenario considering 2001-2006 population trends. [15] The changes due to aging population, population growth and change in cancer rate were calculated in Canproj R-package.[4]
Causes of Death	Surveillance and Health Status Assessment with data obtained from Alberta Vital Statistics, Service Alberta	Only the top seven leading causes of death in Alberta reported for the year 2010. ICD10 codes[8] for the seven leading causes of deaths in Alberta • Circulatory diseases: I00-I99 • Cancer: C00-C97 • Injury: V01-Y36, Y85-Y87, Y89 • Respiratory diseases: J00-J99 • Mental and behavioural disorders: F00-F99 • Nervous system diseases: G00-G99 • Digestive system diseases: K00-K93 Proportions in the causes of death pie charts presented in this report may not add up to 100% due to rounding.
Potential Years of Life Lost (PYLL)	Alberta Cancer Registry, Alberta Health	PYLL for all causes of death are estimated by Alberta Health by taking the mid-point age in each age group, subtracting from 75, and multiplying by the number of deaths in that age group disaggregated by sex and cause of death to determine the years of life lost in each cohort.[16] Cancer Surveillance calculates PYLL due to cancer 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. Since cancer tends to affect people in older age-groups, this method accounts for deaths due to cancer that occur even after the 75-year cutoff that Alberta Health uses. Therefore, the estimated PYLL due to cancer, estimated by Cancer Surveillance, is larger than that estimated by Alberta Health. ICD10 codes[8] for causes of death: • Cancer:C00-C97 • Diseases of the circulatory system: I00-I99 • Diseases of the respiratory system: J00-J99 • Injury: V01-Y98
Prevalence	Alberta Cancer Registry	Complete and limited duration prevalence date: 31 December, 2010 Prevalence was estimated by the “counting method” with rounding criteria as follows: • numbers between 0 and 99 to the nearest 5 • numbers between 100 and 999 to the nearest 10 • numbers equal to or greater than 1000 to the nearest 50

Analysis	Data Sources	Notes
Probability of Developing/ Dying from Cancer	Alberta Cancer Registry, Alberta Health	Probability of developing or dying of cancer was estimated using DevCan software version 6.6.0 published by the National Cancer Institute in the USA.[17] DevCan uses incidence and mortality counts to calculate incidence and mortality rates using population estimates from census data for these areas and then converts these rates to the probabilities of developing or dying from cancer for a hypothetical population relatable to Alberta.[18, 19] The probability of developing or dying from cancer for an individual in a given age range is conditional on the person being cancer-free prior to the beginning of that age range. Probabilities that are less than 1 in 10,000 are not reported.
New Cases and Deaths	Alberta Cancer Registry	The new cases and deaths pie charts include cancer sites whose proportion of new cases or deaths constitute at least 2% of new cases and deaths. Those with a proportion of less than 2% are grouped under the category 'Others'. Proportions in the new cases and deaths pie charts presented in this report may not add up to 100% due to rounding.
Incidence and Mortality	Alberta Cancer Registry, Alberta Health	Age Standardized Rate (per 100,000) is a weighted average of age-specific rates, where the weights are the proportion of persons in the corresponding age groups of the 1991 Canadian standard population representing a 21-year period from 1990-2010. Age Standardized Rates are presented as three year moving averages, which are calculated by averaging the age-specific rates over three years before applying standard population weights. Reported 1990 and 2010 ASRs are single year rates. Statistical significance of the trends was determined by using Joinpoint[20] and is described in the text accompanying each graph. Joinpoint models are based on yearly age standardized 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). Age-specific rates are crude rates for each five-year age group.
Projections	Alberta Cancer Registry, Alberta Health, Canadian Cancer Society	Alberta five-year projections (2010-2015) are provided for incidence and mortality rates and counts using the Canproj program, a cancer projection method based on generalized linear models for age, period, and/or cohort analysis.[4] Reported projected incidence and mortality rates and counts for 2015 have been rounded as follows: • numbers between 0 and 99 to the nearest 5 • numbers between 100 and 999 to the nearest 10 • numbers equal to or greater than 1000 to the nearest 50 Canada incidence rates are single-year rates provided by the Canadian Cancer Society[9, 21] and are estimated by the Public Health Agency of Canada using the Nordpred method.[22] Canada incidence rates are projected for the years 2010 to 2012 and mortality rates are projected for the years 2009 to 2012. Caution should be exercised when comparing Alberta and Canada rates.
Geographic Variation in Incidence and Mortality	Alberta Cancer Registry, Alberta Health	Age-standardized rates (ASRs), standardized to the 1991 Canada standard population, averaged over the three years (2008-2010) are calculated for each zone. The residence in the zones is determined from the postal code of residence at diagnosis/death. Evidence of a difference between zonal rates and the provincial rate were interpreted based on comparisons between the confidence intervals of the zones and the province. [23]

Analysis	Data Sources	Notes
Relative Survival	Alberta Cancer Registry, Statistics Canada	Relative survival ratios (RSRs) are standardized by the age structure in the standard cancer 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 for pancreas, brain and male liver cancers were not age-standardized due to a small number of cases in some of the age intervals. RSRs for cohorts 1991-1993 and 1998-2000 are estimated by the cohort method[5] where complete follow-up data (i.e. at least five years of follow-up to estimate five-year rate) after diagnosis are available. For example, cases diagnosed in 2001, for which vital status data are available to the end of year 2006, the cohort method can be used to obtain an estimate of five-year survival. The cohort survival represents the actual survival experience of individuals. For recently diagnosed cases (cohort 2008-2010), whose complete follow-up data are not available, the up-to-date estimates are computed using the period method.[6] For example, to estimate the five year survival for cases diagnosed in 2008-2010, this method considers zero to one year survival experience for cases diagnosed in 2008-2010, one to two year survival experience for cases diagnosed in 2007-2009 who survived at least one year, and so on up to four to five year survival experience for cases diagnosed in 2004-2006 who survived at least four years. However, comparison between cohort and period RSRs should be interpreted with caution because of the two different methods used to derive the respective ratios.
Childhood Cancers	Alberta Cancer Registry, Alberta Health, Statistics Canada	In this report, childhood cancers are defined as invasive cancers diagnosed and cancer deaths that affect children up to and including the age of 14. As with adults, the classification of childhood cancer is based on both tumor morphology and cancer site. However, greater emphasis is placed on morphology rather than site, as compared to adults where greater emphasis is placed on site. In this report, childhood cancers are classified according to the International Classification of Childhood Cancer, 3rd Edition.[13] Age-standardized rates (ASRs) are standardized to the 1991 Canadian standard population for ages 1014 years and are expressed as rates per 1,000,000. Observed survival proportions for childhood cancer for all the cohorts (1991-1995, 1996-2000, 2001-2005) are estimated by cohort method, where complete follow-up data are available.

1991 Canadian Standard Population

Age Group	Population (per 100,000)	Weights (%)
0-4	6,946.5	6.9
5-9	6,945.4	6.9
10-14	6,803.4	6.8
15-19	6,849.5	6.8
20-24	7,501.6	7.5
25-29	8,994.4	9.0
30-34	9,240.0	9.2
35-39	8,338.8	8.3
40-44	7,606.3	7.6
45-49	5,953.6	6.0
50-54	4,764.9	4.8
55-59	4,404.1	4.4
60-64	4,232.6	4.2
65-69	3,857.0	3.9
70-74	2,966.0	3.0
75-79	2,212.7	2.2
80-84	1,359.5	1.4
85+	1,023.7	1.0
Total	**100,000**	**100**

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