



# The 2024 Report on Cancer Statistics in Alberta

## Appendix

*Surveillance & Reporting*

*Cancer Care Alberta*

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## Appendix 1: Glossary of Terms

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### ***Age-specific rate:***

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

### ***Age-standardized (incidence/mortality) rate:***

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

### ***Benign tumour:***

A tumour that is non-cancerous and 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 or cancer deaths in children aged 0-14 years old.

### ***Confidence interval:***

An indication of the precision of an estimate. A wide confidence interval indicates less precision and vice-versa.

### ***Count:***

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.

### ***Initial Treatment:***

Treatment includes initial surgery, radiotherapy, systemic therapy (chemotherapy and/or immunotherapy), hormone and/or observation provided to a patient diagnosed with cancer. It is recorded for each primary cancer regardless of the time frame since diagnosis.

### ***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; a cancerous tumour.

### ***Median Age:***

The age at which half of the population is older and half is younger.<sup>1</sup>

### ***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 cancer who are alive after a given length of time calculated from the cohort of cancer cases.<sup>2</sup>

### ***Primary Site of Cancer:***

The tissue or organ in which the cancer originates.<sup>3</sup>

### ***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:***

The likely outcome or course of a disease; the chance of recovery or recurrence.

### ***Projection:***

An estimate of cancer incidence or mortality in the future.<sup>4</sup>

### ***Rate:***

The number of cases or deaths occurring in a specified time period in a population at risk.

### ***Relative survival:***

The survival of cancer patients relative to that of the general population.<sup>5</sup> 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.<sup>1</sup>

### ***Statistical Significance:***

Describes a mathematical measure of difference between groups. The difference is said to be statistically significant if it is greater than what might be expected to happen by chance alone 95% of the time. Although statistically significant

usually refers to 95% confidence, sometimes other confidence levels such as 99% or 90% are specified.<sup>1</sup>

### ***Surveillance:***

Surveillance includes the collection of data, and the review, analysis and dissemination of findings on cancer 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.

### ***Survival - Cohort method:***

The cohort method provides survival estimates of cases having complete follow-up for the number of years of survival of interest.<sup>5</sup>

### ***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 that completed follow-up for the number of years of interest, allowing for the estimation of survival of the most recent period.<sup>6</sup>

### ***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 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–C20, C26.0	C18–C20, C26.0
Liver	C22.0	C22.0, C22.2–C22.7
Pancreas	C25	C25
Larynx	C32	C32
Lung and bronchus	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 <i>in situ</i> for incidence)	C67	C67
Kidney and renal pelvis	C64.9, C65.9	C64–C65
Brain/CNS	C70–C72	C70–C72
Thyroid	C73.9	C73
Hodgkin Lymphoma*	Type 9650–9667	C81
Non-Hodgkin Lymphoma*	Type 9590–9597, 9670–9729, 9735–9738 Type 9811–9818, 9823, 9827, 9837, all sites except C42.0., 1., 4	C82–C86, C96.3
Multiple Myeloma*	Type 9731, 9732, 9734	C90.0, C90.2
Leukemia*	Type 9733, 9742, 9800–9801, 9805–9809, 9820, 9826, 9831–9836, 9840, 9860–9861, 9863, 9865–9867, 9869–9876, 9891, 9895–9898, 9910–9911, 9920, 9930–9931, 9940, 9945–9946, 9948, 9963–9964 Type 9811–9818, 9823, 9827 and 9837 sites C42.0., 1., 4	C91–C95, C90.1
All Other Cancers	All sites C00–C80 not listed above (excluding non-melanoma skin cancer)	All sites C00–C80 and C97 not listed above
All Cancers	All invasive sites <sup>†‡</sup>	All invasive sites <sup>‡</sup>

\* Histology types 9590–9992 (leukemia, lymphoma and multiple myeloma), 9050–9055 (mesothelioma) and 9140 (Kaposi Sarcoma) are excluded from other specific organ sites.

<sup>†</sup> Only invasive cancers were included in the incidence analysis except bladder, which also included *in situ*.

<sup>‡</sup> 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*.<sup>7</sup>

ICD-10 refers to the *International Statistical Classification of Diseases and Related Health Problems, 10th Edition*.<sup>8</sup>

## Appendix 3: Data Notes

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### Data Sources

- Cancer incidence and mortality data were obtained from the Alberta Cancer Registry (ACR), while population data were obtained from Alberta Health (AH).
- Other data sources that contributed to this report are causes of death data from Analytics, Alberta Health Services, and Canadian life table from Statistics Canada.

Detailed data sources by type of analysis can be found in the *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.<sup>9</sup>

The quality of data collected by any registry is evaluated based 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. Cancer deaths are coded using the International Classification of Diseases and Related Health Problems (ICD-10 for 2001 onwards). The Surveillance, Epidemiology and End Results (SEER) coding rules are used for the definition of multiple primaries.<sup>10</sup> Stage data presented in this report are using the AJCC 6th edition stage group derived from collaborative staging (CS) fields using the CS algorithm for years 2011-2017 and AJCC 8<sup>th</sup> edition stage group derived from the pure TNM stage for years 2018-2021. Most current version of the Collaborative Stage Data Collection System can be found at: <https://cancerstaging.org/cstage/Pages/default.aspx>.<sup>11</sup>

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.<sup>12</sup> 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 consistently achieved a completeness of over 95%.<sup>13</sup>

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.<sup>13</sup>

Confidentiality and security of personal and health information are protected by the Alberta Health Information Act (HIA), Regional Health Authorities Act (RHA), and Freedom of Information and Protection of Privacy Act (FOIP). The Alberta Cancer Registry maintains the trust of the public, government and data providers by ensuring rigorous security and privacy practices/procedures are enforced relative to all collection, access, use and disclosure processes specific to the Cancer Registry database. Formal policies in accordance with HIA, RHA and FOIP legislations are available on the AHS website, from AHS Privacy at [privacy@ahs.ca](mailto:privacy@ahs.ca) or 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 dashboard, the term “cancer” refers to invasive cancers, with exception of bladder cancer which includes in situ cases. It is important to note that the dashboard contains both actual and estimated data; distinctions are made where applicable. The Alberta Cancer Registry is dynamic with information updated as it becomes available and some cases may be registered in subsequent years. Case finding methods have changed over time with the additions of new technologies. In particular, starting in 2016 changes in pathology reporting may have caused under-reporting of certain cancer anatomical sites. As these issues are rectified, we have seen increases in cancer incidence (particularly for melanoma and non-melanoma skin) in 2017. Therefore, caution should be exercised when evaluating trends. The data in this report reflect the state of the Alberta Cancer Registry as of July 19, 2023.

Incidence rates and counts presented in this dashboard 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 2001 to 2021, while short-term projections cover the period from 2022 to 2026.



<b>Analysis</b>	<b>Data Sources</b>	<b>Notes</b>
<b>Trends</b>	Alberta Cancer Registry, Alberta Health Services; Alberta Health	<p>The population estimates are available from the Alberta Health Services Patient/Care Based Funding Population database, and are derived from the Provincial Registry data using the Alberta Health Population Projections.</p> <p>The changes due to an aging population, population growth and change in cancer rate were calculated in Canproj R-package<sup>4</sup> using the projected age-specific rates and population sizes.</p>
<b>Probability of Developing/ Dying from Cancer</b>	Alberta Cancer Registry, Alberta Health Services; Analytics, Alberta Health Services	<p>Probability of developing or dying of cancer was estimated using DevCan software version 6.7.8.5 published by the National Cancer Institute in the USA.<sup>14</sup> 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.<sup>15,16</sup></p> <p>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.</p> <p>Specific probabilities that are less than 1 in 10,000 are not reported.</p>
<b>New Cancer Cases and Deaths</b>	Alberta Cancer Registry, Alberta Health Services	The new cases and deaths bar charts include cancer sites whose count of new cases or deaths greater than 15 cases. Those with a count of less than 15 are suppressed.
<b>Incidence and Mortality</b>	Alberta Cancer Registry, Alberta Health Services; Alberta Health; Statistics Canada	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 2011 Canadian Standard Population representing a 21-year period from 2001-2021. 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. Statistical significance of the trends was determined by using Joinpoint. <sup>17</sup> Joinpoint models are based on actual 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.
<b>Projections</b>	Alberta Cancer Registry, Alberta Health Services; Statistics Canada	Alberta five-year projections (2022-2026) are provided for incidence and mortality rates and five-year projections (2022-2026) for counts using the Canproj <sup>4</sup> R-package, version 1, which contains 9 projection models. In general, the choice of projection model was based on the age, period, and/or cohort analysis for each cancer type by sex, and automatically performed in Canproj software. Based on validation analysis, however, the age-specific period trends model was selected for prostate cancer incidence projection.
<b>Geographic Variation in</b>	Alberta Cancer Registry, Alberta	Age-standardized rates (ASRs), standardized to the 2011 Canadian Standard Population, for 2017 - 2021 are calculated

<b>Incidence and Mortality</b>	Health Services; Alberta Health; Statistics Canada	for each zone and the rest of Alberta (excluding the zone of interest). The zone is determined from the postal code of residence at diagnosis/death. Evidence of a difference between zonal rates, the rest of Alberta rates and the provincial rate were interpreted based on comparisons between the confidence intervals of the rates in the zones, the rests of Alberta and the province. <sup>18</sup>
<b>Stage</b>	Alberta Cancer Registry, Alberta Health Services; Alberta Health; Statistics Canada	<p>The Alberta Cancer Registry started to collect the information on stage at diagnosis in 2004 using the collaborative staging system which is based on the AJCC (American Joint Committee on Cancer) Cancer Staging Manual.<sup>19</sup> Stage data presented in this report are using the AJCC 6th edition stage group derived from collaborative staging (CS) fields using the CS algorithm<sup>11</sup> for years 2011-2017 and AJCC 8th edition stage group derived from the pure TNM stage for years 2018-2021.</p> <p>The relative survival ratios by stage are calculated using stage generated by the AJCC 6th edition for years 2011-2017 and the AJCC 8th edition stage group derived from the pure TNM stage for years 2018-2021.</p>
<b>Relative Survival</b>	Alberta Cancer Registry, Alberta Health Services; Alberta Health; Statistics Canada	<p>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 2001 and 2021) to permit RSRs to be compared over time, independent of differences in age distribution of cancer cases.</p> <p>RSRs for cohorts 2001-2003, 2007-2009 and 2013-2015 are estimated by the cohort method<sup>7</sup> where complete follow-up data (i.e. at least five years of follow-up to estimate five-year ratio) after diagnosis are available. For recently diagnosed cases (cohort 2019-2021), whose complete follow-up data are not available, the up-to-date estimates are computed using the period method.<sup>6</sup></p> <p>Comparison between cohort and period RSRs should be interpreted with caution because of the two different methods used to derive the respective ratios.</p>
<b>Average Lifespan Shortened (ALSS)</b>	Alberta Cancer Registry, Alberta Health Services; Statistics Canada	<p>Years of life lost (YLL) is one of the two components of disability adjusted life years (DALY), which is a central measure largely used in series of recent publications of the Global Burden of Diseases project. The conceptualization of the ALSS<sup>20-22</sup> measure is to convert absolute YLL value into a ratio in relation to the expected lifespan. The ALSS measure can be expressed in percentage (%) as:</p> $ALSS = \frac{100 * \sum d_i * e_i}{\sum d_i * (a_i + e_i)}$ <p>where d<sub>i</sub> is number of deaths at age i; e<sub>i</sub> is normative life expectancy at age i; a<sub>i</sub> is age at death.</p> <p>The ALSS measure was calculated for top four cancers among Albertans over 21 years from 2001 to 2021.</p>

<p><b>Childhood Cancers</b></p>	<p>Alberta Cancer Registry, Alberta Health Services; Analytics, Alberta Health Services; Alberta Health; Statistics Canada</p>	<p>Childhood cancers are defined as invasive cancers diagnosed and cancer deaths that affect children up to and including the age of 14, and are classified according to the International Classification of Childhood Cancer, 3rd Edition.<sup>12</sup></p> <p>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 for childhood cancers (where greater emphasis is placed on site for adults).</p> <p>Age-standardized rates (ASRs) are calculated using the 2011 Canadian Standard Population for ages 0 - 14 years and are expressed as rates per 1,000,000.</p> <p>The relative survival ratios for period 2002-2006, 2007-2011, 2012-2016 are calculated by cohort method where the complete follow-up data is available. For the period 2017-2021, it is calculated by period method, because complete follow-up data is not available.</p>
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## 2011 Canadian Standard Population

Starting with the 2017 Report on Cancer Statistics in Alberta, the reference population for calculating age-standardized cancer incidence and mortality rates was changed from the 1991 Canadian Standard Population to the 2011 Canadian Standard Population, as had been done by Statistics Canada and other national reporting organizations. A technical explanation for the increase in age-standardized rates caused by this change of reference population is available in “The 2014 Cancer System Performance Report” (see pages 136 – 137, and Figures 8.ii and 8.iii) by the Canadian Partnership against Cancer (CPAC) at

[http://www.cancerview.ca/idc/groups/public/documents/webcontent/sp\\_report\\_2014.pdf](http://www.cancerview.ca/idc/groups/public/documents/webcontent/sp_report_2014.pdf)  
or <http://www.systemperformance.ca/reports/>.

<b>Age Group</b>	<b>Population (per 100,000)</b>	<b>Weights (%)</b>
<b>0-4</b>	5529.7	5.5
<b>5-9</b>	5271.7	5.3
<b>10-14</b>	5585.3	5.6
<b>15-19</b>	6519.4	6.5
<b>20-24</b>	6855.5	6.9
<b>25-29</b>	6900.6	6.9
<b>30-34</b>	6778.6	6.8
<b>35-39</b>	6618.8	6.6
<b>40-44</b>	6947.4	6.9
<b>45-49</b>	7919.9	7.9
<b>50-54</b>	7836.5	7.8
<b>55-59</b>	6851.8	6.9
<b>60-64</b>	5970.5	6.0
<b>65-69</b>	4463.6	4.5
<b>70-74</b>	3359.7	3.4
<b>75-79</b>	2676.9	2.7
<b>80-84</b>	2041.6	2.0
<b>85+</b>	1872.5	1.9
<b>Total</b>	<b>100,000</b>	<b>100</b>

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