



2012 Report on Cancer Statistics in Alberta

Childhood Cancer

Surveillance & Reporting

CancerControl AB

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- *Report Editor:*
Dr. Lorraine Shack, *Director, Surveillance & Reporting*
- *Project Coordinator:*
Bethany Kaposhi, *Epidemiologist*
- *Analysis and Review:*
Dr. Zhenguo Qiu, *Biostatistician*
Li Huang, *Senior Surveillance Analyst*
Jingyu Bu, *Senior Surveillance Analyst*
Anthony Karosas, *Surveillance Analyst*
Andrew Min, *Assistant Programmer Analyst*
Lee-Anne Weeks, *Analyst*
Michael Taylor, *Senior Analyst*
Shuang Lu, *Senior Surveillance Analyst*
Ting Liu, *Programmer*
- *Design Assistance:*
Kira Kulicki, *Communications Coordinator, Alberta Cancer Clinical Trials*

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Purpose of the Report

Surveillance & Reporting, a specialized team within Cancer Measurement Outcomes Research and Evaluation (C-MORE), Alberta Health Services actively contributes to Changing our Future: Alberta's Cancer Plan to 2030 and the goal to make Alberta a place where most cancers are prevented, more are cured and suffering is reduced. This is accomplished in part by conducting cancer *surveillance* through the collection, integration, analysis and dissemination of cancer-related data and information.

This 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 childhood cancer (see [Appendix](#) for cancer definitions) 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 within the **Glossary of Terms** within the [Appendix](#).

Data Notes

In this document, the term “cancer” refers to *invasive cancer* 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 14, 2014.

Incidence *rates* presented in this document exclude non-melanoma skin cancer cases (basal and squamous). Although approximately 30% of the *malignant* cancers diagnosed among Albertans each year are non-melanoma skin cancer, these *tumours* are generally not life-threatening and are inconsistently reported and coded across registries; therefore non-melanoma skin cancer is rarely included in cancer registry reports.

For detailed descriptions about data sources and how they affect data presented in this report, please see the [Appendix](#).

Summary

- Cancer in children (ages 0 to 14) is rare accounting for <1% of all cancers diagnosed. In 2012, **113** children aged 0 to 14 years old were diagnosed with cancer in Alberta. As of December 31, 2012, approximately **710** children (aged 0 to 14 years) were alive who had previously been diagnosed with cancer in Alberta and about **2,600** Albertans aged 0 to 99 were survivors of childhood cancer.
- The most common cancer types diagnosed between 2008 and 2012 were **leukemias** (27%) followed by **central nervous system tumors** (23%), **lymphomas** (10%), **neuroblastomas** (7%), and **soft tissue tumours** (6%). Since 1992, childhood cancer **incidence rates have increased** and **mortality rates have been stable**.
- Survival for childhood cancers is good. Five-year observed survival for all childhood cancers in Alberta is **82%**. In 2012, there were only **10** children aged 0 to 14 years old who died from childhood cancer in Alberta. Over the five year period between 2008 and 2012, the most common cancer causes of death in children were **central nervous system tumors** (45%) followed by **leukemias** (22%), and **neuroblastomas** (7%).

Childhood Cancer in Alberta

Childhood cancers are rare in Alberta. In this report, childhood cancers are defined as invasive cancers that affect children up to and including the age of 14. Childhood cancers account for 0.7% of all new cancer cases diagnosed in Alberta in 2012. Although childhood cancers are rare, they have a profound impact on families and communities. In addition, childhood cancer survivors are more likely to develop additional cancers as they age.¹

Childhood cancers are classified differently than adult cancers^{2, 3}. 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, third edition².

An overview of childhood cancers in Alberta is provided in **Table 13-1**. Explanations and further details on the information given in **Table 13-1** can be found in relevant sections of this report.

Table 13-1: New Cases and Deaths and Five-Year Average Age-Standardized Incidence Rates (ASIRs)^{†‡} and Mortality Rates (ASMRs)^{†‡}, Ages 0-14, Alberta, 2008-2012

Diagnostic Group	New Cases	ASIRs	Deaths	ASMRs
Leukemia	141	40.7	15	4.4
Lymphoid	111	32.1	7	2.1
Acute Myeloid	22	6.3	<5	1.2
Central Nervous System	120	35	31	9.1
Ependymoma	18	5.1	<5	0.6
Astrocytoma	57	16.7	10	3
Intracranial & Intraspinial Embryonal	28	8.1	12	3.4
Lymphoma	55	16.2	<5	0.3
Hodgkin Lymphoma	21	6.2	0	0
Burkitt Lymphoma	7	2.1	<5	0.3
Non-Hodgkin Lymphoma	20	5.9	0	0
Neuroblastoma & Other PNC	39	10.9	5	1.5
Neuroblastoma & Ganglioneuroblastoma	38	10.6	5	1.5
Soft Tissue	33	9.5	5	1.4
Rhabdomyosarcoma	21	6.1	<5	0.3
Renal Tumours	24	6.8	<5	0.3
Nephroblastoma	23	6.5	<5	0.3
Malignant Bone	24	7.1	<5	0.9
Other Malignant Epithelial	25	7.3	<5	0.3
Germ Cell Tumours and Other Gonadal	20	5.8	<5	0.3
Total Childhood Cancers*	532	153.6	69	20.2

[†] Standardized to 1991 Canadian Population.

[‡] ASIR and ASMRs are rates per 1,000,000.

*New cases and deaths from aggregated sites may not add up to the total number of childhood cancers because hepatic tumors, retinoblastoma, other and unspecified malignant neoplasms, and not classified cancers were omitted from the table.

Data Source: Alberta Cancer Registry, Alberta Health Services

Prevalence

The **prevalence** of a disease is defined as the number of people currently living with that disease. In this section of the report, the cancer prevalence is presented in two ways: the number of children (0-14 years old) alive as of December 31, 2012 who had ever been diagnosed with cancer, and the number of people aged 0-99 years who had ever been diagnosed with cancer in childhood (age 0-14 years).

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.

The total number of children living in Alberta in 2012 was approximately 710,850, or about 18% of the Alberta population⁴. As of December 31, 2012, approximately **710** children (0-14 years old) were alive who had previously been diagnosed with cancer. Also about **2,600** Albertans aged 0 to 99 had survived a childhood cancer.

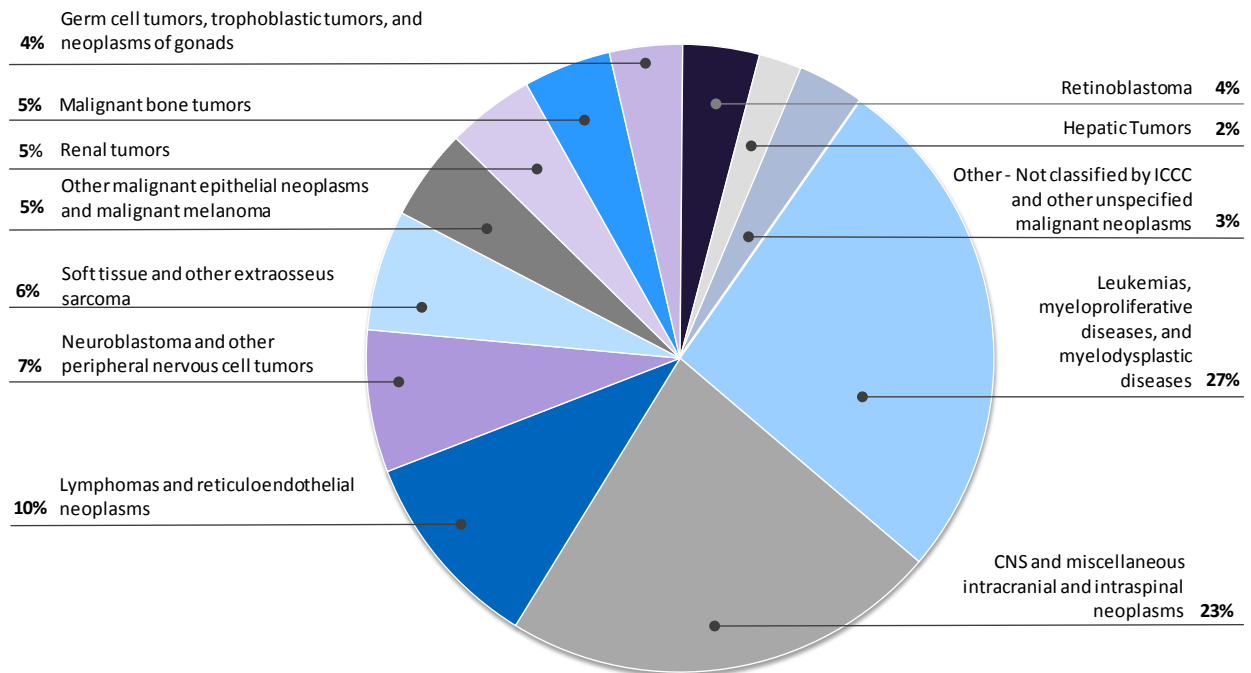
Incidence and Mortality Counts

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 childhood cancers (children aged 0-14) diagnosed in Alberta between 2008 and 2012.

Mortality counts describe the number of deaths attributed to childhood cancer during a specified period of time in a specific population. In this section of the report, mortality counts refer to the number of deaths due to childhood cancer (diagnosed between the ages of 0 and 14 years inclusive) in Alberta between 2008 and 2012, regardless of date of diagnosis.

The following two figures illustrate the proportion of new cancer cases and cancer deaths by cancer type.

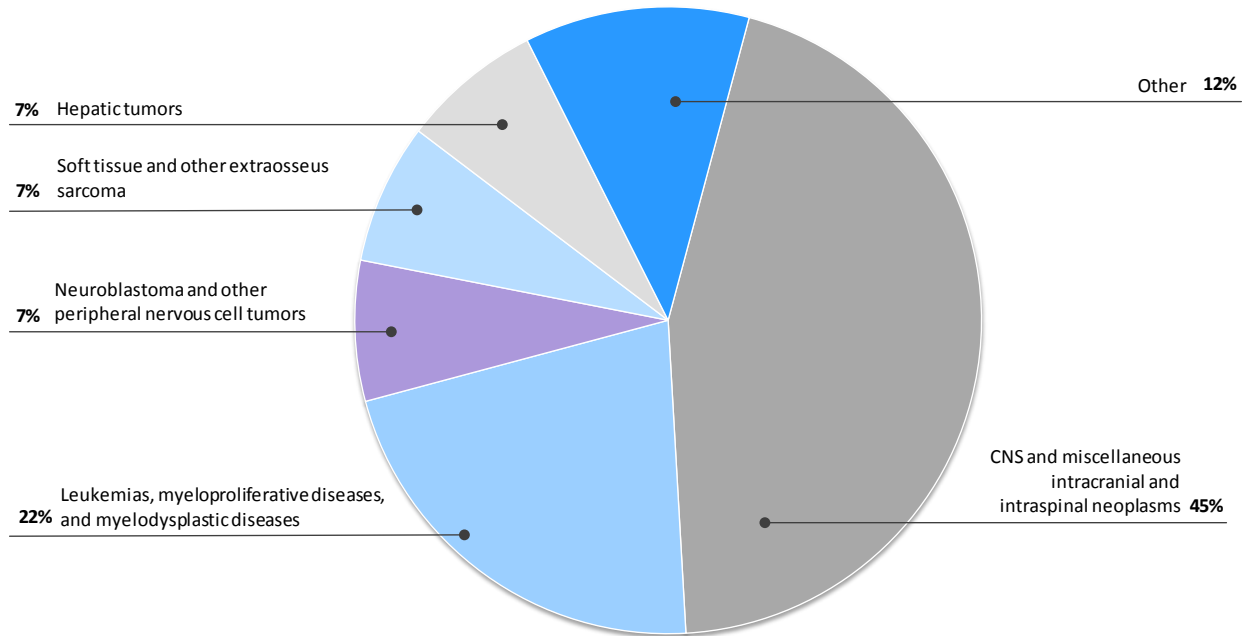
Figure 13-1: New Childhood Cancer Cases, Ages 0-14, Alberta, 2008-2012



Data Source: Alberta Cancer Registry, Alberta Health Services

Between 2008 and 2012, in total 532 childhood cancer cases were diagnosed in Alberta. The most commonly diagnosed childhood cancers were leukemia (27%), central nervous system cancers (23%), and lymphoma (10%); these cancers accounted for 60% of all childhood cancers (**Figure 13-1**). Of the childhood leukemia cases, 79% were lymphoid leukemia and 16% were acute myeloid leukemia. Of the children lymphoma cases, 38% were Hodgkin lymphoma, 13% were Burkitt lymphoma, and 36% were non-Hodgkin lymphoma.

Figure 13-2: Childhood Cancer Deaths, Ages 0-14, Alberta, 2008-2012



Data Source: Alberta Cancer Registry, Alberta Health Services

Of the 69 childhood cancer deaths between 2008 and 2012, 45% were attributable to central nervous system cancers, 22% to leukemia and 7% to neuroblastoma (**Figure 13-2**). These three cancers account for 74% of all childhood cancer deaths.

The category of “Other” is composed of malignant bone tumours, germ cell tumours, trophoblastic tumours, lymphomas, reticuloendothelial neoplasms, renal tumours, other malignant epithelial neoplasms and other tumours not classified by the ICCC.

Incidence and Mortality Rates

Incidence rates are the number of new cancer cases diagnosed per 1,000,000 in the population, in a specific time period. **Mortality rates** are the number of deaths per 1,000,000 in the population, in a specific time period.

In order to compare cancer incidence or cancer mortality over time, or between populations, **age-standardized incidence rates (ASIRs)** or **age-standardized mortality rates (ASMRs)** are presented. These are weighted averages of **age-specific rates** using a standard population. These rates are useful because they are adjusted for differences in age distributions in a population over time, which permit comparisons of cancer incidence or mortality among populations that differ in size, structure, and/or time period. ASIRs and ASMRs give the overall incidence and mortality rates that would have occurred if the population of Alberta had been the same as the standard population. In this report the Canadian 1991 standard population is used.

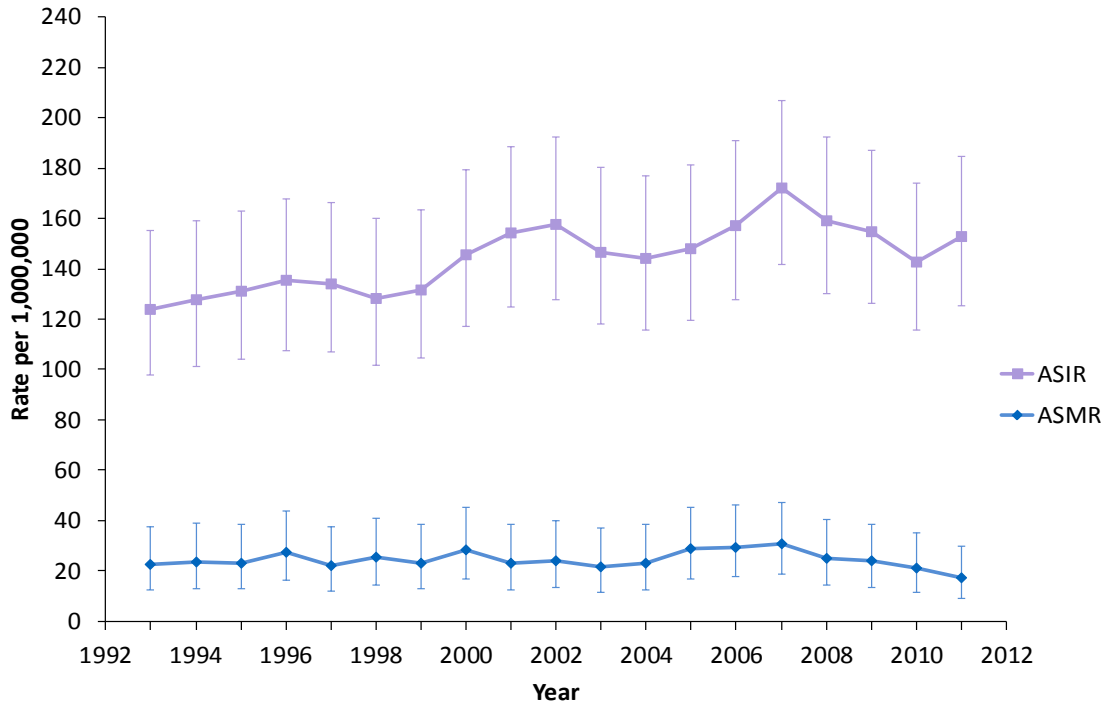
Three-year moving averages are used to smooth out year-to-year fluctuations so that the underlying trend may be more easily observed. They are calculated based on aggregating three years of data. Age-standardized incidence rates (ASIRs) and age-standardized mortality rates (ASMRs) are presented as three-year moving averages; therefore, information can only be presented for 1993-2011. This smoothing of trends is especially important when the number of cancer cases per year is relatively small and where year-to-year variability can be quite large.

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

The following figures show incidence and mortality trends in Alberta. Separate analyses for both incidence and mortality are shown in subsequent sections. The statistical significance* of the trends was determined by using Joinpoint⁵ 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).

* Throughout this report, the use of the word significant refers to statistical significance at an alpha level of 0.05 (i.e. 95%CI).

Figure 13-3: Age-Standardized Incidence Rates (ASIRs)^{†} and Mortality Rates (ASMRs)^{**†} with 95% Confidence Intervals (CI) for Childhood Cancer, Ages 0-14, Both Sexes, Alberta, 1992-2012**



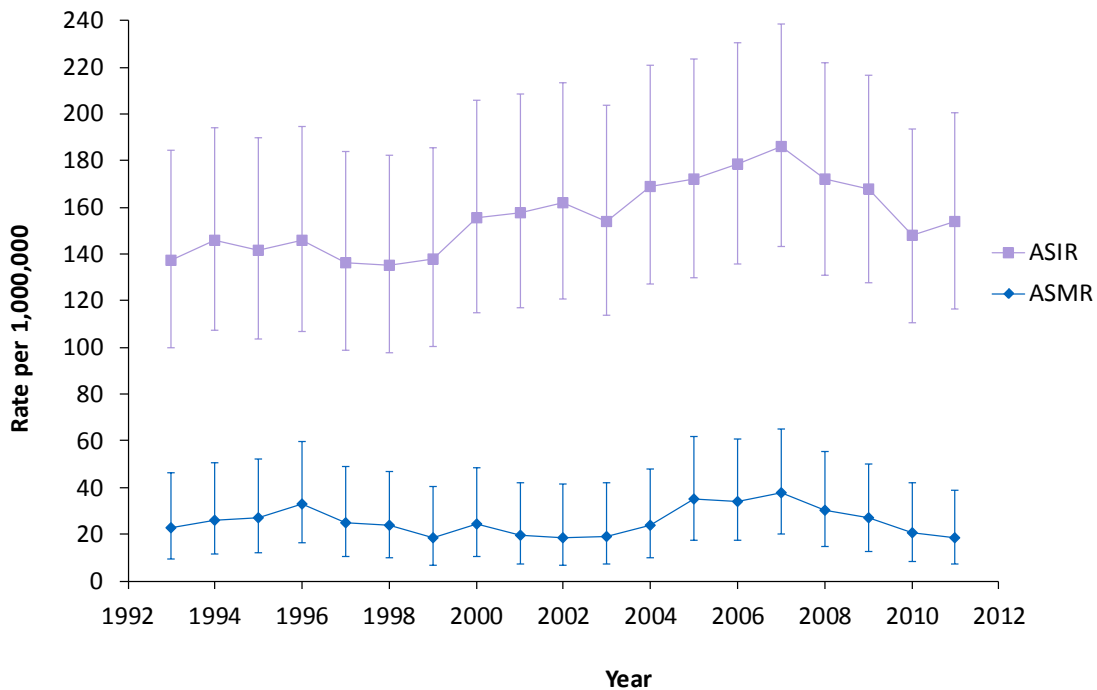
* Three year moving averages.
† Standardized to 1991 Canadian Population.
‡ ASIRs and ASMRs are rates per 1,000,000.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

Childhood cancer ASIRs have increased significantly since 1992 (**Figure 13-3**). From 1992 to 2012, the childhood cancer ASIR has increased by 1.2% annually. In 2011, the three-year moving average ASIR for childhood cancer was 152.9 per 1,000,000 children.

Childhood cancer ASMRs have not changed significantly since 1992 (**Figure 13-3**). In 2011, the three-year moving average ASMR for childhood cancer was 17.2 per 1,000,000 children.

Figure 13-4: Age-Standardized Incidence Rates (ASIRs)^{††} and Mortality Rates (ASMRs)^{††} with 95% Confidence Intervals (CI) for Childhood Cancer, Ages 0-14, Males, Alberta, 1992-2012



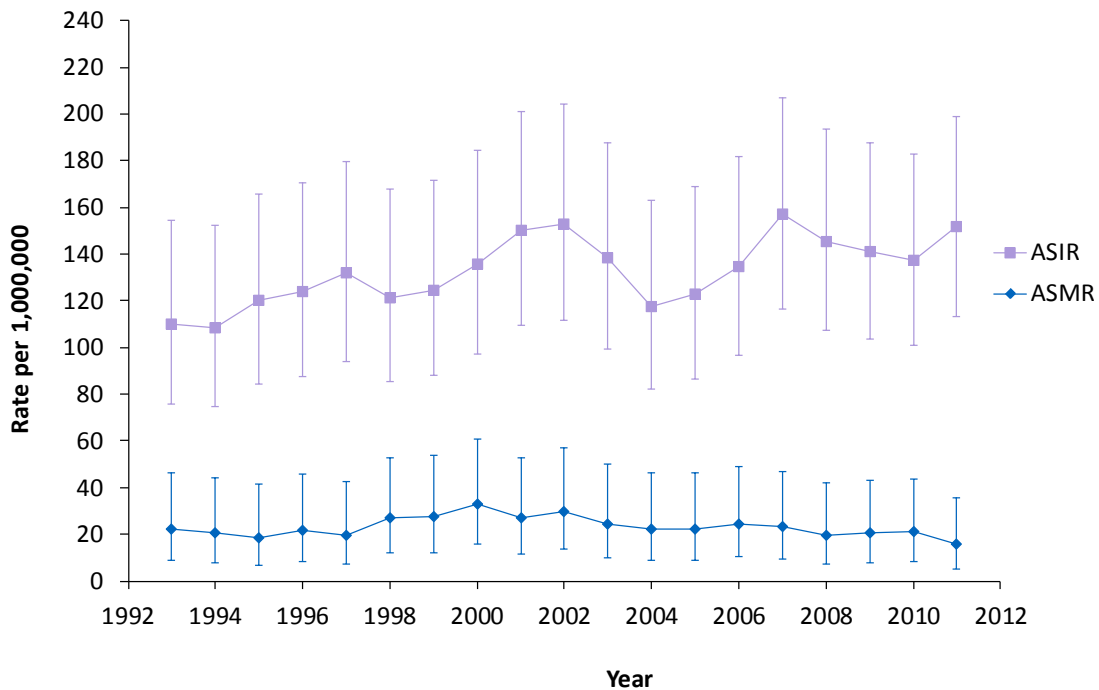
* Three year moving averages.
 † Standardized to 1991 Canadian Population.
 ‡ ASIRs and ASMRs are rates per 1,000,000.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

Childhood cancer ASIRs for males have increased significantly since 1992 (**Figure 13-4**). From 1992 to 2012, the childhood cancer ASIR in males has increased by 1.0% annually. In 2011, the three-year moving average ASIR for childhood cancer in males was 154.1 per 1,000,000 male children.

Childhood cancer ASMRs in males have not changed significantly since 1992 (**Figure 13-4**). In 2011, the three-year moving average ASMR for childhood cancer in males was 18.5 per 1,000,000 male children.

Figure 13-5: Age-Standardized Incidence Rates (ASIRs)^{†} and Mortality Rates (ASMRs)^{**†} with 95% Confidence Intervals (CI) for Childhood Cancer, Ages 0-14, Females, Alberta, 1992-2012**



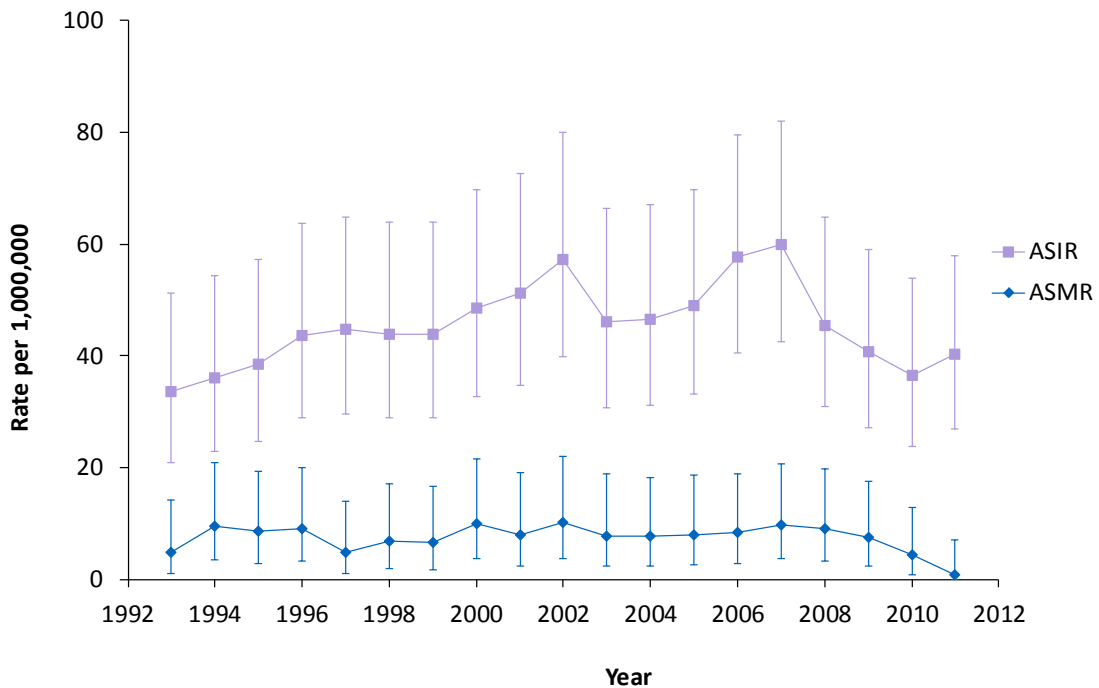
* Three year moving averages.
† Standardized to 1991 Canadian Population.
‡ ASIRs and ASMRs are rates per 1,000,000.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

Childhood cancer ASIRs for females have increased significantly since 1992 (**Figure 13-5**). From 1992 to 2012, the childhood cancer ASIR in females has increased by 1.5% annually. In 2011, the three-year moving average ASIR for childhood cancer in females was 151.6 per 1,000,000 female children.

Childhood cancer ASMRs for females have not changed significantly since 1992 (**Figure 13-5**). In 2011, the three-year moving average ASMR for childhood cancer in females was 15.7 per 1,000,000 female children.

Figure 13-6: Age-Standardized Incidence Rates (ASIRs)^{†} and Mortality Rates (ASMRs)^{**†} with 95% Confidence Intervals (CI) for Childhood Leukemia, Ages 0-14, Both Sexes, Alberta, 1992-2012**



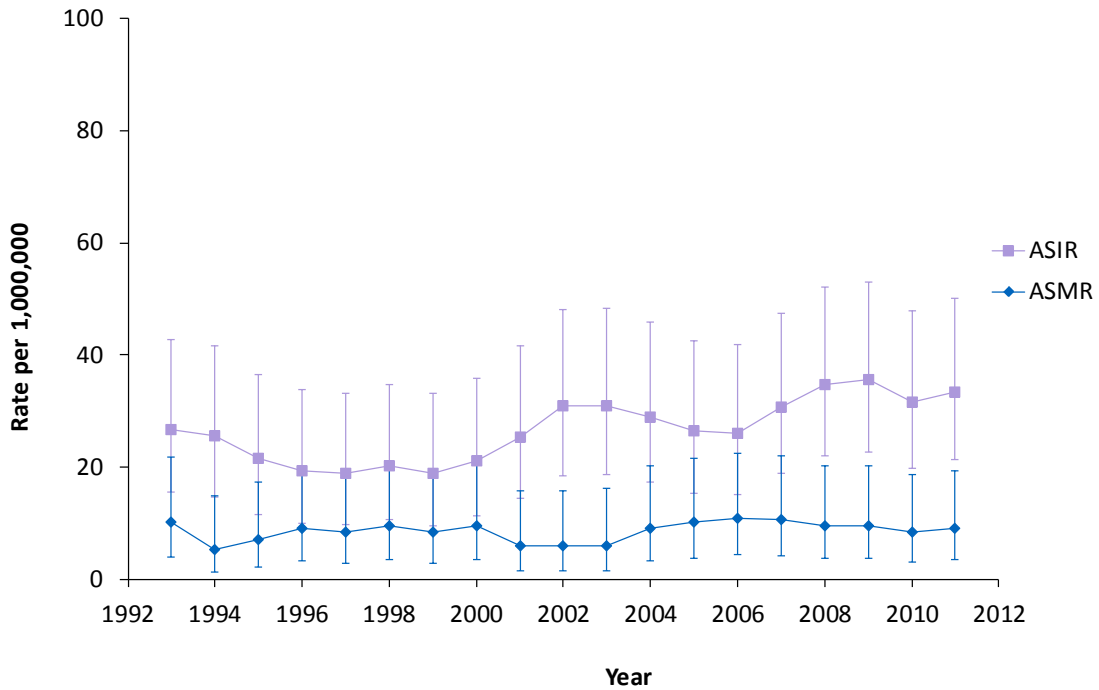
* Three year moving averages.
 † Standardized to 1991 Canadian Population.
 ‡ ASIRs and ASMRs are rates per 1,000,000.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

Childhood leukemia ASIRs have not changed significantly since 1992 (**Figure 13-6**). In 2011, the three-year moving average ASIR for childhood leukemia was 40.3 per 1,000,000 children.

Childhood leukemia ASMRs have not changed significantly since 1992 (**Figure 13-6**). In 2011, the three-year moving average ASMR for childhood leukemia was 0.9 per 1,000,000 children.

Figure 13-7: Age-Standardized Incidence Rates (ASIRs)^{} and Mortality Rates (ASMRs)^{**} with 95% Confidence Intervals (CI) for Childhood Cancers of the Central Nervous System, Ages 0-14, Both Sexes, Alberta, 1992-2012**



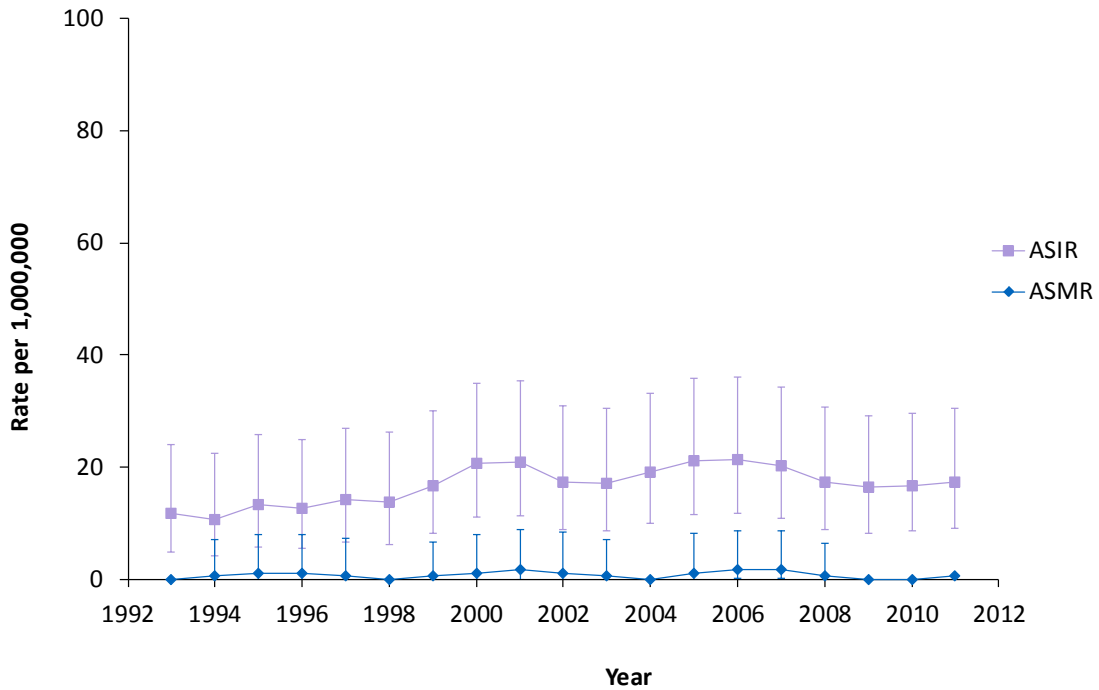
* Three year moving averages.
 † Standardized to 1991 Canadian Population.
 ‡ ASIRs and ASMRs are rates per 1,000,000.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

Childhood central nervous system (CNS) cancer ASIRs have significantly increased since 1992 (**Figure 13-7**). From 1992 to 2012, the childhood CNS cancer ASIR has increased by 2.2% annually. In 2011, the three-year moving average ASIR for childhood cancers of the CNS was 33.4 per 1,000,000 children.

Childhood CNS cancer ASMRs have not changed significantly since 1992 (**Figure 13-7**). In 2011, the three-year moving average ASMR for childhood cancers of the CNS was 9.0 per 1,000,000 children.

Figure 13-8: Age-Standardized Incidence Rates (ASIRs)^{†} and Age-Standardized Mortality Rates (ASMRs)^{**†} with 95% Confidence Intervals (CI) for Childhood Lymphoma, Ages 0-14, Both Sexes, Alberta, 1992-2012**



* Three year moving averages .
† Standardized to 1991 Canadian Population.
‡ ASIRs and ASMRs are rates per 1,000,000.

Data Source: Alberta Cancer Registry, Alberta Health Services; Alberta Health

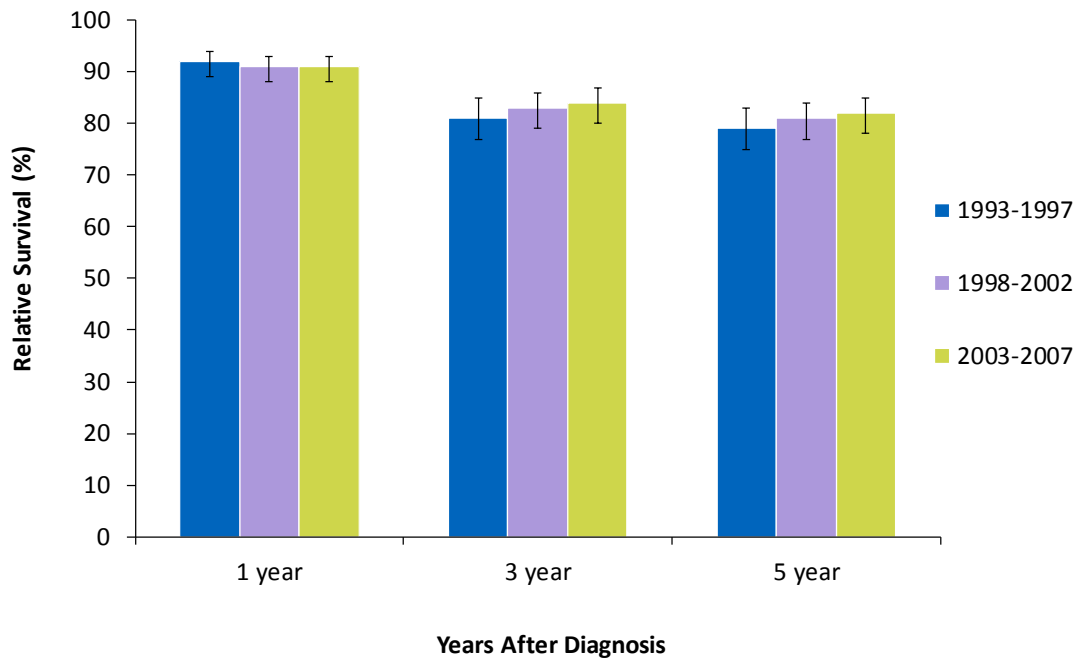
Childhood lymphoma ASIRs have not changed significantly since 1992 (**Figure 13-8**). In 2011, the three-year moving average ASIR for childhood lymphoma was 17.4 per 1,000,000 children.

Childhood lymphoma ASMRs have not changed significantly since 1992 (**Figure 13-8**). In 2011, the three-year moving average ASMR for childhood lymphoma was 0.5 per 1,000,000 children.

Childhood Cancer Survival

The **observed survival** proportion (OSP) describes the proportion of children diagnosed with a specific cancer who survived through the specific time period. Observed survival proportions are estimated by the **cohort method** when complete follow-up data (e.g., at least five years of follow-up to estimate five-year rate) after diagnosis are available. Children whose cancers were only identified through the death certificate were excluded from the calculation. Survival depends on several factors including the cancer type (most importantly site, stage and morphology at diagnosis), sex, age at diagnosis, health status and available treatments for that cancer.

Figure 13-9: Observed Survival Proportions* with 95% Confidence Intervals (CI) for Childhood Cancer, Both Sexes, Ages 0-14, Alberta, 1993-1997, 1998-2002, 2003-2007

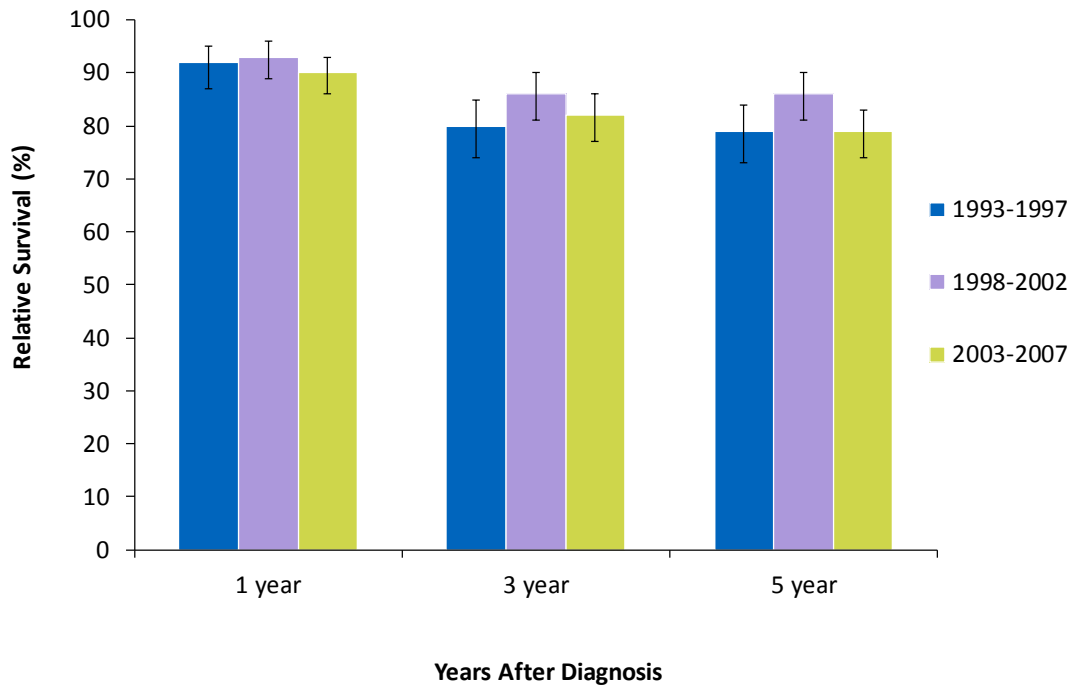


* Ratios calculated by cohort method, where complete follow-up data are available.

Data Source: Alberta Cancer Registry, Alberta Health Services; Statistics Canada

Five-year observed survival proportions for Alberta children diagnosed with cancer have not changed significantly since the 1993-1997 time period. In 2003-2007, the five year observed survival proportion was 82% (**Figure 13-9**).

Figure 13-10: Observed Survival Proportions* with 95% Confidence Intervals (CI) for Childhood Cancer, Males, Ages 0-14, Alberta, 1993-1997, 1998-2002, 2003-2007

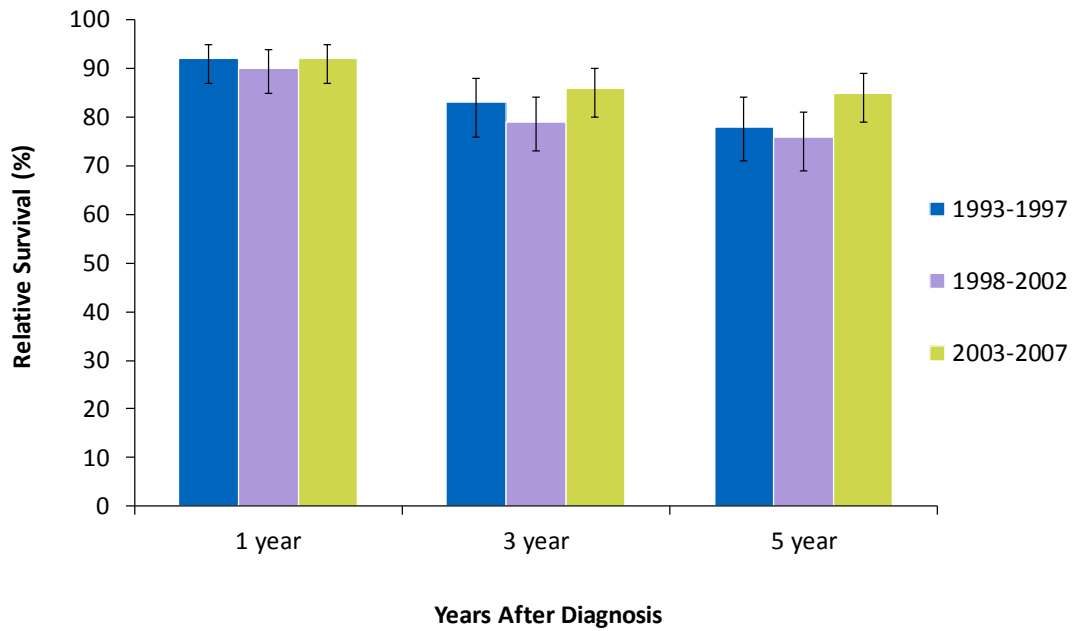


* Ratios calculated by cohort method, where complete follow-up data are available.

Data Source: Alberta Cancer Registry, Alberta Health Services; Statistics Canada

Five-year observed survival proportions for males diagnosed with childhood cancer have not changed significantly since 1993-1997. In 2003-2007, the five year observed survival proportion for males diagnosed with childhood cancer was 79% (**Figure 13-10**).

Figure 13-11: Observed Survival Proportions* with 95% Confidence Intervals (CI) for Childhood Cancer, Females, Ages 0-14, Alberta, 1993-1997, 1998-2002, 2003-2007



* Ratios calculated by cohort method, where complete follow-up data are available.

Data Source: Alberta Cancer Registry, Alberta Health Services; Statistics Canada

Five-year observed survival proportions for females diagnosed with childhood cancer have not changed significantly since 1993-1997. In 2003-2007, the five-year observed survival proportion for females diagnosed with childhood cancer was 85% (**Figure 13-11**).

Further Information

Further information is available on a separate document, the [Appendix](#):

Appendix 1: Glossary of Terms

Appendix 2: Cancer Definitions

Appendix 3: Data Notes

References

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Contact Information

If further information is required, please contact Surveillance & Reporting, C-MORE, Alberta Health Services as follows:

Mailing Address: **Alberta Health Services**
Surveillance & Reporting
C-MORE
1400 - 10123-99 Street
Edmonton, AB, Canada
T5J 3H1

Phone: 780-643-4347
Fax: 780-643-4380
Email: ACB.cancerdata@albertahealthservices.ca