

REVIEW

Canadian cancer statistics at a glance: cancer in children

Larry F. Ellison MSc, Prithwish De MHSc PhD, Leslie S. Mery MSc, Paul E. Grundy MD,
for the Canadian Cancer Society's Steering Committee for Canadian Cancer Statistics

Every year in Canada, cancer is diagnosed in about 850 children (143 per million in 2004) between birth and 14 years of age.¹ The incidence is generally highest during the first 5 years of life and decreases with age. The incidence rates of the most common childhood cancers have remained stable during the past 2 decades (Figure 1). The rate of death from childhood cancer has decreased substantially but is still about 135 deaths each year (24.6 per million in 2004).¹ Survivors of childhood cancer are at substantial risk for health problems, including late sequelae of cancer treatment and chronic psychological and cognitive impairments. The latter can hinder both their psychosocial adjustment after treatment and their health and well-being over the long term.

Little is known about the cause of childhood cancers. Only a small proportion (probably less than 5%) occur in children who have constitutional genetic abnormalities and diseases such as Down syndrome, AIDS, neurofibromatosis and nevoid basal cell carcinoma syndrome. Another small proportion is caused by exposure to chemotherapeutic agents or radiotherapy for a prior malignant disease.² Opportunities to prevent cancer in children are therefore limited. This is especially so because screening tests are lacking for most childhood cancers.

Diagnosis

The International Classification of Childhood Cancers³ was developed to reflect the differences in childhood cancers compared with cancers in adults in terms of histology, site of origin and tumour behaviour. It classifies childhood cancers under 12 diagnostic groups, with additional subgroups for further refinement. Compared with adults, children have a higher proportion of blood and lymphatic cancers, most commonly leukemia, and cancers of the central nervous system.¹ Cancer is slightly more common in boys than in girls, and the type of cancer diagnosed is likely to vary by age.¹ Sometimes a diagnosis of childhood cancer is delayed because of the nonspecific nature of signs and symptoms, which can vary by type of cancer and extent of disease. Tumours in children are more likely than those in adults to have short latency periods. They grow more rapidly, aggressively and invasively, and metastasize more frequently.²

Survival

The rates of survival after 5 years for all childhood cancers combined and for selected major diagnostic groups and sub-

Key points

- Although rare, cancer in children has a substantial impact on public health in Canada.
- On average, cancer is diagnosed in about 850 children in Canada each year, and about 135 are expected to die of the disease.
- Since 1985, rates of death among children with cancer have decreased substantially. Incidence rates have remained stable.
- The current 5-year rate of survival among children with cancer is about 82%, compared with 71% in the late 1980s.
- As rates of survival improve, it is important to consider the impact of childhood cancer on the psychosocial adjustment of survivors after treatment and their long-term health and well-being.

groups are presented in Table 1. Five-year survival rates for childhood cancers have improved considerably in Canada, from 71% in the late 1980s⁴ to 82% in the early 2000s.

Across all diagnostic groups, the highest 5-year rates of survival are observed among children with retinoblastoma (99%). The lowest are among those with malignant bone tumours (66%). The estimated rates of survival for subgroups within a diagnostic category can vary considerably.⁵ The prognosis for lymphoid leukemia, for instance, is much better than for acute myeloid leukemia. The biggest improvements in survival rates have occurred among children with hepatic tumours, leukemia and neoplasms of the central nervous system.^{4,5} Substantial improvements have also been observed in prognosis for many diagnostic subgroups, including lymphoid leukemias, non-Hodgkin lymphomas and astrocytomas.

The improvements in rates of survival are attributed to improvements in treatment. For many types of childhood cancer, treatment that is based on a clinical trial protocol gives a definite survival advantage to children. In Canada, nearly 80% of children with cancer are either enrolled in a clinical trial or receiving treatment according to a registered protocol established by a clinical trial.⁶

From the Health Statistics Division, Statistics Canada (Ellison), Ottawa, Ont.; Cancer Control Policy and Information, Canadian Cancer Society (De), Toronto, Ont.; Surveillance Action Group, Canadian Partnership Against Cancer (Mery), Ottawa, Ont.; Division of Pediatric Hematology, Oncology and Palliative Care, Stollery Children's Hospital (Grundy), Edmonton, Alta.

Late effects

Improved survival rates have led to greater recognition, monitoring and study of the psychosocial, physical and economic impacts of a cancer diagnosis in childhood. As cancer survivors enter adulthood, the reported frequency of late effects among them ranges from 33% to 75%, depending on the type of initial cancer, its stage at diagnosis and the type of treatment received.⁷ Chemotherapy, radiation therapy and surgery can all lead to late effects. An estimated two-thirds of survivors have at least 1 chronic or late-occurring effect from their cancer therapy; up to one-third of these late effects are considered major, serious or life-threatening.^{6,8} Late effects can include cardiopulmonary, endocrine, renal or pulmonary dysfunction, neurocognitive impairments and second cancers.⁸ The young adult survivor, for instance, may experience medical effects of treatment, such as cardiomyopathy and infertility, as well as depression associated with “survivor guilt.” In some cases, improved understanding of the late effects of treatment has re-

What can physicians do?

- Consider both the physical and psychological effects of a cancer diagnosis in a child
- Promptly refer children with suspected cancer to the local pediatric oncology centre
- Work with pediatric oncologists to ensure appropriate and comprehensive long-term follow-up of patients with childhood cancer
- Be aware of the prior medical history of a survivor of childhood cancer and provide survivors with education for the reduction and prevention of future cancer-risk behaviours

sulted in modifications in the initial therapy protocols. Cranial radiation, for instance, was shown to be an effective adjunct to the treatment of lymphoblastic leukemia. However, the identification of moderate to severe neuropsychological and neurologic sequelae has led to the replacement of cranial radiation with higher-dose systemic and intrathecal chemotherapy. The

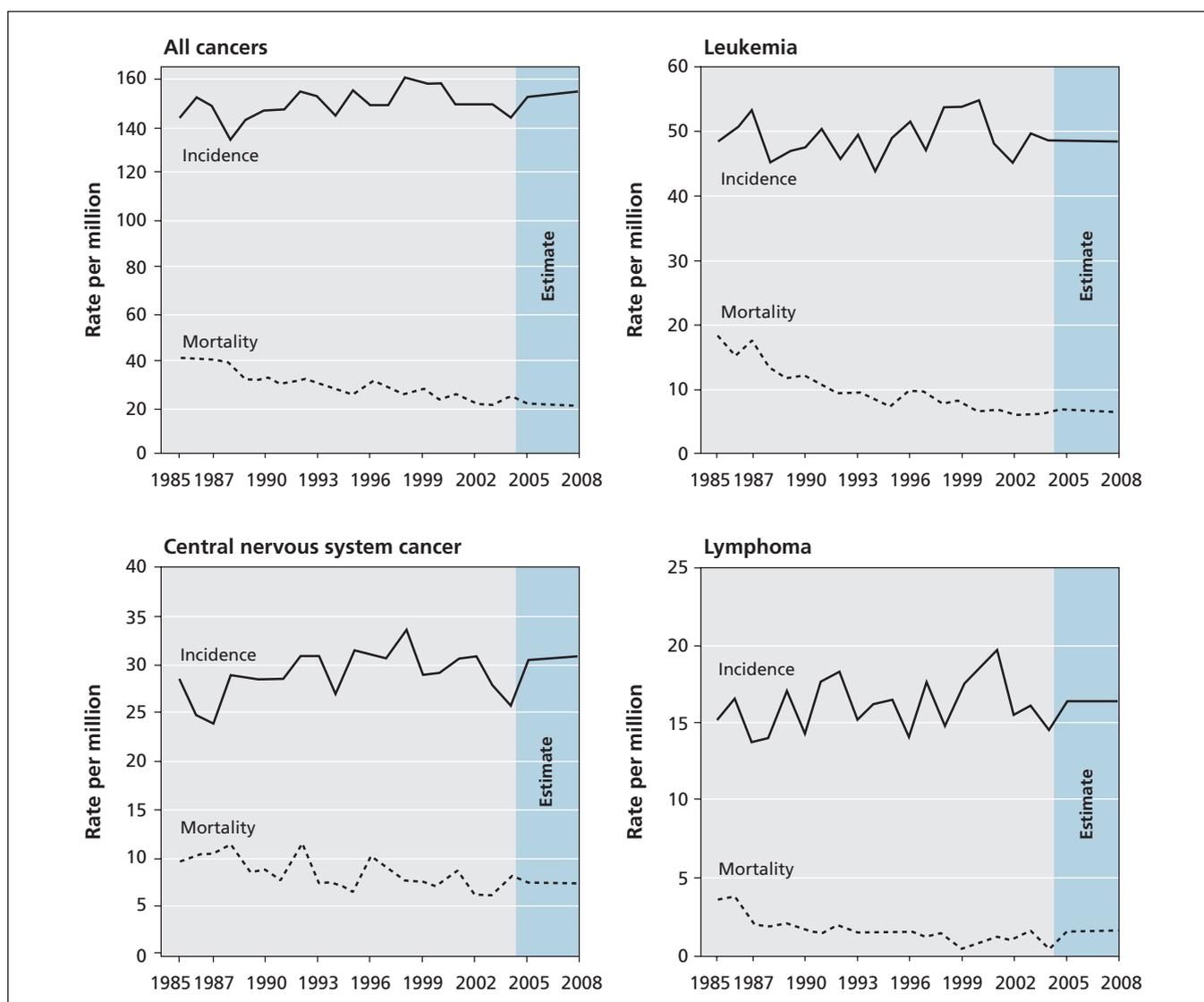


Figure 1: Age-standardized rates of incidence and mortality for selected cancers among children less than 15 years old in Canada, 1985–2008.¹

Table 1: New cases and estimated 5-year survival rates for selected diagnostic groups of childhood cancers among children less than 15 years old in Canada, 2000–2004

Diagnostic group	No. of new cases	5-year survival rate* (95% CI), %
All diagnostic groups	4242	82 (81–83)
Leukemias, myeloproliferative diseases and myelodysplastic diseases	1380	86 (84–88)
Lymphoid leukemias	1091	91 (88–92)
Acute myeloid leukemias	176	67 (59–73)
Lymphomas and reticuloendothelial neoplasms	506	88 (85–91)
Hodgkin lymphomas	172	94 (88–96)
Non-Hodgkin lymphomas (except Burkitt lymphoma)	155	84 (76–89)
Central nervous system and miscellaneous intracranial and intraspinal neoplasms	828	75 (72–78)
Astrocytomas	365	86 (81–89)
Intracranial and intraspinal embryonal tumours	207	64 (56–70)
Neuroblastoma and other peripheral nervous cell tumours	295	72 (66–78)
Retinoblastoma	100	99 (93–100)

Source: Canadian Cancer Registry, Statistics Canada.

Note: CI = confidence interval.

*Excludes cases diagnosed in the province of Quebec.

result has been reduced toxicity for most children receiving treatment for lymphoblastic leukemia.

Monitoring of patients by specialized care centres, such as those of the Children's Oncology Group in North America, is necessary to screen survivors of childhood cancer for treatment-related sequelae. Both pediatric oncology programs and the special programs of adult cancer centres provide the advantage of a team of specialists, including oncologists, endocrinologists, cardiologists, psychologists and social workers.

Treatment-related sequelae must be kept in perspective. Many children with cancer are treated successfully without adverse effects and go on to lead fully productive lives as adults.

Future directions

Current knowledge of the emotional impact and other effects of childhood cancer on the families and communities of patients is rudimentary. Long-term follow-up studies are needed to better inform protocols for psychosocial support to improve the quality of life of survivors of childhood cancer and their families.⁷

Although many more children with cancer survive today than 20 years ago, existing therapies are far from perfect in their success rates or minimization of toxicity. Ongoing studies are vital in our continuing efforts to improve treatments, survival rates and the well-being of children who have cancer.

This article has been peer reviewed.

Competing interests: None declared.

Contributors: Larry Ellison, Prithwish De and Leslie Mery contributed to the conception and design of the article. Larry Ellison contributed to the acquisition and analysis of the data. All of the authors contributed to the interpretation of the data. Larry Ellison, Prithwish De and Paul Grundy drafted the article. All of the authors critically revised it and approved the final version.

Acknowledgement: The Steering Committee for Canadian Cancer Statistics is a committee of the Canadian Cancer Society and is responsible for the annual production of *Canadian Cancer Statistics*. Membership is described in *Canadian Cancer Statistics 2008*.¹

REFERENCES

1. Canadian Cancer Society. *Canadian cancer statistics 2008*. Toronto (ON): Canadian Cancer Society; 2008. Available: www.cancer.ca/Canada-wide/About%20cancer/Cancer%20statistics/Canadian%20Cancer%20Statistics.aspx?sc_lang=en (accessed 2008 Nov. 28).
2. Pizzo PA, Poplack DG, editors. *Principles and practice of pediatric oncology*. 5th ed. Philadelphia (PA): Lippincott Williams & Wilkins; 2005.
3. Steliarova-Foucher E, Stiller C, Lacour B, et al. International Classification of Childhood Cancer, third edition. *Cancer* 2005;103:1457-67.
4. Villeneuve PJ, Raman S, Leclerc JM, et al. Survival rates among Canadian children and teenagers with cancer diagnosed between 1985 and 1988. *Cancer Prev Control* 1998;2:15-22.
5. Ellison LF, Pogany L, Mery LS. Childhood and adolescent cancer survival: a period analysis of data from the Canadian Cancer Registry. *Eur J Cancer* 2007;43:1967-75.
6. Centre for Chronic Disease Prevention and Control. *Diagnosis and initial treatment of cancer in Canadian children 0 to 14 years, 1995–2000*. Ottawa (ON): Public Health Agency of Canada; 2003. Available: www.phac-aspc.gc.ca/ccdpc-cpcmc/cancer/publications/pdf/795_Report_eng.pdf (accessed 2008 Nov. 29).
7. Eiser C, Holland J, Johansen C. Psychosocial aspects of childhood cancer. In: *Childhood cancer: rising to the challenge*. Geneva (Switzerland): International Union Against Cancer; 2006. Available: www.uicc.org/templates/uicc/pdf/wcc/ccr.pdf (accessed 2008 Nov. 29).
8. Oeffinger KC, Eshelman DA, Tomlinson GE, et al. Grading of late effects in young adult survivors of childhood cancer followed in an ambulatory adult setting. *Cancer* 2000;88:1687-95.

Correspondence to: Dr. Prithwish De, Canadian Cancer Society, 200–10 Alcorn Ave., Toronto ON M4V 3B1; fax 416 961-4189; stats@cancer.ca

For more information

- Canadian Cancer Statistics 2008: www.cancer.ca/statistics
- Children's Oncology Group: www.childrensoncologygroup.org
- International Society for Paediatric Oncology: www.siop.nl
- Canadian Childhood Cancer Surveillance and Control Program, Public Health Agency of Canada: www.phac-aspc.gc.ca/ccdpc-cpcmc/program/ccscsp-pcsce/index.html