

Wisconsin Pediatric Cancer Report:

Cancer in Children and Adolescents



Introduction

Cancer is a group of diseases that starts when cells in the body begin to grow out of control. The abnormal cells may spread to other parts of the body. If the spread is not controlled, it can result in death.

Cancer in children and teenagers is uncommon, accounting for less than 1% of all cancer cases in the U.S. This year, an estimated 10,380 children younger than 15 and about 5,000 adolescents aged 15 to 19 will be diagnosed with cancer nationwide.

In this report, childhood cancer is defined as cancer diagnosed among persons aged 0-14 and adolescent cancer among persons aged 15-19. The rates are presented as the number of cases per 1,000,000 persons, whereas rates for adults are typically reported as the number of cases per 100,000 persons. Benign and borderline brain tumors are not included in the analysis because the statistical methods require historical data and these tumors were not required to be reported until 2004.

Key Findings

- In 2009-2013, cancer incidence rates among children and adolescents were respectively higher and lower in Wisconsin compared to the U.S.
- In 2009-2013, mortality rates among children and adolescents were lower in Wisconsin compared to the U.S.
- From 2009 to 2013, childhood and adolescent incidence and mortality rates were higher among males compared to females, Whites compared to African Americans, and adolescents compared to children in Wisconsin and in the U.S.
- During 2009-2013, the leading cancer types among children in Wisconsin were leukemia (31%), followed by brain and other central nervous system (CNS) tumors (28%).
- During 2009-2013, the leading cancer types among adolescents in Wisconsin were lymphomas and brain and other CNS tumors (23% each).
- Incidence rates for all cancers combined in Wisconsin were relatively stable among children and adolescents from 1995 to 2013.
- Mortality rates for all cancers combined were unstable among children and adolescents in Wisconsin due to the small number of deaths each year from 1995 to 2013.

Risk of Cancer Among Children and Adolescents in the U.S.

The risk of being diagnosed with invasive cancer by age 20 is 1 in 276 for males and 1 in 296 for females in the U.S. (Table 1). Overall, the risk of being diagnosed with each specific cancer type is greater in males than in females, and higher in Whites than in African Americans (race data is not shown in Table 1). The risk of being diagnosed with leukemia by age 20 was greatest compared to other cancer types for both males and females nationwide.

Table 1. Risk of being diagnosed with invasive cancer by age 20 for selected cancer types by sex in the U.S., 2010-2012

	Males	Females
All Cancer Types	1 in 276	1 in 296
Brain and CNS	1 in 1604	1 in 1808
Hodgkin Lymphoma	1 in 3917	1 in 4446
Leukemia (All Types)	1 in 1041	1 in 1174
Lymphoid Leukemia	1 in 1394	1 in 1613
Non-Hodgkin Lymphoma	1 in 3260	1 in 5962

Notes: Risk of developing cancer by age 20 for those free of cancer at birth, based on cancer cases diagnosed during 2010-2012. Numbers are rounded to the nearest whole person.

Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.7.3; Statistical Research and Applications Branch, National Cancer Institute, 2016.

Cancer Incidence and Mortality Among Children and Adolescents

During 2009-2013, an average of 263 new invasive cancer cases and 31 cancer deaths occurred each year among children and adolescents in Wisconsin (Table 2). The average annual age-adjusted incidence rate in Wisconsin was 175.7 per 1,000,000, which was slightly lower than the U.S. incidence rate of 176.3 per 1,000,000. The average annual age-adjusted mortality rate in Wisconsin was 20.6 per 1,000,000, which was 12% lower than the U.S. mortality rate of 23.4 per 1,000,000. In both Wisconsin and the U.S., incidence and mortality rates of pediatric cancer were greater among males, whites, and young adolescents 15 to 19 years of age.

Table 2. Average annual number of new invasive cancer cases and incidence rates, and average annual number of cancer deaths and mortality rates among children and adolescents (0-19), by sex, race, and age in Wisconsin and the U.S., 2009-2013

		Incidence			Mortality		
		Wisconsin		U.S.	Wisconsin		U.S.
		Case	Rate	Rate	Deaths	Rate	Rate
Sex	Male	139	181.5	183.3	17	22.2	25.6
	Female	124	169.7	168.2	14	18.9	21.1
Race	White	223	177.4	188.0	27	21.3	24.0
	Black	20	125.6	135.1	<6	—	22.2
Age	0-14	180	164.6	161.0	21	19.0	21.5
	15-19	83	208.8	221.7	10	25.3	29.0
Total		263	175.7	176.3	31	20.6	23.4

Notes: Rates are per 1,000,000 and age-adjusted to 2000 U.S. standard population. Rates were calculated in SEER*Stat software, version 8.3.2.

Sources: Incidence data provided by Wisconsin Cancer Reporting System, Office of Health Informatics, Division of Public Health, Department of Health Services. Mortality data collected by Wisconsin Vital Statistics Program and provided by National Center for Health Statistics.

Leading Cancer Types Among Children and Adolescents in Wisconsin

Figure 1. Five-year average number and proportion of new invasive cancer cases for leading cancer types among children and adolescents in Wisconsin, 2009-2013

Children (Ages 0-14)		Adolescents (Ages 15-19)	
Type of cancer	Number (percentage)	Type of cancer	Number (percentage)
Leukemia (all types)	298 (31%)	Lymphomas	110 (23%)
Lymphoid Leukemia	228 (23%)	Hodgkin Lymphomas	71 (15%)
Acute Myeloid Leukemia	51 (5%)	Non-Hodgkin Lymphomas	35 (7%)
Brain and Other CNS Tumors	272 (28%)	Brain and Other CNS Tumors	110 (23%)
Lymphomas	85 (9%)	Leukemia (all types)	53 (12%)
Hodgkin Lymphomas	27 (3%)	Lymphoid Leukemia	27 (5%)
Non-Hodgkin Lymphomas	21 (2%)	Acute Myeloid Leukemia	18 (4%)
Soft Tissue Sarcomas	74 (8%)	Thyroid Cancer	53 (12%)
Neuroblastomas	67 (7%)	Germ Cell Tumors	48 (11%)
Renal Tumors	48 (5%)	Soft Tissue Sarcomas	27 (6%)
Bone Tumors	32 (3%)	Bone Tumors	25 (5%)
All Types	973 (100%)	All Types	474 (100%)

Notes: Incidence case numbers were calculated in SEER*Stat software, version 8.3.2.

Sources: Incidence data provided by Wisconsin Cancer Reporting System, Office of Health Informatics, Division of Public Health, Department of Health Services.

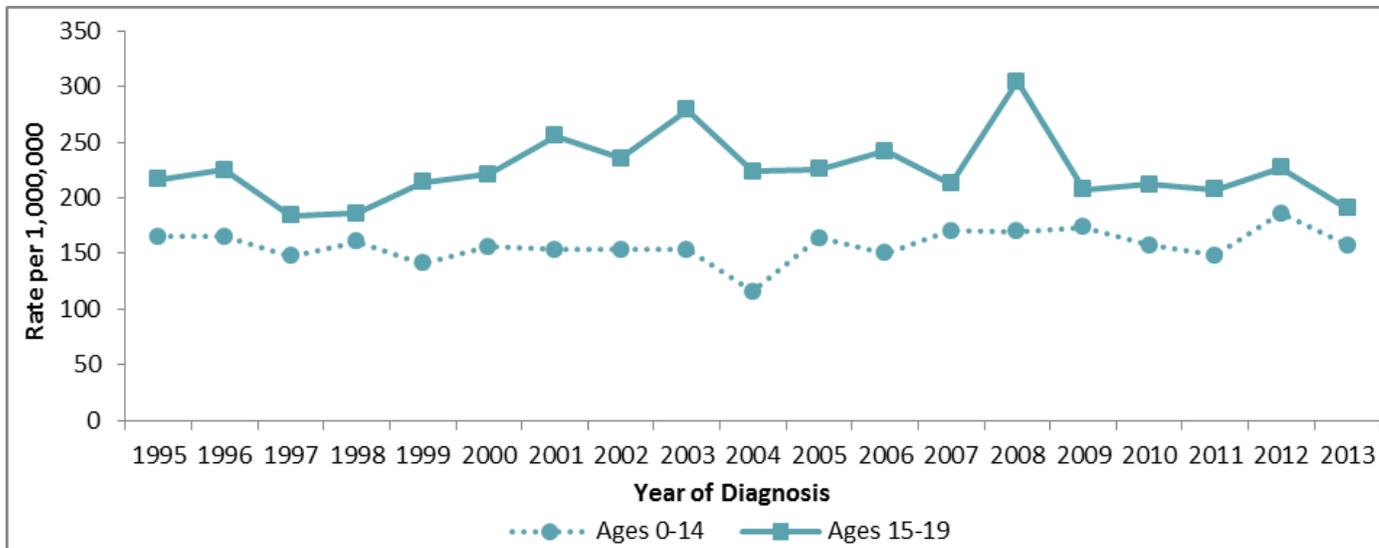
Image source: Noun Project

During 2009- 2013, 298 leukemia cases accounted for 31% of the total newly diagnosed cancers among children in Wisconsin, including 228 lymphoid leukemia cases and 51 acute myeloid leukemia cases. The second leading cancer among children was brain and other CNS tumors (272 cases), accounting for 28% of the total newly diagnosed, followed by lymphomas (85 cases) making up 9% of the total. Among adolescents, both lymphomas and brain and other CNS tumors were the leading cancer type (110 cases), each accounting for 23% of the total newly diagnosed. Leukemia and thyroid cancer (53 cases each) followed as the second leading cancer types, accounting for 12% of the total in this age group.

Trends in Cancer Incidence and Mortality Among Children and Adolescents

Incidence rates for all cancer types combined were consistently higher among adolescents compared to children from 1995 to 2013 in Wisconsin (Figure 2). The incidence rates among adolescents fluctuated while the rates among children were relatively stable during this time period.

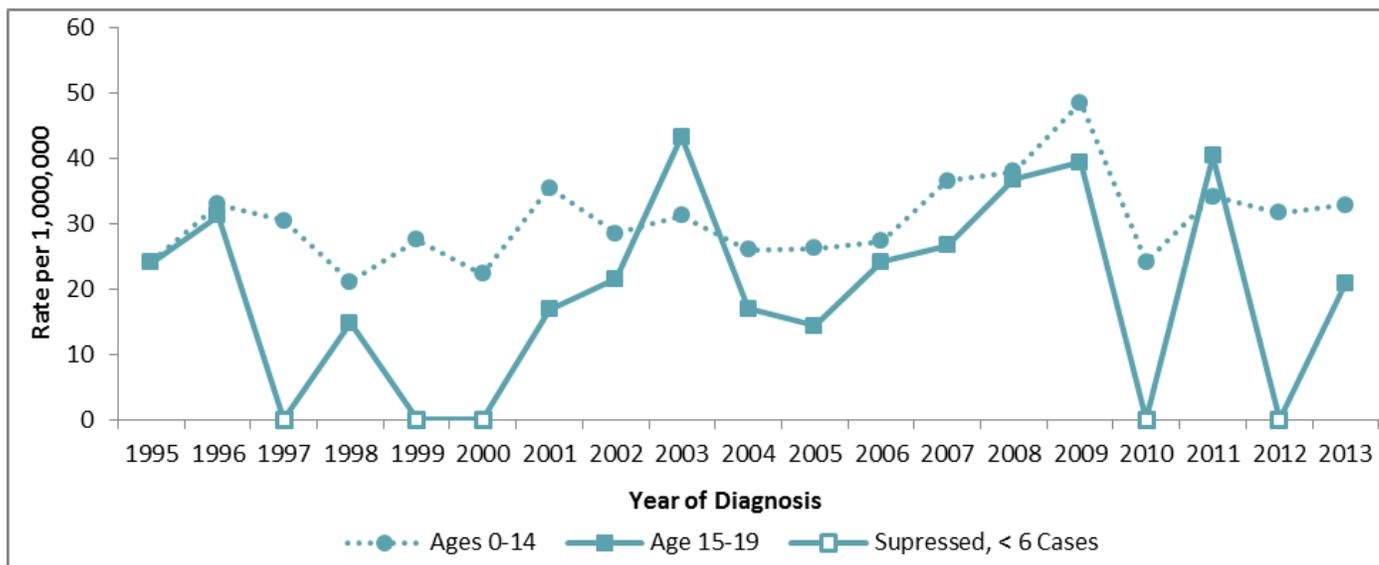
Figure 2. Trends in overall cancer incidence rates by age group in Wisconsin, 1995-2013



Notes: Rates are per 1,000,000 and age-adjusted to 2000 U.S. standard population. Rates were calculated in SEER*Stat software, version 8.3.2. Sources: Incidence data provided by Wisconsin Cancer Reporting System, Office of Health Informatics, Division of Public Health, Department of Health Services.

Figure 3 shows that incidence rates for brain and CNS tumors among children were higher than rates among adolescents for most years since 1995. During 1995-2013, the incidence rate trends for both age groups showed some annual variations in the rates, due to the instability of small numbers.

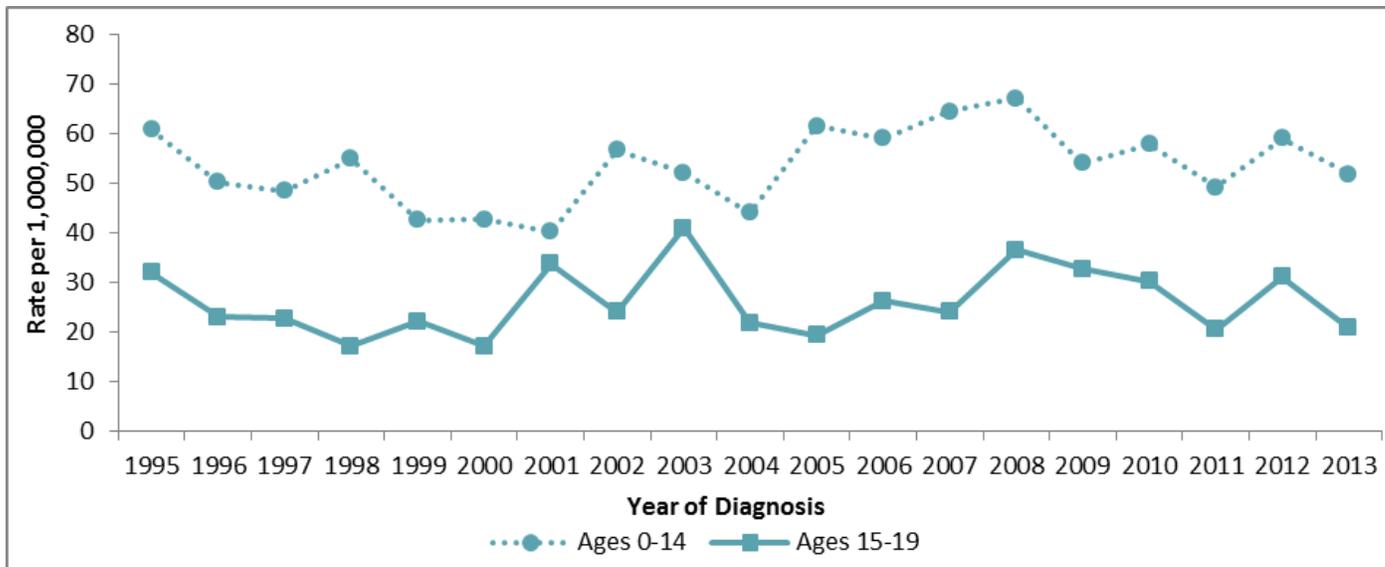
Figure 3. Trends in brain and CNS tumor incidence rates by age group in Wisconsin, 1995-2013



Notes: Rates are per 1,000,000 and age-adjusted to 2000 U.S. standard population. Rates were calculated in SEER*Stat software, version 8.3.2. Sources: Incidence data provided by Wisconsin Cancer Reporting System, Office of Health Informatics, Division of Public Health, Department of Health Services.

Figure 4 shows that incidence rates of leukemia among children were consistently higher than the rates among adolescents from 1995 to 2013. Overall, the trends in leukemia incidence rates for both age groups were relatively stable, while some annual variations in the rates may be due to the instability of small numbers.

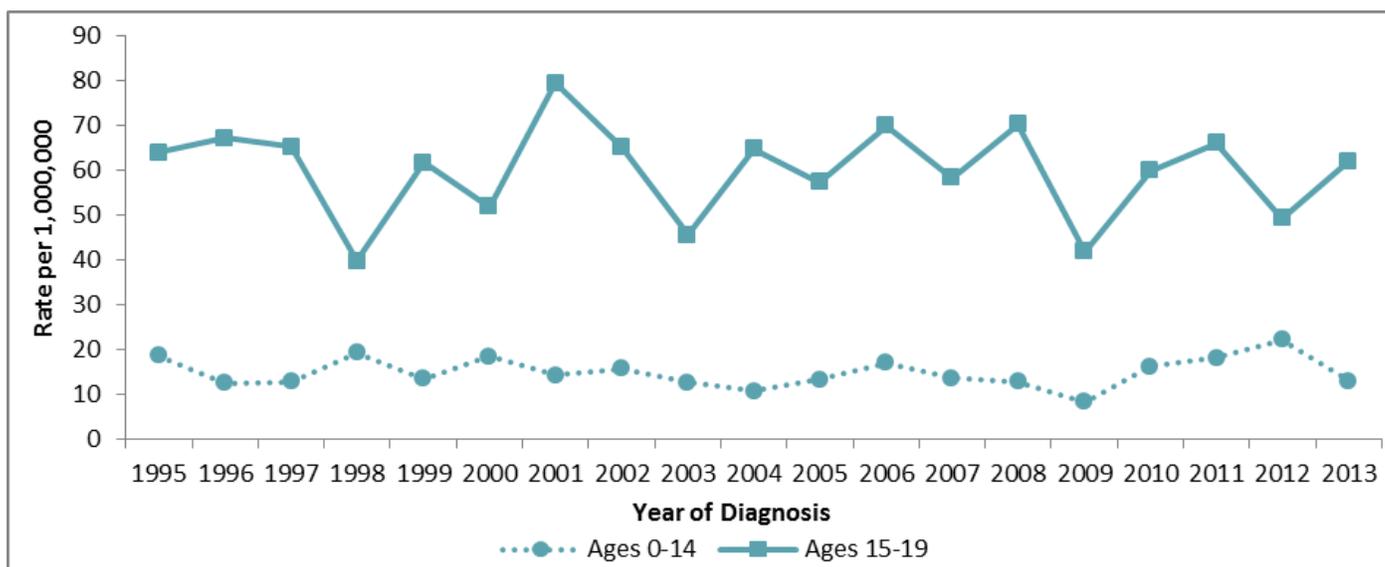
Figure 4. Trends in leukemia incidence rates by age group in Wisconsin, 1995-2013



Notes: Rates are per 1,000,000 and age-adjusted to 2000 U.S. standard population. Rates were calculated in SEER*Stat software, version 8.3.2. Sources: Incidence data provided by Wisconsin Cancer Reporting System, Office of Health Informatics, Division of Public Health, Department of Health Services.

Incidence rates of lymphomas (including Hodgkin lymphoma and non-Hodgkin lymphoma) in adolescents were consistently higher than the relatively steady rates in children between 1995 and 2013 (Figure 5). The incidence rates among adolescents fluctuated above the relatively stable rates among children during this time period.

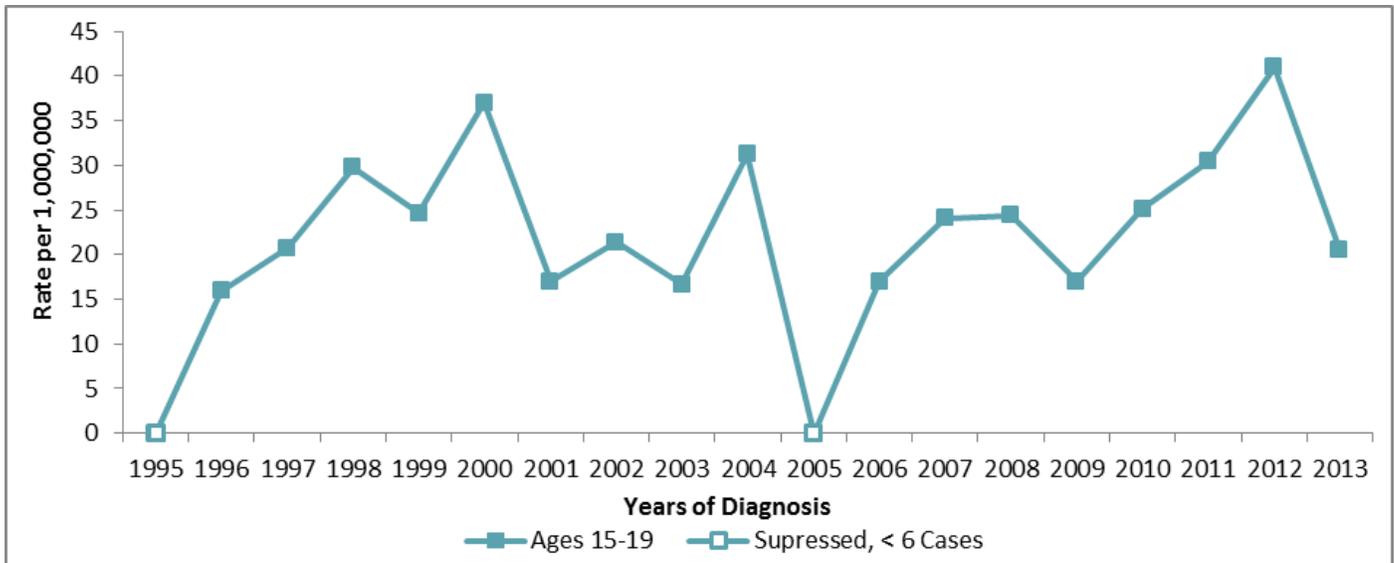
Figure 5. Trends in lymphomas incidence rates by age group in Wisconsin, 1995-2013



Notes: Rates are per 1,000,000 and age-adjusted to 2000 U.S. standard population. Rates were calculated in SEER*Stat software, version 8.3.2. Sources: Incidence data provided by Wisconsin Cancer Reporting System, Office of Health Informatics, Division of Public Health, Department of Health Services.

Thyroid cancer incidence rates in children are not displayed in Figure 6 because there are few cases diagnosed among children under age 15. Throughout the 1995-2013 period, the incidence rates among adolescents fluctuated between 15.9 per 1,000,000 in 1996 and 41.0 per 1,000,000 in 2012, due to the instability of small numbers.

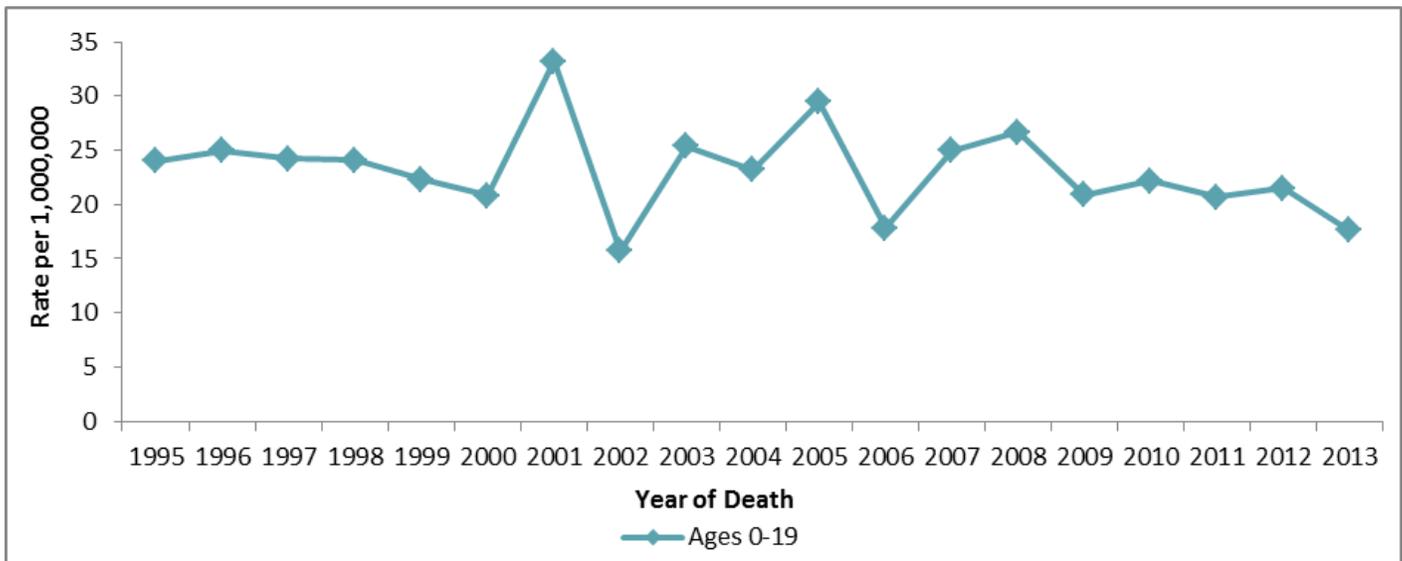
Figure 6. Trends in thyroid cancer incidence rates among adolescents in Wisconsin, 1995-2013



Notes: Rates are per 1,000,000 and age-adjusted to 2000 U.S. standard population. Rates were calculated in SEER*Stat software, version 8.3.2. Sources: Incidence data provided by Wisconsin Cancer Reporting System, Office of Health Informatics, Division of Public Health, Department of Health Services.

The overall cancer mortality rate among children and adolescents aged 0-19 had declined from 24.0 per 1,000,000 in 1995 to 17.6 per 1,000,000 in 2013. However, during the 1995-2013 period, the mortality trend for this age group showed some annual variations in the rates, due to the instability of small numbers.

Figure 7. Trend in overall cancer mortality rates among children and adolescents combined in Wisconsin, 1995-2013



Notes: Rates are per 1,000,000 and age-adjusted to 2000 U.S. standard population. Rates were calculated in SEER*Stat software, version 8.3.2. Sources: Mortality data collected by Wisconsin Vital Statistics Program and provided by National Center for Health Statistics.

Cancer Risk Factor Among Children and Adolescents

Unlike many types of cancer in adults, lifestyle-related risk factors do not play a major role in pediatric cancer risk. Causes of pediatric cancer among children and adolescents are largely unknown and hard to precisely identify, as cancer arises from a complex interaction of risk factors including biological and environmental exposures. Certain genetic syndromes, inherited cancer-associated genes, specific DNA changes, and radiation exposures contribute to a small percentage of pediatric cancers.

Cancer Signs and Symptoms Among Children and Adolescents

Signs and symptoms of pediatric cancers among children and adolescents often look similar to other common diseases in individuals 0-19 years of age, and the similarity makes early diagnosis difficult. Some common symptoms of pediatric cancer include swelling or an unusual mass; a sudden tendency to bruise; a prolonged fever or illness; loss of energy or unexplained paleness; a persistent localized pain; frequent headaches, often with vomiting; rapid weight loss; and sudden vision changes. As these symptoms or signs may be caused by cancer or many other health problems, a health professional should be consulted for diagnostic advice.

Additional Information and Definitions

For more information about pediatric cancers, risk factors, and symptoms, please visit the websites below:

- **American Cancer Society:**
 - ◇ **Cancer in Children:** <http://www.cancer.org/cancer/cancerinchildren/>
 - ◇ **Cancer in Adolescents:** <http://www.cancer.org/cancer/cancerinadolescents/>
- **National Cancer Institute:**
 - ◇ **Childhood Cancers:** <http://www.cancer.gov/types/childhood-cancers>
 - ◇ **Adolescents and Young Adults with Cancer:** <http://www.cancer.gov/types/aya>
- **Centers for Disease Control and Prevention: Cancer Among Children:** <http://www.cdc.gov/cancer/dcpc/data/children.htm>

To learn more about the most common pediatric cancer types among children and adolescents, page 8 shows a list of the definitions of these cancer types in these age groups.

Common Cancer Types Among Children and Adolescents

The common types of cancer that develop in children and adolescents include:

Acute myeloid leukemia: Cancer of blood-forming cells arising in the bone marrow that starts from myeloid cells and grows quickly. Acute myeloid leukemia accounts for about 15% and 31% of leukemia cases in children and adolescents, respectively.

Bone tumors: Cancer that forms in cells of the bone. The most common types of bone cancer in children are osteosarcoma and Ewing sarcoma.

Brain and other CNS tumors: The growth of abnormal cells in the tissues of the brain and other CNS. The most common types of brain and other CNS tumors in children are medulloblastoma, astrocytoma, ependymoma, and brain stem glioma. Brain and other CNS tumors account for 21% and 10% of the cancer cases among children and adolescents, respectively.

Germ cell tumors: A diverse group of tumors that arise from either the ovaries in girls or the testicles in boys. These tumors are most common in adolescents.

Hepatic tumors: Cancer that forms in the tissues of the liver.

Hodgkin lymphoma: Cancer of the lymphatic system that is marked by the presence of a type of cell called the Reed–Sternberg cell. Hodgkin lymphoma often starts in the lymph nodes in the chest, neck, or abdomen. Hodgkin lymphoma is rare in children, but increases rapidly from age 10 through adolescence.

Lymphoid leukemia: Cancer of blood-forming cells arising in the bone marrow that starts from lymphocytes. Lymphocytic leukemia may be acute and develop quickly or chronic and develop slowly. Acute lymphocytic leukemia accounts for about 80 percent of leukemia cases in children.

Melanoma of the skin: Cancer that begins in melanocytes (cells that make the pigment melanin) in the skin.

Neuroblastomas: Cancer that arises in immature nerve cells and affects mostly infants and children.

Non-Hodgkin lymphoma: Cancer of the lymphatic system, excluding Hodgkin lymphoma. The most common types of non-Hodgkin lymphoma in children are Burkitt lymphoma, lymphoblastic lymphoma, and large cell lymphoma.

Renal tumors: Cancer of the kidney. The most common type of kidney tumor in children is Wilms tumor.

Retinoblastomas: Cancer that forms in the tissues of the retina (the light-sensitive layers of nerve tissue at the back of the eye).

Soft tissue sarcomas: Cancer that begins in the muscle, fat, fibrous tissue, blood vessels, or other supporting tissue of the body. The most common soft tissue sarcoma is rhabdomyosarcoma.

Thyroid cancer: Cancer that forms in the thyroid gland.

Comments and Questions

Please contact the Wisconsin Cancer Reporting System at DHSWCRSdata@dhs.wisconsin.gov.

Visit the Wisconsin Cancer Reporting System website: <https://www.dhs.wisconsin.gov/wcrs/index.htm>.

Acknowledgments

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References

1. *American Cancer Society. Cancer Facts & Figures 2016*. Atlanta, Ga: American Cancer Society; 2016.
2. *Child & Adolescent Cancer in Ohio, 1996-2011*. Ohio Cancer Incidence Surveillance System, Ohio Department of Health and The Ohio State University, Columbus, Ohio, August 2014.



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