



Cancer Incidence in Children and Adolescents in Massachusetts, 2000-2009

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OBJECTIVE: To examine the epidemiology of invasive cancer incidence in Massachusetts children and adolescents diagnosed from 2000-2009.

INTRODUCTION:

- From 2000 to 2009, there were 3,001 cases of invasive cancer diagnosed among children and adolescent residents of Massachusetts (birth to age 19). Males represented 53.4% of the cancer cases and females 46.6%.
- The three most common cancers diagnosed among male children and adolescents, accounting for 61.3% of all cases, were leukemia, cancer of the brain and central nervous system, and lymphomas.
- The three most common cancers for females, accounting for 55.8% of all cases, were leukemia, cancer of the brain and central nervous system, and malignant epithelial neoplasm, the most common of which were thyroid cancer and melanoma.

Age-Specific Incidence Rates per 100,000 and 95% Confidence Intervals of Leading Cancers among Children and Adolescents by Age Group and Sex, MA, 2000-2009

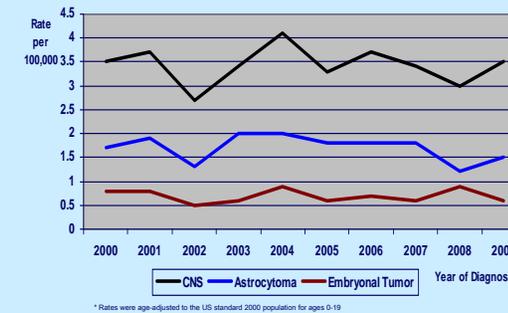
Age 00-04 years			Age 05-09 years		
Rank	Males	Females	Rank	Males	Females
	All Cancers 23.1 (20.9, 25.2)	All Cancers 33.0 (29.9, 36.0)		All Cancers 13.6 (12.0, 15.2)	All Cancers 14.7 (12.7, 16.6)
1	Leukemia 8.0 (6.7, 9.2)	Leukemia 12.4 (10.6, 14.3)	1	Central Nervous System 4.6 (3.7, 5.5)	Central Nervous System 4.8 (3.6, 5.9)
2	Central Nervous System 4.6 (3.6, 5.5)	Central Nervous System 6.5 (5.2, 7.9)	2	Leukemia 3.6 (2.7, 4.4)	Leukemia 4.0 (3.0, 5.0)
3	Peripheral Nervous System 4.3 (3.4, 5.2)	Peripheral Nervous System 5.3 (4.1, 6.5)	3	Lymphoma 2.4 (1.7, 3.0)	Soft Tissue Sarcoma 1.3 (0.7, 1.9)
4	Renal Tumor 1.8 (1.2, 2.3)	Renal Tumor 2.3 (1.6, 3.2)	4	Soft Tissue Sarcoma 0.9 (0.5, 1.3)	Lymphoma 1.0 (0.5, 1.5)
5	Soft Tissue Sarcoma 1.3 (0.8, 1.9)	Retinoblastoma 1.7 (1.0, 2.4)	5	Renal Tumor 0.6 (0.3, 0.9)	Primary Bone 0.7 (0.3, 1.1)

Age 10-14 years			Age 15-19 years		
Rank	Males	Females	Rank	Males	Females
	All Cancers 14.4 (12.8, 16.0)	All Cancers 16.3 (14.3, 18.3)		All Cancers 25.2 (23.1, 27.2)	All Cancers 27.2 (26.6, 31.8)
1	Lymphoma 4.2 (3.3, 5.0)	Central Nervous System 3.3 (2.4, 4.2)	1	Lymphoma 6.6 (5.5, 7.7)	Epithelial Tumor 10.2 (8.7, 11.9)
2	Leukemia 3.1 (2.4, 3.8)	Lymphoma 3.2 (2.4, 4.2)	2	Germ cell 4.0 (3.2, 4.9)	Lymphoma 7.6 (6.3, 8.9)
3	Central Nervous System 2.8 (2.1, 3.5)	Leukemia 3.1 (2.2, 3.9)	3	Epithelial Tumor 4.0 (3.2, 4.9)	Leukemia 3.0 (2.2, 3.8)
4	Primary Bone 1.5 (1.0, 2.0)	Epithelial Tumor 2.5 (1.7, 3.3)	4	Leukemia 3.6 (2.8, 4.4)	Central Nervous System 2.8 (2.0, 3.6)
5	Epithelial Tumor 1.2 (0.8, 1.7)	Primary Bone 1.4 (0.8, 2.0)	5	Central Nervous System 2.8 (2.1, 3.5)	Soft Tissue Sarcoma 2.3 (1.5, 3.0)

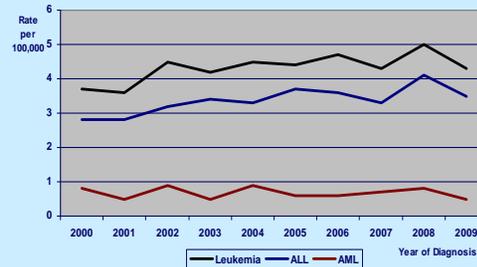
LEUKEMIA:

- Leukemia accounted for 23.5% of childhood/adolescent cancer cases (n=705)
- There were significant increases in the incidence trends for childhood and adolescent leukemia in Massachusetts (APC=2.3%)
 - Acute lymphoid leukemia (ALL)** (n=548) is an acute (fast growing) leukemia that starts in the lymphoid cells of the bone marrow. It accounted for 77.7% of all childhood and adolescent leukemia cases. A significantly larger percentage of males were diagnosed than females (56.4% vs. 43.6%). ALL was more likely to be diagnosed in the younger age groups with 72.5% of cases diagnosed before the age of 10 and 51.3% before the age of 5. There was a significant increase in the incidence trends for ALL (APC=3.2%)
 - Acute myeloid leukemia (AML)** (n=115) starts in myeloid cells that form white cells (other than lymphocytes), red blood cells, or platelets. It accounted for 16.3% of all childhood and adolescent cases. 44.4% of cases were male and 55.7% female, no significant difference. 29.6% were diagnosed before the age of five and 61.8% were diagnosed between 10 and 19. The incidence trend for AML decreased non-significantly with an APC of -1.2%.

Age-Adjusted Central Nervous System Cancer Incidence Rates per 100,000* by Subtype and Year among Children and Adolescents, MA, 2000-2009



Age-Adjusted Leukemia Incidence Rates per 100,000* by Subtype and Year among Children and Adolescents, MA, 2000-2009

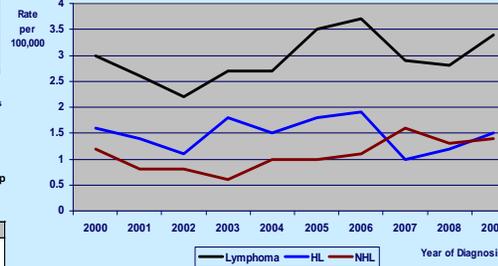


* Rates were age-adjusted to the US standard 2000 population for ages 0-19

LYMPHOMA:

- Lymphoma accounted for 16.6% of childhood/adolescent cancer cases (n=499). The incidence trends for all lymphomas from 2000 to 2009 was not significant (APC= -1.1%).
- Hodgkin lymphoma (HL)** (n=252) is a type of lymphoma that involves the Reed-Sternberg cells. Those lymphomas that don't involve these cells are referred to as non-Hodgkin lymphoma. Among children and adolescents diagnosed with lymphoma, 50.5% of lymphoma cases were HL (n=252). 92.5% were diagnosed after the age of 9, with 65.5% diagnosed after the age of 14. 51.2% of HL cases were male and 48.8% female, a non-significant difference. The incidence trend was not significant (APC= -1.1%).
- Non-Hodgkin lymphoma (NHL)** (n=182) in children comprises three main types. Lymphoblastic and large cell lymphomas are categorized as NHL, separate from Burkitt lymphoma (n=55). 36.5% of Massachusetts childhood and adolescent lymphoma cases were NHL (n=182). A significantly larger percentage of males were diagnosed with NHL compared to females (67.0% vs. 33.0%). Of the NHL cases, 77.5% were diagnosed after the age of 14. The incidence trend was statistically significant (APC= 6.0%).

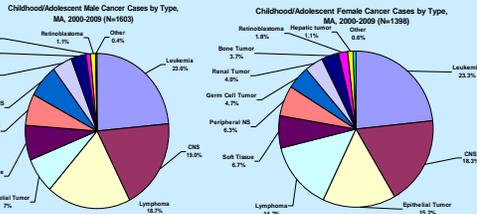
Age-Adjusted Lymphoma Incidence Rates per 100,000* by Subtype and Year among Children and Adolescents, MA, 2000-2009



* Rates were age-adjusted to the US standard 2000 population for ages 0-19

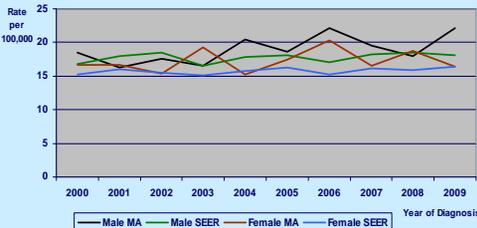
CENTRAL NERVOUS SYSTEM:

- CNS cancer accounted for 18.7% of childhood and adolescent cancer cases (n=560). The trend from 2000 to 2009 was not statistically significant (APC= -0.2%).
- Astrocytomas** (n=280) for the most part can spread widely throughout and mingle with normal brain tissue. There are three grades: low-slow growing and the most common type in children, anaplastic-moderate growing, and glioblastoma - the highest grade and the fastest growing. They accounted for 50.0% of CNS childhood and adolescent cancers. There was no significant difference in among males and females (53.6% vs. 46.4%), no predominant age group, and the trend was not statistically significant (APC= -1.9%).
- Embryonal tumors** (n=111) begin in embryonic (fetal) cells in the brain and spinal cord. They accounted for 19.8% of CNS childhood and adolescent cancers. There was no significant difference in incidence among males and females (51.4% vs. 48.7%) and 39.6% of the cases were diagnosed before the age of 5 compared to 31.5% from age 10-19. The trend was not significant (APC= -0.5%).



- For both males and females, the age-adjusted incidence rate of all cancers combined among children and adolescents did not change significantly with annual percent changes (APC) of 1.0% and 0.8%, respectively, comparable to US trends.

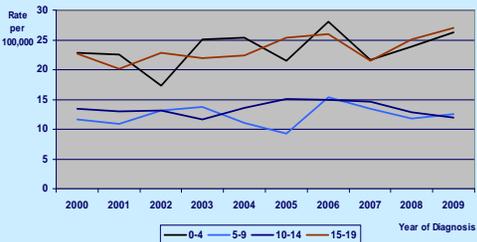
Age-Adjusted Incidence Rate per 100,000 for All Cancers* among Children and Adolescents by Sex by Year, MA and US SEER, 2000-2009



Sources: MCR and SEER 18 Registries. * Rates were age-adjusted to the US standard 2000 population for ages 0-19

- Children under the age of 5 and adolescents ages 15 to 19 had higher cancer rates than the groups 5 to 14. The age group 15-19 was the only one with a significant increasing trend with an APC of 2.1%.

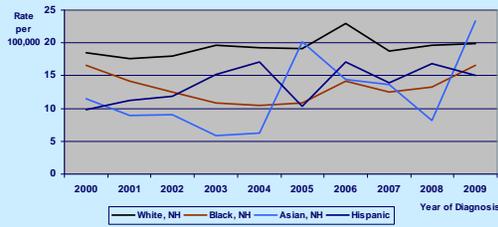
Cancer Age-Specific Incidence Rate per 100,000 among Children and Adolescents, MA by Year, 2000-2009



AGE GROUP:

- The age-specific incidence rate of childhood cancer was highest among Massachusetts males and females 15-19 years old, followed by males and females 0-4 years old. The rates for both males and females in these two groups were both statistically significantly elevated when compared to the other two groups (5-9 and 10-14).
- The most common cancer groupings among children and adolescents varied by age group and sex.
- Leukemia ranked number one among 0-4 year old for both males and females, with significantly higher rates than any other cancer. Additionally, females in this age group had a significantly higher incidence rate of leukemia compared to males.
- Central nervous system tumors ranked number one among 5 to 9-year-olds for both males and females.
- Lymphomas ranked number one for males and central nervous system tumors rank number one for females in the 10-14 years old group. Lymphomas ranked number one for males and malignant epithelial neoplasm ranked number one for females in the 15-19 years old group.

Age-Adjusted Incidence Rate per 100,000 for All Cancers* among Children and Adolescents in MA by Race/Ethnicity by Year, 2000-2009



* Rates were age-adjusted to the US standard 2000 population for ages 0-19

Age-Adjusted Incidence Rates per 100,000* and 95% Confidence Intervals of the Top Five Cancers among Children and Adolescents by Race/Ethnicity, MA, 2000-2009

Age 00-19 years				
Rank	White, NH	Black, NH	Asian, NH	Hispanic
	All Cancers 19.3 (18.5, 20.1)	All Cancers 13.2 (11.3, 15.2)	All Cancers 12.4 (10.1, 14.7)	All Cancers 14.0 (12.4, 15.7)
1	Leukemia 4.6 (4.2, 5.0)	Leukemia 2.6 (1.8, 3.5)	Leukemia 3.5 (2.3, 4.8)	Leukemia 4.1 (3.2, 5.0)
2	Central Nervous System 3.8 (3.5, 4.2)	Leukemia 2.5 (1.6, 3.3)	Lymphoma 2.2 (1.2, 3.3)	Central Nervous System 2.3 (1.7, 3.0)
3	Lymphoma 3.1 (2.8, 3.4)	Central Nervous System 1.8 (1.0, 2.5)	Soft Tissue Sarcoma 2.1 (1.2, 3.3)	Lymphoma 2.3 (1.6, 3.0)
4	Epithelial Tumor 2.0 (1.8, 2.3)	Soft Tissue Sarcoma 1.7 (1.0, 2.4)	Soft Tissue Sarcoma 1.0 (0.3, 1.6)	Epithelial Tumor 1.4 (0.8, 1.9)
5	Peripheral Nervous System 1.4 (1.1, 1.6)	Renal Tumor 0.9 (0.2, 1.4)	Germ Cell 0.8 (0.2, 1.4)	Soft Tissue Sarcoma 1.1 (0.6, 1.6)

* Rates were age-adjusted to the US standard 2000 population for ages 0-19

The data source for all graphs and tables in this poster was the MCR, except for the general population data, which was derived from US Census estimates and the national data which came from the SEER 18 Registries. We acknowledge the Centers for Disease Control and Prevention for its support of the staff and printing of this poster under cooperative agreement #5U49CE000201 awarded to the Massachusetts Department of Public Health. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention.