

Georgia Childhood Cancer Report 2014

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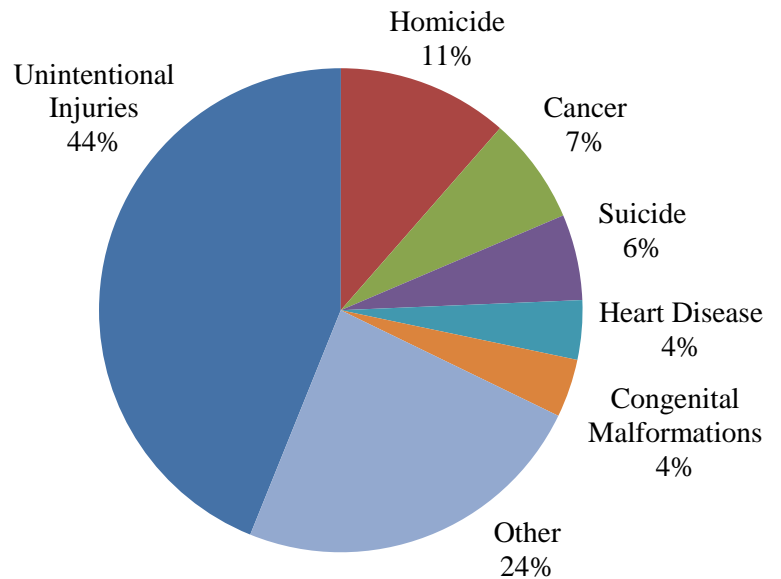
Introduction

Cancer is the third most common cause of death among children between 1 and 19 years of age, following unintentional injuries and homicide. It accounted for 7% of all childhood mortality in Georgia from 2001-2011* (*Figure 1*). The most common forms of childhood cancer are leukemias, central nervous system (CNS) neoplasms, and lymphomas, accounting for about 60% of all childhood cancer diagnoses and deaths (*Table 1*).

This report was written to assist health professionals, volunteers, cancer control organizations, community groups, and others who are working to reduce the burden of cancer throughout Georgia.

This report describes the burden of childhood cancer in Georgia and includes: 1) the number of cancer cases and incidence rates for Georgia children; and 2) the number of cancer deaths and mortality rates for Georgia children.

Figure 1. Childhood Mortality by Cause, Ages 1 to 19 Years, Georgia, 2001-2011*



* Death data are for 2001-2008 and 2010-2011 combined.

Table 1. Incidence and Mortality for the Top Three Cancer Types in Children Ages 0 to 19 Years,

	Incidence		Mortality	
	Cases*	% of Cases	Deaths*	% of Deaths
Leukemias	110	26%	19	30%
CNS Cancers	79	18%	15	24%
Lymphomas	63	15%	4	7%

*Average number of cases (2002-2011) or deaths (2001-2008&2010-2011) per year in Georgia

Basic Cancer Information

What is Cancer?

Cancer is a group of diseases characterized by uncontrolled growth and spread of abnormal cells. Cells with the ability to spread to other locations in the body are called invasive or malignant cancers. If the growth is not controlled, it can result in death. Cancer is caused by both internal and external factors. Fortunately, many cancers can be cured if detected and treated promptly. Different types of cancer can behave very differently, growing at different rates and responding to different therapies. That is why people with cancer need treatment that is aimed at their specific disease. This report focuses on malignant cancers only.

Who is at Risk for Developing Cancer?

Everyone is at risk for developing cancer, but the risk increases as individuals age. Most cancers affect adults who are middle-aged or older. Approximately 75% of all cancers in Georgia are diagnosed at age 55 years or older, while only about 1% occur among children under 20 years of age. In the United States, males have a 1 in 2 lifetime risk, and females have a 1 in 3 lifetime risk. Lifetime risk refers to the probability that an individual, over the course of a lifetime, will develop cancer.

Cancer in Children

Approximately 430 new cancer cases and 60 cancer deaths are expected to occur each year in Georgia among children aged 0-19. Despite its rarity, cancer is still the leading cause of death by disease among children between the ages of 1 and 19 years. In Georgia (as well as in the U.S.), mortality rates from childhood cancer have declined by about 64% since 1970.

Early detection of cancer is problematic because initial symptoms are usually non-specific.¹ Parents should make sure their children have regular medical checkups and should be alert to any unusual symptoms that persist. These include an unusual mass or swelling; unexplained paleness and loss of energy; sudden tendency to bruise; a persistent, localized pain; limping; prolonged, unexplained fever or illness; frequent headaches, often with vomiting; sudden vision changes; and excessive, rapid weight loss.

The types of cancers that develop in children are very different from those that develop in adults. Many childhood cancers occur very early in life and many parents want to know why. Unfortunately, the cause of most childhood cancers is not known. Childhood cancers

are often the result of DNA changes in cells that take place very early in life, sometimes even before birth. Unlike cancers in adults, childhood cancers are not significantly related to lifestyle-related risk factors of the individual such as tobacco or alcohol use, poor diet, or lack of physical activity (*Table 2*).

Childhood cancers can be treated by a combination of therapies (surgery, radiation, chemotherapy) chosen based on the specific type, location, and stage of the disease. Treatment is coordinated by a team of experts including pediatric oncologists, pediatric nurses, social workers, psychologists, and others who assist children and their families.

For all childhood cancers combined, 5-year relative survival rates have improved markedly over the past four decades, from about 60% in the mid-1970s to the present rate of more than 80%, largely due to new and improved treatments. Rates vary considerably, however, depending on the specific cancer type. Survivors of childhood cancer may experience treatment-related side effects several months or years after their diagnosis. Late treatment effects can include organ malfunction, secondary cancers, and cognitive impairment.

Table 2. Comparison of Childhood Cancers Versus Adult Cancers

	Children	Adults
Top 5 Cancers	Leukemias Central Nervous System Neoplasms Lymphomas Soft Tissue Sarcomas Peripheral Nervous System Tumors	Prostate Female Breast Lung and Bronchus Colon and Rectum Melanoma
Prevention	Because the cause of most childhood cancer is unknown, there is no known way to prevent it.	Nearly two-thirds of cancer deaths can be linked to modifiable risk factors such as tobacco use, diet, obesity, and lack of exercise. In addition, many skin cancers could be prevented by protection from the sun's rays.
Survival	The Georgia 5-year relative survival rate for all cancers from 2004-2010 among children age 0 to 19 years is 82%.	The Georgia 5-year relative survival rate for all cancers from 2004-2010 among all ages is 64%.

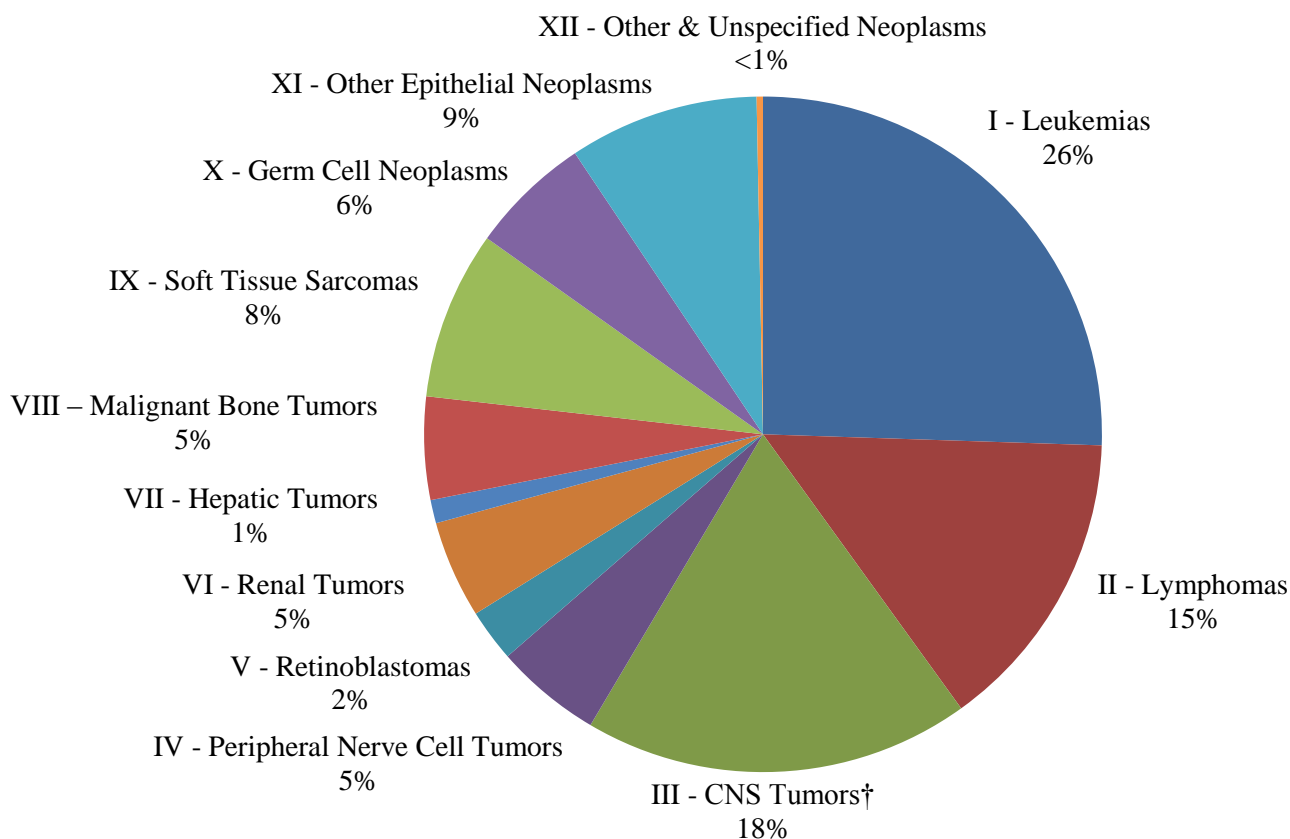
¹ *Cancer in Children*. (2014). Retrieved September 4, 2014 from <http://www.cancer.org/cancer/cancerinchildren/detailedguide/index>

Childhood Cancer Incidence

Childhood Cancer Incidence in Georgia

- Leukemia is the most common form of childhood cancer, accounting for 26% of all childhood cancer diagnoses between 2002 and 2011 in Georgia (*Figure 2*).
- Central nervous system (CNS) tumors and lymphomas combined account for about one third of all childhood cancer diagnoses.
- Between 2002 and 2011, there were 4,306 cancer diagnoses among children aged 0 to 19 years living in Georgia. The age-adjusted rate for this time period was 158.5 per million (*Table 3*).
- The highest cancer incidence rate among children aged 0 to 19 years was for leukemia (40.1 per million), followed by CNS neoplasms with a rate of 29.4 per million.
- Overall, males had a higher cancer incidence rate than females. This difference was most apparent in lymphomas (especially non-Hodgkin and Burkitt lymphomas), neuroblastomas, and gonadal germ cell tumors. Females were more likely to be diagnosed with extragonadal germ cell tumors and thyroid carcinomas.
- Cancer incidence was highest in the youngest and oldest age categories (*Table 4*).
- Children aged 0 to 4 years were most likely to be diagnosed with leukemias, CNS neoplasms, peripheral nerve cell tumors, renal tumors, or retinoblastomas.
- Children aged 15 to 19 years were most likely to be diagnosed with lymphomas (especially Hodgkin lymphoma), leukemias, germ cell tumors, CNS neoplasms, and other malignant neoplasms such as melanomas or thyroid carcinomas.

Figure 2. Childhood Malignant Cancer Incidence*, Ages 0 to 19 Years, Georgia, 2002-2011



* The International Classification of Childhood Cancer, Third Edition (ICCC-3) groupings were used.

† Although the Georgia Comprehensive Cancer Registry started collecting data on benign CNS tumors in 2004, the current report discusses only malignant tumors.

Table 3. Age-Adjusted Childhood Cancer Incidence Rates*†, Ages 0 to 19 Years, Georgia, 2002-2011

International Classification of Childhood Cancer (ICCC-3) Grouping	Both Sexes		Males		Females	
	Cases	Rate per Million	Cases	Rate per Million	Cases	Rate per Million
All Types	4306	158.5	2268	163.0	2038	153.6
I - Leukemias, Myeloproliferative & Myelodysplastic Diseases	1099	40.1	593	42.5	506	37.6
ia - Lymphoid leukemia	761	27.6	421	30.1	340	25.1
ib - Acute myeloid leukemia	214	7.9	103	7.5	111	8.4
ic - Chronic myeloproliferative diseases	66	2.5	31	2.3	35	2.7
id - Myelodysplastic syndrome & other myeloproliferative diseases	29	1.1	19	1.4	10	~
ie - Unspecified and other specified leukemias	29	1.1	19	1.4	10	~
II - Lymphomas & Reticuloendothelial Neoplasms	626	23.7	382	28.3	244	18.9
iia - Hodgkin lymphoma	316	12.0	178	13.2	138	10.7
iib - Non-Hodgkin lymphoma (except Burkitt)	215	8.2	140	10.4	75	5.9
iic - Burkitt lymphoma	66	2.5	50	3.8	16	1.2
iid - Miscellaneous lymphoreticular neoplasms	21	0.8	***	~	***	~
iie - Unspecified lymphomas	8	~	***	~	<5	~
III - Central Nervous System & Miscellaneous Intracranial & Intraspinial Neoplasms†	794	29.4	411	29.8	383	29.1
iiia - Ependymomas and choroid plexus tumor	66	2.4	30	2.1	36	2.6
iiib - Astrocytomas	404	15.1	202	14.6	202	15.5
iiic - Intracranial and intraspinal embryonal tumors	154	5.6	90	6.5	64	4.7
iiid - Other gliomas	147	5.5	75	5.5	72	5.5
iiie - Other specified intracranial and intraspinal neoplasms	11	~	***	~	***	~
iiif - Unspecified intracranial and intraspinal neoplasms	12	~	***	~	<5	~
IV - Neuroblastoma & Other Peripheral Nervous Cell Tumors	219	7.5	128	8.5	91	6.5
V - Retinoblastomas	108	3.6	48	3.1	60	4.1
VI - Renal Tumors	201	7.0	96	6.5	105	7.5
via - Nephroblastoma and other nonepithelial renal tumors	181	6.3	87	5.9	94	6.7
vib - Renal carcinomas	***	~	***	~	***	~
vic - Unspecified malignant renal tumors	<5	~	<5	~	<5	~
VII - Hepatic Tumors	48	1.7	23	1.6	25	1.8
viiia - Hepatoblastoma	35	1.2	18	1.2	17	1.2
viiib - Hepatic carcinomas	***	~	***	~	***	~
viiic - Unspecified malignant hepatic tumors	<5	~	<5	~	<5	~
VIII - Malignant Bone Tumors	212	8.1	122	9.0	90	7.1
viiiia - Osteosarcomas	121	4.6	67	5.0	54	4.3
viiiib - Chondrosarcomas	<5	~	<5	~	<5	~
viiiic - Ewing tumor and related sarcomas of bone	70	2.7	41	3.0	29	2.3
viiiid - Other specified malignant bone tumors	7	~	***	~	<5	~
viiiie - Unspecified malignant bone tumors	***	~	6	~	<5	~
IX - Soft Tissue & Other Extrasosseous Sarcomas	347	13.0	192	14.0	155	11.9
ixia - Rhabdomyosarcomas	143	5.3	80	5.7	63	4.8
ixb - Fibrosarcomas, peripheral nerve sheath & other fibromatous neoplasms	30	1.1	15	~	15	~
ixc - Kaposi sarcoma	6	~	***	~	<5	~
ixd - Other specified soft tissue sarcomas	120	4.5	64	4.7	56	4.4
ixe - Unspecified soft tissue sarcomas	48	1.8	***	~	***	~
X - Germ Cell & Trophoblastic Tumors & Neoplasms of Gonads	249	9.2	132	9.4	117	9.0
xax - Intracranial and intraspinal germ cell tumors	43	1.6	27	2.0	16	1.2
xaxb - Malignant extracranial and extragonadal germ cell tumors	42	1.4	14	~	28	2.0
xaxc - Malignant gonadal germ cell tumors	151	5.7	91	6.5	60	4.8
xaxd - Gonadal carcinomas	8	~	<5	~	***	~
xaxe - Other and unspecified malignant gonadal tumors	5	~	<5	~	***	~
XI - Other Malignant Epithelial Neoplasms & Malignant Melanomas	390	14.7	138	10.1	252	19.5
xiia - Adrenocortical carcinomas	<5	~	<5	~	<5	~
xiib - Thyroid carcinomas	154	5.8	30	2.2	124	9.6
xiic - Nasopharyngeal carcinomas	22	0.8	13	~	9	~
xiid - Malignant melanomas	107	4.0	48	3.5	59	4.5
xiie - Skin carcinomas	<5	~	<5	~	<5	~
xiif - Other and unspecified carcinomas	102	3.8	45	3.3	57	4.4
XII - Other & Unspecified Malignant Neoplasms	13	~	<5	~	***	~

* Average annual rate per million, age-adjusted to the 2000 US standard million population

† Although the Georgia Comprehensive Cancer Registry started collecting data on benign CNS tumors in 2004, the current report discusses only malignant tumors.

~ Rates are not calculated where the count is less than sixteen.

*** Counts less than five and those that allow calculation of counts less than five are concealed for confidentiality purposes.

Table 4. Age-Specific Childhood Cancer Incidence Rates*†, Ages 0 to 19 Years, Georgia, 2002-2011

	Ages 0 to 4		Ages 5-9		Ages 10-14		Ages 15-19	
	Cases	Rate per Million	Cases	Rate per Million	Cases	Rate per Million	Cases	Rate per Million
All Types	1411	209.6	762	117.0	824	122.7	1309	194.5
I - Leukemias, Myeloproliferative & Myelodysplastic Diseases	454	67.5	239	36.7	192	28.6	214	31.8
II - Lymphomas & Reticuloendothelial Neoplasms	55	8.2	106	16.3	143	21.3	322	47.9
III - CNS & Miscellaneous Intracranial & Intraspinial Neoplasms†	278	41.3	212	32.5	177	26.4	127	18.9
IV - Neuroblastoma & Other Peripheral Nervous Cell Tumors	175	26.0	28	4.3	8	~	8	~
V - Retinoblastomas	105	15.6	<5	~	<5	~	<5	~
VI - Renal Tumors	139	20.7	44	6.8	6	~	12	~
VII - Hepatic Tumors	31	4.6	6	~	5	~	6	~
VIII - Malignant Bone Tumors	16	2.4	28	4.3	72	10.7	96	14.3
IX - Soft Tissue & Other Extraosseous Sarcomas	87	12.9	52	8.0	100	14.9	108	16.0
X - Germ Cell & Trophoblastic Tumors & Neoplasms of Gonads	49	7.3	18	2.8	44	6.6	138	20.5
XI - Other Malignant Epithelial Neoplasms & Malignant Melanomas	17	2.5	26	4.0	75	11.2	272	40.4
XII - Other & Unspecified Malignant Neoplasms	5	~	<5	~	<5	~	***	~

* Average annual rate per million

† Although the Georgia Comprehensive Cancer Registry started collecting data on benign CNS tumors in 2004, the current report discusses only malignant tumors.

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Childhood Cancer Incidence Rates by Georgia Public Health District

Table 5. Age-Adjusted Childhood Cancer Incidence Rates*† by Health District, Ages 0 to 19 Years, Georgia, 2002-2011

Georgia Rate = 158.5

Health District	Rate per Million	Health District	Rate per Million
1-1 Northwest	165.4‡	5-1 South Central	130.2‡
1-2 North Georgia	165.8‡	5-2 North Central	173.9‡
2 North	180.7‡	6 East Central	161.7‡
3-1 Cobb-Douglas	169.1‡	7 West Central	144.9‡
3-2 Fulton	141.9‡	8-1 South	151.5‡
3-3 Clayton	125.2‡	8-2 Southwest	125.0‡
3-4 East Metro	163.8‡	9-1 Coastal	166.8‡
3-5 DeKalb	158.5	9-2 Southeast	146.9‡
4 LaGrange	154.3‡	10 Northeast	176.9‡

- Among the Georgia Public Health Districts, childhood cancer incidence rates ranged from 125.0 per million to 180.7 per million (Table 5).
- Health Districts 1-1, 1-2, 2, 3-1, 3-4, 5-2, 6, 9-1, and 10 had significantly higher rates than the overall state average, while Districts 3-2, 3-3, 4, 5-1, 7, 8-1, 8-2, and 9-2 had significantly lower rates.
- See Appendix C for a list of counties included in each Health District.

* Average annual rate per million, age-adjusted to the 2000 US standard million population

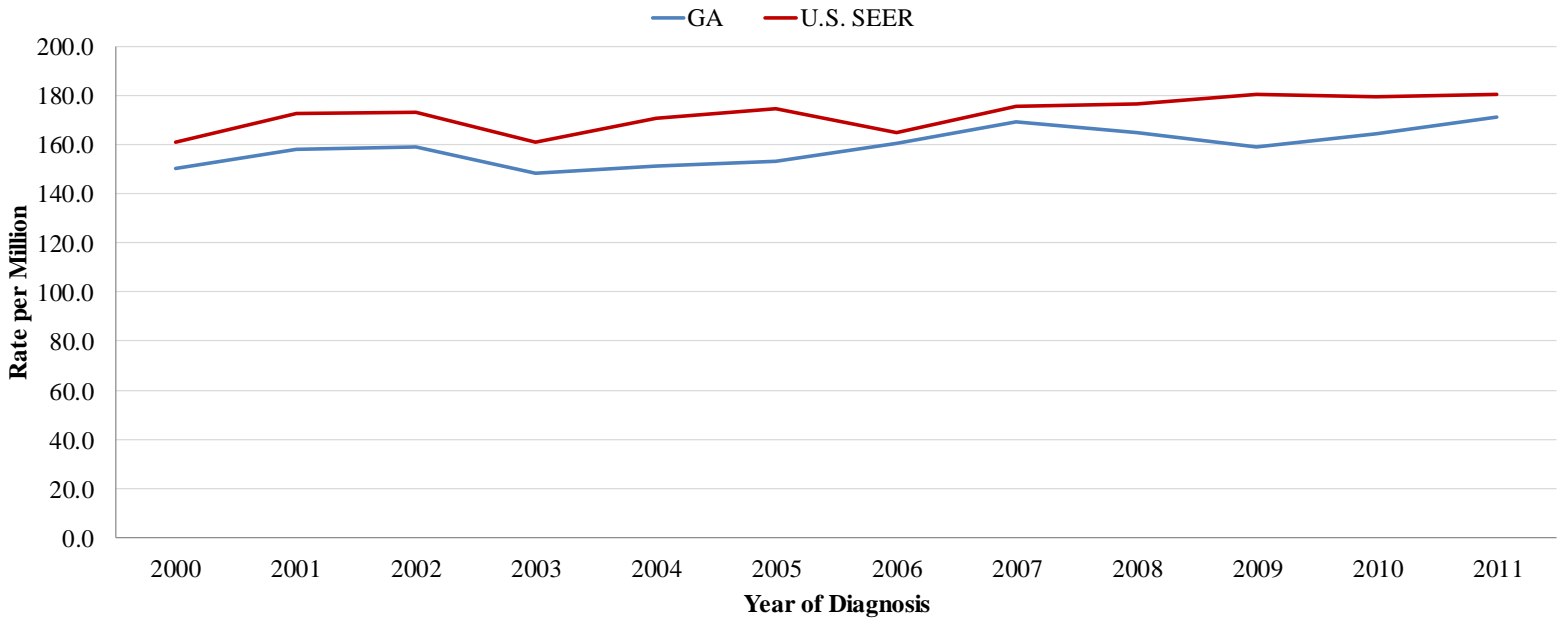
† Although the Georgia Comprehensive Cancer Registry started collecting data on benign CNS tumors in 2004, the current report discusses only malignant tumors.

‡ Rate is significantly higher or lower than the state rate (p<.05).

Trends in Childhood Cancer Incidence in Georgia

In Georgia, incidence rates for all childhood cancers combined increased at an average rate of about 1.0% per year from 2000 to 2011 (*Figure 3*). This increase mimics national trends, but the reasons behind it are unclear.

Figure 3. Childhood Cancer Incidence Rates*†, All Types, Ages 0 to 19 Years, Georgia vs U.S. SEER‡, 2000-2011



* Average annual rate per million, age-adjusted to the 2000 US standard million population

† Although the Georgia Comprehensive Cancer Registry started collecting data on benign CNS tumors in 2004, the current report discusses only malignant tumors.

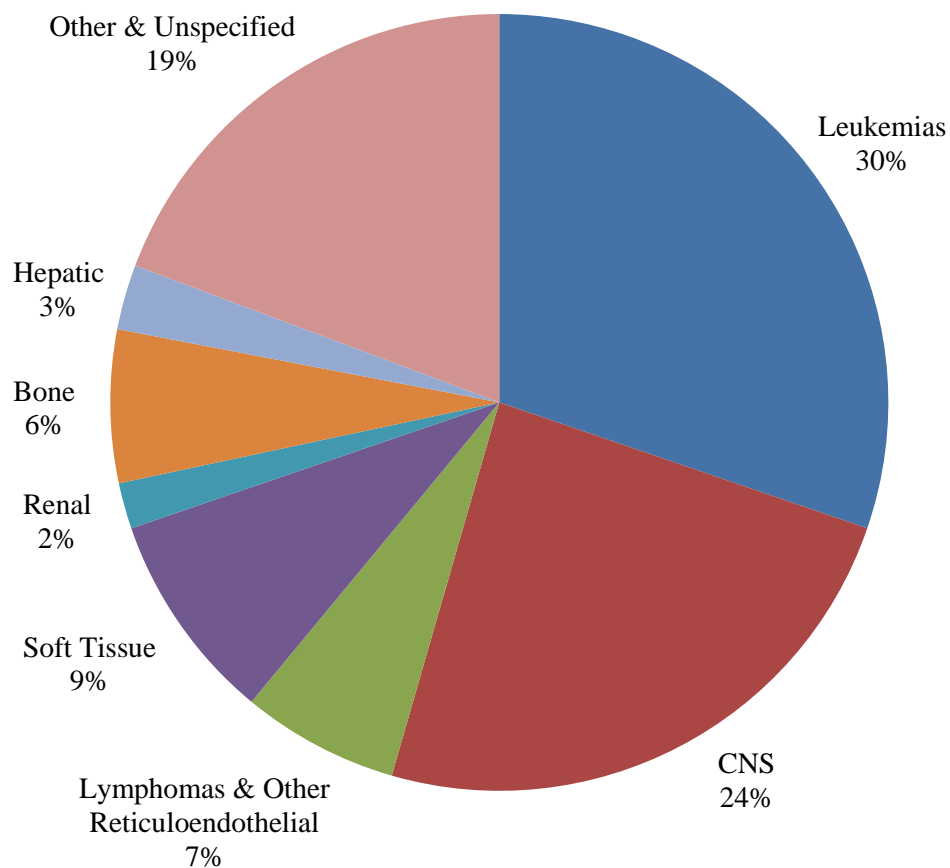
‡ United States Surveillance, Epidemiology, and End Results Program

Childhood Cancer Mortality

Childhood Cancer Mortality in Georgia

- Leukemia is the most common cause of childhood cancer deaths, accounting for 30% of all childhood cancer deaths in Georgia between 2001 and 2011* (*Figure 4*).
- Central nervous system (CNS) neoplasms are second, responsible for 24% of all childhood cancer deaths.
- Between 2001 and 2011*, there were 628 cancer deaths among Georgia's children aged 0 to 19 years. The age-adjusted rate for this time period was 23.7 per million (*Table 6*).
- The highest cancer mortality rate among children aged 0 to 19 years was for leukemia (7.2 per million), followed by CNS neoplasms with a rate of 5.8 per million.
- Overall, males had a higher cancer mortality rate than females. This difference was most apparent for lymphomas, soft tissue sarcomas, and bone cancers.
- Cancer mortality was highest among children in the 15 to 19 year old age group (*Table 7*).
- In the younger age groups, leukemias and CNS tumors account for the majority of childhood cancer deaths. As age progresses, other types of cancers begin to claim more children's lives, but leukemia and CNS tumors remain the most common causes of cancer death throughout childhood.

Figure 4. Childhood Cancer Mortality, Ages 0 to 19 Years, Georgia, 2001-2011*



* Because of data quality issues, 2009 cancer death data are not used for analysis. This report includes data for 2001-2008 and 2010-2011 combined.

Table 6. Age-Adjusted Childhood Cancer Mortality Rates*, Ages 0 to 19 Years, Georgia, 2001-2011†

	<u>Both Sexes</u>		<u>Males</u>		<u>Females</u>	
	Deaths	Rate per Million	Deaths	Rate per Million	Deaths	Rate per Million
All Types	628	23.7	335	24.8	293	22.6
Leukemias	190	7.2	95	7.1	95	7.3
CNS	152	5.8	79	5.9	73	5.6
Lymphomas & Other Reticuloendothelial	41	1.6	24	1.8	17	1.3
Soft Tissue	55	2.1	32	2.3	23	1.8
Renal	12	~	<5	~	***	~
Bone	40	1.5	28	2.1	12	~
Hepatic	17	0.6	***	~	***	~
Other & Unspecified	121	4.5	66	4.7	55	4.2

* Average annual rate per million, age-adjusted to the 2000 US standard million population

† Because of data quality issues, 2009 cancer death data are not used for analysis. This report includes data for 2001-2008 and 2010-2011 combined.

~ Rates are not calculated where the count is less than sixteen.

*** Counts less than five and those that allow calculation of counts less than five are concealed for confidentiality purposes.

Table 7. Age-Specific Childhood Cancer Mortality Rates*, Ages 0 to 19 Years, Georgia, 2001-2011†

	<u>Ages 0 to 4</u>		<u>Ages 5 to 9</u>		<u>Ages 10 to 14</u>		<u>Ages 15 to 19</u>	
	Deaths	Rate per Million	Deaths	Rate per Million	Deaths	Rate per Million	Deaths	Rate per Million
All Types	147	22.1	145	22.5	122	18.3	214	32.3
Leukemias	39	5.9	43	6.7	40	6.0	68	10.3
CNS	39	5.9	50	7.8	30	4.5	33	5.0
Lymphomas & Other Reticuloendothelial	<5	~	<5	~	12	~	26	3.9
Soft Tissue	10	~	12	~	5	~	28	4.2
Renal	<5	~	6	~	<5	~	<5	~
Bone	<5	~	<5	~	11	~	26	3.9
Hepatic	7	~	<5	~	<5	~	<5	~
Other & Unspecified	48	7.2	28	4.3	17	2.6	28	4.2

* Average annual rate per million

† Because of data quality issues, 2009 cancer death data are not used for analysis. This report includes data for 2001-2008 and 2010-2011 combined.

~ Rates are not calculated where the count is less than sixteen.

Childhood Cancer Mortality Rates by Georgia Public Health District

Table 8. Age-Adjusted Childhood Cancer Mortality Rates* by Health District, Ages 0 to 19 Years, Georgia, 2001-2011†

- Among the Georgia Public Health Districts, childhood cancer mortality rates ranged from 19.5 per million to 32.5 per million (*Table 8*).
- No health district had a mortality rate significantly higher or lower than the state rate.
- A rate was not calculated for Health District 5-1 because there were fewer than sixteen deaths.
- See Appendix C for a list of counties included in each Health District.

Georgia Rate = 23.7

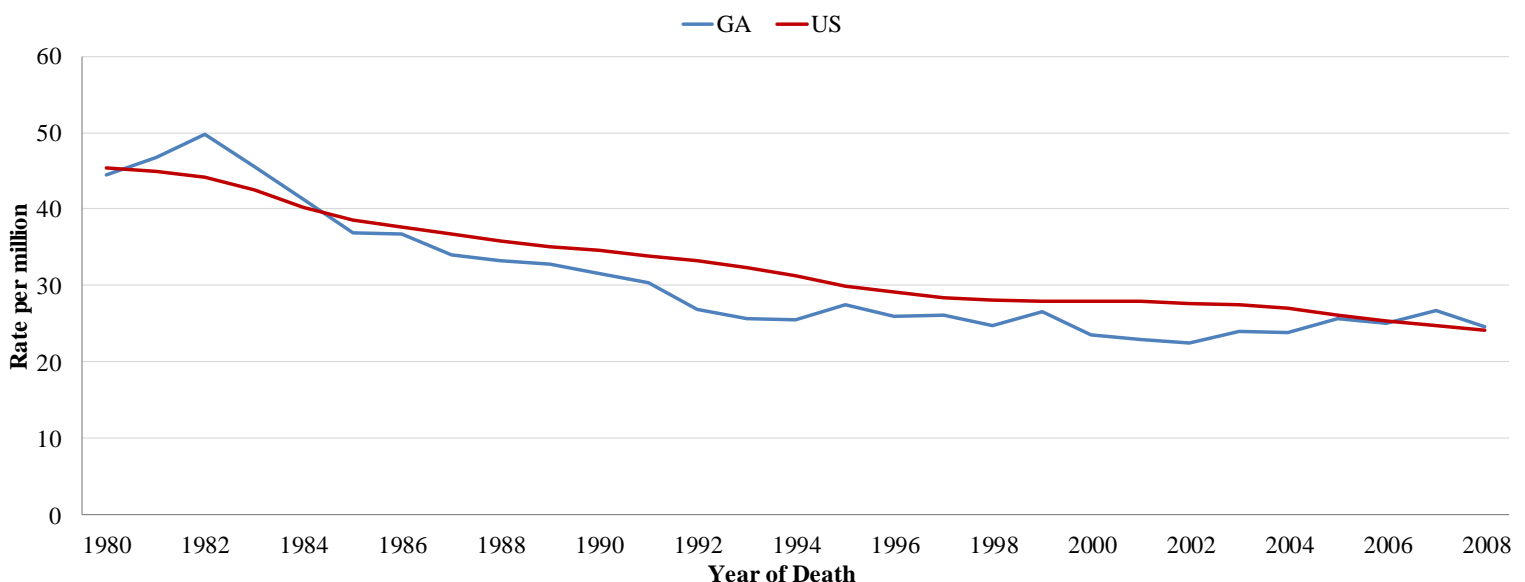
Health District	Rate per Million	Health District	Rate per Million
1.1 Northwest	28.7	5.1 South Central	~
1.2 North Georgia	20.4	5.2 North Central	27.8
2.0 North	22.4	6.0 East Central	26.4
3.1 Cobb-Douglas	24.1	7.0 West Central	27.7
3.2 Fulton	19.5	8.1 South	30.7
3.3 Clayton	21.9	8.2 Southwest	24.2
3.4 East Metro	20.4	9.1 Coastal	25.5
3.5 DeKalb	31.1	9.2 Southeast	32.5
4.0 LaGrange	24.6	10.0 Northeast	25.5

- * Average annual rate per million, age-adjusted to the 2000 US standard million population
- † Because of data quality issues, 2009 cancer death data are not used for analysis. This report includes data for 2001-2008 and 2010-2011 combined.
- ~ Rates are not calculated where the count is less than sixteen.

Trends in Childhood Cancer Mortality in Georgia

In Georgia, mortality rates for all childhood cancers combined decreased at an average rate of about 4.6% per year from 1980 to 1994 (*Figure 5*). Since 1994, cancer mortality rates have remained fairly steady among Georgia children. Nationally, childhood cancer mortality rates have been steadily decreasing by about 2.2% per year since 1980. This decrease results from improvements in survival for most childhood cancers, especially leukemia and lymphoma. The availability of newer, more effective chemotherapy treatments is the principal reason for improved survival among childhood cancer patients.

Figure 5. Childhood Cancer Mortality Rates*, All Types, Ages 0 to 19 Years, Georgia, 1980-2008



* Rolling 3-year average rate per million, age-adjusted to the 2000 US standard million population

Please note: Implementation of ICD-10 occurred in 1999. The comparability ratio for malignant neoplasms is 1.0068. No adjustments were made to the data to take this into account.

Childhood Cancer Survival

- Overall, Georgia childhood cancer survival rates were similar to U.S. SEER survival rates for cancers diagnosed between 2004 and 2010 (*Table 9*). Georgia children diagnosed with hepatic tumors fared 26 percent worse than U.S. children. Georgia males with sympathetic nervous system tumors fared 11 percent better than U.S. males. Georgia males with renal tumors fared 10 percent better than U.S. males.
- Overall survival among females was better than that for males, but this varied by cancer type.
- In Georgia, children with retinoblastoma had the highest survival rate (96.4 percent), while children with hepatic tumors had the lowest (51.8 percent).

Table 9. Five-Year Relative Childhood Cancer Survival Rates, Ages 0 to 19 Years, Georgia and U.S. SEER*, 2004-2010

	<u>State of Georgia</u>			<u>U.S. SEER</u>		
	Total	Males	Females	Total	Males	Females
All Types	82.0	81.7	82.3	82.5	81.7	83.6
I - Leukemias, Myeloproliferative & Myelodysplastic Diseases	80.8	80.6	81.1	82.2	81.7	82.8
II - Lymphomas & Reticuloendothelial Neoplasms	88.9	89.4	87.8	91.8	91.6	92.0
III - CNS & Miscellaneous Intracranial & Intraspinial Neoplasms†	72.4	71.4	73.5	73.2	73.4	73.1
IV - Neuroblastoma & Other Peripheral Nervous Cell Tumors	82.8	85.6	77.8	78.6	77.2	80.0
V - Retinoblastomas	96.4	97.3	95.5	96.5	96.0	96.9
VI - Renal Tumors	93.0	97.1	89.7	88.7	88.0	89.4
VII - Hepatic Tumors	51.8	67.9	~	69.9	70.4	68.5
VIII - Malignant Bone Tumors	70.4	67.3	74.9	69.5	67.7	71.9
IX - Soft Tissue & Other Extrasosseous Sarcomas	73.0	72.5	72.8	71.3	70.6	72.1
X - Germ Cell & Trophoblastic Tumors & Neoplasms of Gonads	94.1	95.6	92.5	92.3	92.1	92.6

Childhood Leukemia

What is it?

Leukemia is a cancer of the blood-forming cells.² Most often, it involves the white blood cells, but it can involve other blood cell types as well. Leukemia starts in the bone marrow and then spreads to the blood. From there it can go to the lymph nodes, spleen, liver, central nervous system, or other organs.

In the United States, leukemia is the most common cancer in children and adolescents, accounting for nearly 1 out of 3 cancers in children under age twenty. Thanks to advances in therapy, five-year survival rates have greatly increased over time. Prognosis depends on the specific type of leukemia and other factors such as age, white blood cell count, sex, race, genetics, and response to treatment.

Types of Childhood Leukemia

Leukemia can be classified as either fast growing (acute), or slower growing (chronic). Almost all leukemia in children is acute. Acute leukemia is divided into 2 types:

About 3 out of 4 childhood leukemias are acute lymphocytic leukemia (ALL). U.S. five-year relative survival for children with ALL is 87%. Acute myelogenous leukemia (AML) represents most of the remaining leukemias in children. U.S. five-year relative survival for children with AML is 62%.

Risk Factors and Prevention

The exact cause of most cases of leukemia is not known, but doctors have found that this cancer is linked to a number of risk factors.

Certain genetic diseases that cause children to be born with an abnormal immune system and other genetic conditions such as Li-Fraumeni syndrome, Down syndrome, and Klinefelter syndrome carry an increased risk of leukemia.

If an identical twin develops childhood leukemia, the other twin has about a 1 in 5 chance of getting leukemia as well. This risk is even higher if the leukemia develops in the first year of life. Twins who are not identical and other brothers and sisters have a slightly increased risk.

Exposure to high levels of radiation is another known risk factor for childhood leukemia. Children and adults who were treated with radiation therapy or chemotherapy for other cancers are at slightly increased risk for developing a second cancer, usually AML, later in life. Patients who are taking drugs to suppress their immune systems (mainly organ transplant patients) are also at increased risk for leukemia.

It is important to remember that most children with leukemia do not have any known risk factors, and there is no known way to prevent most cases.

Leukemia Incidence in Georgia Children

- Leukemia ranks first among cancer diagnoses for children ages 0 to 19 years in Georgia, accounting for 26% of all malignant childhood cancer incidence (*Figure 2*).
- Between 2002 and 2011, there was an average of 110 cases per year of leukemia in children. The age-adjusted rate was 40.1 per million. This is significantly lower than the U.S. SEER rate of 48.2 per million (*Appendix D*).
- Males were 6% more likely than females to be diagnosed with leukemia (*Table 3*).
- The highest rates were among children under age five years (*Table 4*).
- The five-year relative survival rate for children diagnosed with leukemia between 2004 and 2010 was 80.8% (*Table 9*).

Leukemia Mortality in Georgia Children

- Leukemia ranks first among cancer deaths for children ages 0 to 19 years in Georgia, accounting for 30% of all childhood cancer mortality (*Figure 4*).
- Between 2001 and 2011*, there was an average of 19 deaths per year from leukemia among children. The age-adjusted rate was 7.2 per million (*Table 6*).
- Males were 10% more likely than females to die from leukemia (*Table 6*).
- The highest rates were among children between ages 15 and 19 years (*Table 7*).

² *Childhood Leukemia*. (2014). Retrieved September 4, 2014 from <http://www.cancer.org/cancer/leukemiaainchildren/detailedguide/index>

* Death data are for 2001-2008 and 2010-2011 combined.

Central Nervous System Cancer in Children

What is it?

The central nervous system (CNS) includes the brain and spinal cord.³ Both malignant and benign CNS tumors are capable of causing damage that is often disabling and sometimes fatal. The major distinction is how readily they spread and whether they can be removed and not come back. About 71% of childhood CNS tumors are malignant. Although the Georgia Comprehensive Cancer Registry started collecting data on benign CNS tumors in 2004, the current report discusses only malignant tumors.

CNS tumors are the second largest category of cancer in children, constituting about 17% of all cancers in U.S. children under the age of twenty. Survival for children with CNS cancer is poorest among infants but improves with age. U.S. five-year relative survival rates have improved over time to 73%.

Types of CNS Cancer

The brain consists of various kinds of tissues and cells. Different types of tumors can start in these diverse tissue and cell types. All of these tumors have varying outlooks for survival and may be treated differently.

About half of all CNS cancers start in cells called astrocytes and are called astrocytomas. Most can spread widely throughout normal brain tissue, making them very hard to remove by surgery. Some special types of low-grade tumors called non-infiltrating astrocytomas have a good prognosis.

Oligodendrogliomas spread or infiltrate in a manner similar to astrocytomas and, in most cases, cannot be completely removed by surgery. Only about 3% of CNS cancers in children are oligodendrogliomas.

About 8% of CNS cancers in children are ependymomas. These tumors start in the cells that line the spinal canal. Ependymomas do not spread outside the brain or spinal cord, nor do they infiltrate normal brain tissue. As a result, some (but not all) of these tumors can be removed and cured by surgery.

Medulloblastomas tend to grow quickly and spread throughout the spinal canal and meninges. They account for about 13% of childhood CNS cancers and can often be treated effectively.

Risk Factors and Prevention

Few risk factors for CNS cancer have been found and there is no clear cause for most CNS tumors. The only established environmental risk factor for brain tumors is ionizing radiation, usually given for the treatment of other cancers.

Rare cases of brain and spinal cord tumors run in families. In general, persons with familial tumor syndromes have multiple tumors that occur when they are young. These syndromes include Von Hippel-Lindau disease, neurofibromatosis, tuberous sclerosis, and Li-Fraumeni syndrome.

CNS Cancer Incidence in Georgia Children

- CNS cancer ranks second among cancer diagnoses for children ages 0 to 19 years in Georgia, accounting for 18% of all malignant childhood cancer incidence (*Figure 2*).
- Between 2002 and 2011, there was an average of 79 cases per year of malignant CNS cancer in children. The age-adjusted rate was 29.4 per million. This is similar to the U.S. SEER rate of 29.7 per million (*Appendix D*).
- Males were about as likely as females to be diagnosed with malignant CNS cancer (*Table 3*).
- The highest rates were among children under age 5 years (*Table 4*).
- The five-year relative survival rate for children diagnosed with malignant CNS cancer between 2004 and 2010 was 72.4% (*Table 9*).

CNS Cancer Mortality in Georgia Children

- CNS cancer ranks second among cancer deaths for children ages 0 to 19 years in Georgia, accounting for 24% of all childhood cancer mortality (*Figure 4*).
- Between 2001 and 2011*, there was an average of 15 deaths per year from CNS cancer among children. The age-adjusted rate was 5.8 per million (*Table 6*).
- Males were about 5% more likely than females to die from CNS cancer (*Table 6*).
- The highest rates were among children between ages 5 and 9 years (*Table 7*).

³ *Brain and Spinal Cord Tumors in Children*. (2014). Retrieved September 4, 2014 from <http://www.cancer.org/cancer/braincnstumorinchildren/detailedguide/index>

* Death data are for 2001-2008 and 2010-2011 combined.

Childhood Lymphoma

What is it?

Lymphoma is a cancer that starts in lymph tissue and is divided into two main types: Hodgkin lymphoma and non-Hodgkin lymphoma (NHL).⁴ Non-Hodgkin lymphoma differs significantly from Hodgkin lymphoma in behavior, pathology, spread, and responsiveness to treatment.

Hodgkin lymphoma accounts for about 7% of childhood cancers. It is rare among young children and becomes more common among teens and young adults. The U.S. five-year relative survival rate is 96%.

NHL makes up about 6% of childhood cancers. It is more likely to occur in younger children than is Hodgkin lymphoma, but it is still rare in children younger than 3. The U.S. five-year relative survival rate is 86%.

Types of Childhood NHL

Precursor cell lymphomas (also called lymphoblastic lymphomas) account for 22% of NHL in Georgia's children. It is most common among children ages 5 to 9 years old, and boys are affected twice as often as girls. It can grow very rapidly and often interferes with breathing, so it needs to be diagnosed and treated quickly.

Burkitt lymphoma accounts for 23% of childhood NHL in Georgia. It is most often seen in boys around the age of 5 to 10 years old. Burkitt lymphoma nearly always starts in the abdomen and is one of the fastest growing cancers known. It may spread to other organs including the brain and must be treated quickly.

Mature cell lymphomas (also called large cell lymphomas) account for 48% of all NHL in Georgia's children. It occurs most often among children between ages 15 and 19 years, and boys are about 50% more likely than girls to be diagnosed. Unlike the other types, it seldom spreads to the bone marrow or brain, nor does it grow as quickly.

Risk Factors and Prevention

The exact cause of lymphoma is not known. Researchers have found that this cancer is associated with a number of other conditions, but most children with lymphoma do not have any known risk factors.

Epstein-Barr virus (EBV) infection is associated with an increased risk for some lymphomas, but its role is unclear. Immunodeficiency due to HIV infection, organ transplant, or congenital syndromes has also been associated with an increased risk. Boys are affected more often than girls.

Lymphoma Incidence in Georgia Children

- Lymphoma ranks third among cancer diagnoses for children ages 0 to 19 years in Georgia, accounting for 15% of all malignant childhood cancer incidence (*Figure 2*).
- Between 2002 and 2011, there was an average of 63 cases per year of lymphoma in children. The age-adjusted rate was 23.7 per million. This is significantly lower than the U.S. SEER rate of 25.0 per million (*Appendix D*).
- Males were 50% more likely than females to be diagnosed with lymphoma (*Table 3*).
- The highest rates were among children between ages 15 and 19 years (*Table 4*).
- The five-year relative survival rate for children diagnosed with lymphoma between 2004 and 2010 was 88.9% (*Table 9*).

Lymphoma Mortality in Georgia Children

- Lymphoma ranks fourth among cancer deaths for children ages 0 to 19 years in Georgia, accounting for 7% of all childhood cancer mortality (*Figure 4*).
- Between 2001 and 2011*, there was an average of 4 deaths per year from lymphoma among children. The age-adjusted rate was 1.6 per million (*Table 6*).
- Males were 38% more likely than females to die from lymphoma (*Table 6*).
- The greatest number of deaths was among children between ages 15 and 19 years (*Table 7*).

⁴ *Non-Hodgkin Lymphoma in Children*. (2014). Retrieved September 4, 2014 from <http://www.cancer.org/cancer/non-hodgkinlymphomainchildren/detailedguide/index>

* Death data are for 2001-2008 and 2010-2011 combined.

Soft Tissue Sarcoma in Children

What is it?

Sarcomas are cancers that develop from connective tissues in the body, such as muscles, fat, membranes that line the joints, or blood vessels.⁵ Rhabdomyosarcoma, the most common soft tissue sarcoma in children, is a cancer made up of cells that normally develop into skeletal muscles of the body.

Most rhabdomyosarcomas are diagnosed in children and teens. More than half of all rhabdomyosarcomas are diagnosed in children younger than 10 years old.

The exact prognosis for each child with rhabdomyosarcoma depends on many factors. The U.S. five-year survival rate is 66%. The rate varies somewhat based on tumor location, stage, and the age of the child (with children aged 1 to 9 years tending to do better than older or younger children).

Types of Rhabdomyosarcoma

The most common type of rhabdomyosarcoma is embryonal rhabdomyosarcomas (ERMS). These cancers generally occur in the head and neck area or in the genital and urinary tracts. They usually affect infants and young children.

The second main type, alveolar rhabdomyosarcoma (ARMS) affects all age groups and is found more often in the large muscles of the arms, legs, or trunk.

Risk Factors and Prevention

Rhabdomyosarcoma is unlike most adult cancers in that there are no known environmental or lifestyle risk factors associated with it. However, there is evidence of an increased risk for rhabdomyosarcoma from genetic disorders including Li-Fraumeni syndrome, Beckwith-Wiedemann syndrome, neurofibromatosis, Costello syndrome, and Noonan syndrome.

Because no avoidable or modifiable risk factors have yet been found, there is no known way to prevent rhabdomyosarcoma.

Soft Tissue Sarcoma Incidence in Georgia Children

- Soft tissue sarcoma ranks fifth among cancer diagnoses for children ages 0 to 19 years in Georgia, accounting for 8% of all malignant childhood cancer incidence (*Figure 2*).
- Between 2002 and 2011, there was an average of 35 cases per year of soft tissue sarcoma in children. The age-adjusted rate was 13.0 per million. This is significantly higher than the U.S. SEER rate of 12.3 per million (*Appendix D*).
- Males were 18% more likely than females to be diagnosed with soft tissue sarcoma (*Table 3*).
- The highest rates were among children between ages 15 and 19 years (*Table 4*).
- The five-year relative survival rate for children diagnosed with soft tissue sarcoma between 2004 and 2010 was 73.0% (*Table 9*).

Soft Tissue Sarcoma Mortality in Georgia Children

- Soft tissue sarcoma ranks third among cancer deaths for children ages 0 to 19 years in Georgia, accounting for 9% of all childhood cancer mortality (*Figure 4*).
- Between 2001 and 2011*, there was an average of 6 deaths per year from soft tissue sarcoma among children. The age-adjusted rate was 2.1 per million (*Table 6*).
- Males were 28% more likely than females to die from soft tissue sarcoma (*Table 6*).
- The greatest number of deaths was among children between ages 15 and 19 years (*Table 7*).

⁵ *Rhabdomyosarcoma*. (2014). Retrieved September 4, 2014 from <http://www.cancer.org/cancer/rhabdomyosarcoma/detailedguide/index>

* Death data are for 2001-2008 and 2010-2011 combined.

Neuroblastoma in Children

What is it?

Neuroblastoma is a form of cancer that occurs in infants and young children.⁶ It is rarely found in children older than 10 years. These tumors start in early nerve cells (neuroblasts) of the sympathetic nervous system, so they can be found anywhere along this system.

A little more than a third of neuroblastomas start in the adrenal glands. About one fourth begin in sympathetic nerve ganglia in the abdomen. Most of the rest start in sympathetic ganglia near the spine in the chest or neck, or in the pelvis.

Neuroblastoma accounts for about 4% of all cancers in children. It is the most common cancer in infants less than one year old. Nearly 90% of cases are diagnosed by age five and it is extremely rare in people over the age of ten. The U.S. five-year survival rate is 77%. Prognosis depends on how far the tumor has spread, the age of the child, tumor grade (how it looks under a microscope), and other laboratory tests.

Ganglioneuromas and Ganglioneuroblastomas

Ganglioneuromas are benign tumors composed of mature ganglion and nerve sheaths that do not continue to grow. They are usually removed by surgery and carefully examined under a microscope to be certain they do not have areas of malignancy.

Ganglioneuroblastoma is a tumor that has both malignant and benign parts. It contains neuroblasts that can grow and spread abnormally, as well as areas of benign tissue that are similar to ganglioneuroma.

Risk Factors and Prevention

Neuroblastomas have not been associated with any environmental or lifestyle risk factors. There is evidence suggesting that rarely, certain people may inherit an increased risk of developing neuroblastoma. Familial cases differ from sporadic cases in age of onset and patterns of spread.

Because there are no avoidable risk factors for neuroblastoma, there is no proven way to prevent this cancer. If there is a family history of neuroblastoma, genetic counseling may be considered.

Peripheral Nerve Cell Cancer Incidence in Georgia Children

- Peripheral nerve cell cancer ranks seventh among cancer diagnoses for children ages 0 to 19 years in Georgia, accounting for 5% of all malignant childhood cancer incidence (*Figure 2*).
- Between 2002 and 2011, there was an average of 22 cases per year of peripheral nerve cell cancer in children. The age-adjusted rate was 7.5 per million. This is lower than the U.S. SEER rate of 8.0 per million, but this difference is not significant (*Appendix D*).
- Males were 31% more likely than females to be diagnosed with peripheral nerve cell cancer (*Table 3*).
- The majority of cases occurred among children under age five years (*Table 4*).
- The five-year relative survival rate for children diagnosed with peripheral nerve cell cancer between 2004 and 2010 was 82.8% (*Table 9*).

Peripheral Nerve Cell Cancer Mortality in Georgia Children

- Due to ICD coding limitations, we were unable to produce mortality rates for peripheral nerve cell cancer.

⁶ *Neuroblastoma*. (2014). Retrieved September 4, 2014 from <http://www.cancer.org/cancer/neuroblastoma/detailedguide/index>

Bone Cancer in Children

What is it?

Osteosarcoma is the most common type of cancer that starts in the bone.⁷ Most osteosarcomas occur in children and young adults. Teenagers are the most commonly affected age group, but osteosarcoma can occur at any age. It usually develops in areas where the bone is growing quickly, such as near the ends of the long bones, especially around the knee and sometimes the shoulder. The U.S. five-year relative survival rate is about 66%, depending on whether the tumor has spread and how it responds to treatment.

The Ewing family of tumors (EFT) accounts for about 2% of all childhood cancers.⁸ EFT is a group of cancers that start in the bones or nearby soft tissue that share some common features. They can occur at any age, but these tumors are most common in early teenage years. U.S. five-year survival is 69%.

Risk Factors and Prevention

The exact cause of most osteosarcomas is not known. The risk of osteosarcoma is highest during the teenage “growth spurt”, suggesting a relationship between rapid bone growth and risk of tumor formation. People who were treated with radiation, especially at a young age, for another cancer have a higher risk of later developing osteosarcoma. Certain non-cancerous bone diseases, such as Paget disease of the bone and hereditary multiple osteochondromas, increase the risk for developing osteosarcoma. Also at an increased risk are children with retinoblastoma, Li-Fraumeni syndrome, or Rothmund-Thomson syndrome.

Studies of children with EFT have not found risk factors linked to radiation, chemicals, or any other environmental exposures. Nor is EFT passed along within families. Scientists have found few factors related to the risk of developing EFT. EFT occurs most often in the white population and is rare among African Americans and Asian Americans. The reason is not known.

Bone Cancer Incidence in Georgia Children

- Bone cancer ranks eighth among cancer diagnoses for children ages 0 to 19 years in Georgia, accounting for 5% of all malignant childhood cancer incidence (*Figure 2*).
- Between 2002 and 2011, there was an average of 21 cases per year of bone cancer in children. The age-adjusted rate was 8.1 per million. This is significantly lower than the U.S. SEER rate of 8.9 per million (*Appendix D*).
- Males were 27% more likely than females to be diagnosed with bone cancer (*Table 3*).
- The highest rates were among children between ages 15 and 19 years (*Table 4*).
- The five-year relative survival rate for children diagnosed with bone cancer between 2004 and 2010 was 70.4% (*Table 9*).

Bone Cancer Mortality in Georgia Children

- Bone cancer ranks fifth among cancer deaths for children ages 0 to 19 years in Georgia, accounting for 6% of all childhood cancer mortality (*Figure 4*).
- Between 2001 and 2011*, there was an average of 4 deaths per year from bone cancer among children. The age-adjusted rate was 1.5 per million (*Table 6*).
- Males were more likely than females to die from bone cancer (*Table 6*).
- The greatest number of deaths was among children between ages 15 and 19 years (*Table 7*).

⁷ *Osteosarcoma*. (2014). Retrieved September 4, 2014 from <http://www.cancer.org/cancer/osteosarcoma/detailedguide/index>

⁸ *Ewing Family of Tumors*. (2014). Retrieved September 4, 2014 from <http://www.cancer.org/cancer/ewingfamilyoftumors/detailedguide/index>

* Death data are for 2001-2008 and 2010-2011 combined.

Renal Cancer in Children

What is it?

Wilms tumor (also called nephroblastoma) is the most common type of renal (kidney) cancer in children.⁹ About 9 of 10 kidney tumors that occur in children are Wilms tumors. The average age at diagnosis is about 3 to 4 years. It becomes less common as children grow older and is uncommon after age 6. The U.S. five-year relative survival rate for children with renal cancer is 91%.

Types of Wilms Tumor

Wilms tumors are classified into two major types depending on how they look under the microscope. These two categories differ in prognosis and treatment.

Wilms tumors of unfavorable appearance contain anaplasia, characterized by the presence of large, irregular nuclei in the tumor's cells. The more anaplasia, the less the chance for a cure.

Wilms tumors of favorable appearance do not contain anaplasia. Patients with these tumors usually have a much better outlook for cure. More than nine of ten Wilms tumors have a favorable appearance.

Risk Factors and Prevention

So far research has not found any strong links between Wilms tumor and environmental factors, either during a mother's pregnancy or after a child's birth. A small number of children with Wilms tumor have a relative with the same cancer. There is a strong link between Wilms tumors and certain kinds of birth defects. But most children with Wilms tumors do not have any known gene changes or birth defects.

Renal Cancer Incidence in Georgia Children

- Renal cancer ranks ninth among cancer diagnoses for children ages 0 to 19 years in Georgia, accounting for 5% of all malignant childhood cancer incidence (*Figure 2*).
- Between 2002 and 2011, there was an average of 20 cases per year of renal cancer in children. The age-adjusted rate was 7.0 per million. This is significantly higher than the U.S. SEER rate of 6.4 per million (*Appendix D*).
- Males were 13% less likely than females to be diagnosed with renal cancer (*Table 3*).
- The highest rates were among children under age five years (*Table 4*).
- The five-year relative survival rate for children diagnosed with renal cancer between 2004 and 2010 was 93.0% (*Table 9*).

Renal Cancer Mortality in Georgia Children

- Renal cancer ranks eighth among cancer deaths for children ages 0 to 19 years in Georgia, accounting for 2% of all childhood cancer mortality (*Figure 4*).
- Between 2001 and 2011*, there was an average of 1 death per year from renal cancer among children (*Table 6*).
- Females were more likely than males to die from renal cancer (*Table 6*).
- The greatest number of deaths was among children between ages 5 and 9 years (*Table 7*).

⁹ *Wilms Tumor*. (2014). Retrieved September 4, 2014 from <http://www.cancer.org/cancer/wilmstumor/detailedguide/index>

* Death data are for 2001-2008 and 2010-2011 combined.

Conclusions

Childhood cancers are uncommon but they remain an important public health issue. The information in this report summarizes current incidence and mortality rates for childhood cancers in Georgia. It also provides short summaries about what is known about the more common types of childhood cancers. The information will be useful to many individuals concerned about cancer such as public health workers, health care providers, volunteer workers and groups, and families and friends of children with cancer. The report also calls attention to needed actions.

To reduce the incidence and mortality from childhood cancers, several steps are being taken:

Search for causes so that childhood cancer can be prevented. The cause or causes of most childhood cancers are unknown, making preventive actions impossible. The search for causes is difficult because the cancers are rare. However, more research needs to be conducted on childhood cancers in Georgia so that we may shed light on the causes of childhood cancer.

Assure that every child with cancer in Georgia has access to the best treatment. In recent decades, the treatment of childhood cancers has improved

markedly. Presently more than 80% of children with cancer survive 5 years or more. Much of this dramatic improvement is due to the development of improved therapies at children's cancer centers, where the majority of children with cancer have their treatment.

Improve the quality of information about childhood cancer in Georgia. In 2002, when this report was first published, accurate and reliable information about childhood cancer in Georgia was available for only 26 counties. The quality of information reported by hospitals and other cancer care providers to the Georgia Cancer Registry has improved so that we now have accurate and reliable information about childhood cancer for the entire state. Efforts to achieve accurate and reliable information are ongoing and the quantity of available data continues to improve over time.

Thus, by participating in the search for causes, by assuring access to appropriate treatment, and by improving the quality of information contained in the Georgia Cancer Registry, Georgians will be participating in efforts to reduce the burden of childhood cancers, a group of uncommon but devastating illnesses.

Technical Notes

Definitions:

Age-adjusted rate: A rate calculated in a manner that allows for the comparison of rates derived from populations with different age structures.

Cancer incidence: The number of new cancer cases occurring in a population during a specified period of time. For childhood cancer, this is expressed as a rate per million population.

Cancer mortality: The number of cancer deaths occurring in a population during a specified period of time. For childhood cancer, this is expressed as a rate per million population.

Relative survival rate: A net survival measure representing cancer survival in the absence of other causes of death.

Data Sources:

The number of deaths and mortality rates for the state of Georgia for 2001-2008, 2010, and 2011 were obtained from the Georgia Department of Public Health, Office of Vital Records. Mortality data were coded using ICD-10 codes. A list of the cancer groupings used for this publication can be found in Appendix B.

The number of new cases and incidence rates for the state of Georgia for 2002-2011 were obtained from the Georgia Department of Public Health, Division of Health Protection, Epidemiology Program, Georgia Comprehensive Cancer Registry. Incidence data were coded using ICD-O-3 codes. The International Classification of Childhood Cancer (ICCC) site recode ICD-O-3/WHO 2008 groupings were used. For more information on this classification scheme, please visit the Surveillance, Epidemiology, and End Results (SEER) Program on the web at <http://seer.cancer.gov/iccc/>.

Childhood cancer incidence trend and survival data for Georgia and the United States were obtained from the SEER Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2013 Sub (2000-2011) <Katrina/Rita Population Adjustment> - Linked To County Attributes - Total U.S., 1969-2012 Counties, National Cancer Institute, DCCPS, Surveillance

Research Program, Surveillance Systems Branch, released April 2014 (updated 5/7/2014), based on the November 2013 submission. Incidence and survival data were categorized using the ICCC site recode ICD-O-3/WHO 2008.

Childhood cancer mortality trend data for Georgia and the United States were obtained from the SEER Program (www.seer.cancer.gov) SEER*Stat Database: Mortality - All COD, Aggregated With State, Total U.S. (1969-2011) <Katrina/Rita Population Adjustment>, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released July 2014. Underlying mortality data provided by NCHS (www.cdc.gov/nchs). Cause of death was categorized using the cause of death recode. All malignant cancers were included.

Population estimates for 2001-2011 and the 2000 US standard million population were obtained from the US Bureau of the Census, available at <http://www.census.gov/>.

Methods:

Incidence rates were calculated per million population and age-adjusted by the direct method to the 2000 US standard million population. Except where calculated to show trends, the incidence rates are ten-year average annual rates for the period 2002 through 2011.

Mortality rates were calculated per million population and age-adjusted by the direct method to the 2000 US standard million population. Because of data quality issues, 2009 cancer death data are not used for analysis. Except where calculated to show trends, the mortality rates are ten-year average annual rates including data for 2001-2008, 2010, and 2011 combined.

Mortality trends were calculated using 3 year rolling averages allowing for greater stability in the point estimates produced. For a given calendar year (index year), the rates for the index year, the year prior to, and the following year were averaged together to produce the point estimate for the index year.

Appendix A

The Georgia Comprehensive Cancer Registry

The Georgia Comprehensive Cancer Registry (GCCR) is a statewide population-based cancer registry collecting all cancer cases diagnosed among Georgia residents since January 1, 1995. This information furthers our understanding of cancer and is used to develop strategies and policies for prevention, control, and treatment. The availability of this data at the state level allows health researchers to analyze geographic, racial, and other differences that provide clues that point to risk factors. This data also helps in determining where early detection, educational, or other programs should be directed.

The Georgia Department of Public Health has designated the Georgia Center for Cancer Statistics (GCCS) at the Rollins School of Public Health at Emory University as its agent for the purpose of collecting and editing Georgia cancer data.

GCCR is a participant in the National Program for Cancer Registries (NPCR) that was established by the Centers for Disease Control and Prevention (CDC) in 1992 through the Federal Cancer Registry Amendment Act (Public Law 102-515) and is also a participant in the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute. Both NPCR and SEER provide funding and guidance for the development of cancer registries throughout the United States. GCCR is also a member of the North American Association of Central Cancer Registries (NAACCR), which is a professional society that was established in 1987. NAACCR provides ongoing development of cancer registries and the establishment of registry standards.

GCCR Goals:

- To collect information on all newly diagnosed cancer cases.
- To calculate cancer incidence rates for the state of Georgia.
- To make data available to the public and health care professionals.
- To identify and evaluate cancer incidence and mortality trends and problems on an ongoing basis.
- To provide cancer incidence and mortality data to cancer control programs to assist them in developing strategies and evaluating their effectiveness.
- To stimulate cancer control research.

For more information, please visit us on the web at <http://dph.georgia.gov/georgia-comprehensive-cancer-registry>.

Appendix B

ICD-10 Codes for Childhood Cancer Mortality

All Sites	C00-C97
Leukemias	C90.1, C91-C95
CNS	C70-C72
Lymphomas & Other Reticuloendothelial Neoplasms	C81.0-C90.0, C90.2, C96
Soft Tissue, including heart	C38.0, C45.2, C46.1, C47, C49
Renal Tumors	C64-C65
Bone Tumors	C40-C41
Hepatic Tumors	C22
Other & Unspecified	C00-C21, C23-C37, C38.1-C39.9, C43.0-C45.1, C45.7-C46.0, C46.2-C46.9, C48, C50-C63 C66-C69, C73-C80, C97

ICD-O-3 Codes for Childhood Cancer Incidence

The International Classification of Childhood Cancer (ICCC) site recode ICD-O-3/WHO 2008 groupings were used. For more information on this classification scheme, please visit the Surveillance, Epidemiology, and End Results (SEER) Program on the web at <http://seer.cancer.gov/iccc/>.

Appendix C

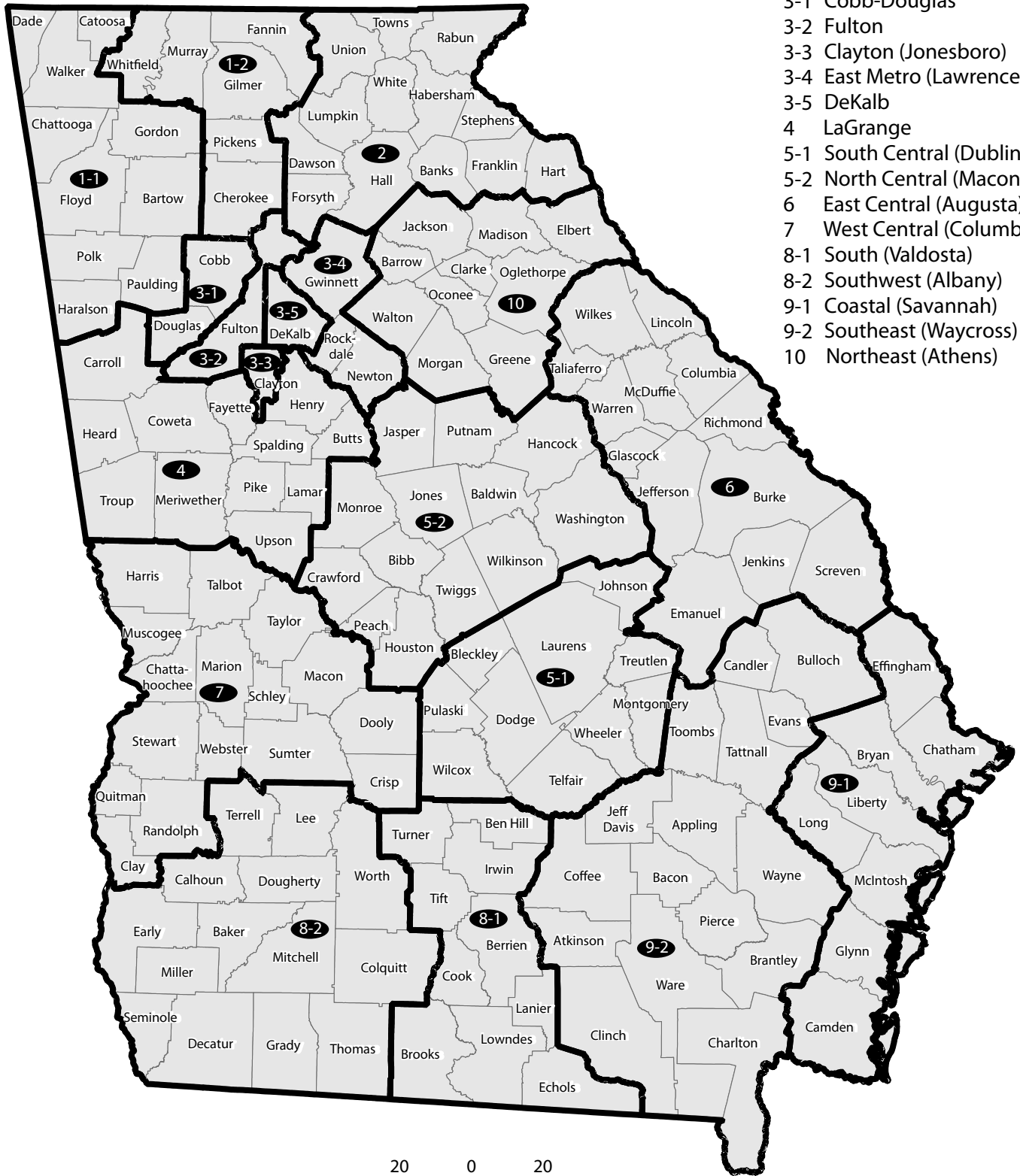
Georgia Public Health Districts


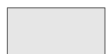
Health District	Counties
1-1 Northwest	Bartow, Catoosa, Chattooga, Dade, Floyd, Gordon, Haralson, Paulding, Polk, Walker
1-2 North Georgia	Cherokee, Fannin, Gilmer, Murray, Pickens, Whitfield
2 North	Banks, Dawson, Forsyth, Franklin, Habersham, Hall, Hart, Lumpkin, Rabun, Stephens, Towns, Union, White
3-1 Cobb-Douglas	Cobb, Douglas
3-2 Fulton	Fulton
3-3 Clayton	Clayton
3-4 East Metro	Gwinnett, Newton, Rockdale
3-5 DeKalb	DeKalb
4 LaGrange	Butts, Carroll, Coweta, Fayette, Heard, Henry, Lamar, Meriwether, Pike, Spalding, Troup, Upson
5-1 South Central	Bleckley, Dodge, Johnson, Laurens, Montgomery, Pulaski, Telfair, Treutlen, Wheeler, Wilcox
5-2 North Central	Baldwin, Bibb, Crawford, Hancock, Houston, Jasper, Jones, Monroe, Peach, Putnam, Twiggs, Washington, Wilkinson
6 East Central	Burke, Columbia, Emanuel, Glascock, Jefferson, Jenkins, Lincoln, McDuffie, Richmond, Screven, Taliaferro, Warren, Wilkes
7 West Central	Chattahoochee, Clay, Crisp, Dooley, Harris, Macon, Marion, Muscogee, Quitman, Randolph, Schley, Stewart, Sumter, Talbot, Taylor, Webster
8-1 South	Ben Hill, Berrien, Brooks, Cook, Echols, Irwin, Lanier, Lowndes, Tift, Turner
8-2 Southwest	Baker, Calhoun, Colquitt, Decatur, Dougherty, Early, Grady, Lee, Miller, Mitchell, Seminole, Terrell, Thomas, Worth
9-1 Coastal	Bryan, Camden, Chatham, Effingham, Glynn, Liberty, Long, McIntosh
9-2 Southeast	Appling, Atkinson, Bacon, Brantley, Bryan, Bulloch, Camden, Candler, Charlton, Clinch, Coffee, Evans, Glynn, Jeff Davis, Liberty, Long, McIntosh, Pierce, Tattnall, Toombs, Ware, Wayne
10 Northeast	Barrow, Clarke, Elbert, Greene, Jackson, Madison, Morgan, Oconee, Oglethorpe, Walton

GEORGIA

Public Health Districts

- 1-1 Northwest (Rome)
- 1-2 North Georgia (Dalton)
- 2 North (Gainesville)
- 3-1 Cobb-Douglas
- 3-2 Fulton
- 3-3 Clayton (Jonesboro)
- 3-4 East Metro (Lawrenceville)
- 3-5 DeKalb
- 4 LaGrange
- 5-1 South Central (Dublin)
- 5-2 North Central (Macon)
- 6 East Central (Augusta)
- 7 West Central (Columbus)
- 8-1 South (Valdosta)
- 8-2 Southwest (Albany)
- 9-1 Coastal (Savannah)
- 9-2 Southeast (Waycross)
- 10 Northeast (Athens)



 Health Districts
 Counties



Appendix D

Age-Adjusted Childhood Malignant Cancer Incidence Rates*†, Ages 0 to 19 Years, Georgia Versus U.S. SEER, 2002-2011

	Rate per Million	
	Georgia	U.S. SEER
All Types	158.5‡	173.3
I - Leukemias, Myeloproliferative & Myelodysplastic Diseases	40.1‡	48.2
ia - Lymphoid leukemia	27.6‡	35.1
ib - Acute myeloid leukemia	7.9‡	8.5
ic - Chronic myeloproliferative diseases	2.5‡	2.0
id - Myelodysplastic syndrome & other myeloproliferative diseases	1.1‡	1.5
ie - Unspecified and other specified leukemias	1.1	1.2
II - Lymphomas & Reticuloendothelial Neoplasms	23.7‡	25.0
iia - Hodgkin lymphoma	12.0	12.0
iib - Non-Hodgkin lymphoma (except Burkitt)	8.2	8.6
iic - Burkitt lymphoma	2.5	2.5
iid - Miscellaneous lymphoreticular neoplasms	0.8‡	1.6
iie - Unspecified lymphomas	~	0.3
III - Central Nervous System & Miscellaneous Intracranial & Intraspinial Neoplasms†	29.4	29.7
iiia - Ependymomas and choroid plexus tumor	2.4‡	2.7
iiib - Astrocytomas	15.1	14.7
iiic - Intracranial and intraspinal embryonal tumors	5.6‡	6.2
iiid - Other gliomas	5.5	5.2
iiie - Other specified intracranial and intraspinal neoplasms	~	0.6
iiif - Unspecified intracranial and intraspinal neoplasms	~	0.3
IV - Neuroblastoma & Other Peripheral Nervous Cell Tumors	7.5	8.0
V - Retinoblastomas	3.6‡	3.2
VI - Renal Tumors	7.0‡	6.4
via - Nephroblastoma and other nonepithelial renal tumors	6.3	5.9
vib - Renal carcinomas	~	0.5
vic - Unspecified malignant renal tumors	~	~
VII - Hepatic Tumors	1.7‡	2.3
viiia - Hepatoblastoma	1.2‡	1.7
viiib - Hepatic carcinomas	~	0.7
viiic - Unspecified malignant hepatic tumors	~	~
VIII - Malignant Bone Tumors	8.1‡	8.9
viiiia - Osteosarcomas	4.6‡	5.2
viiiib - Chondrosarcomas	~	0.4
viiiic - Ewing tumor and related sarcomas of bone	2.7	2.7
viiiid - Other specified malignant bone tumors	~	0.5
viiiie - Unspecified malignant bone tumors	~	0.2
IX - Soft Tissue & Other Extrasosseous Sarcomas	13.0‡	12.3
ixia - Rhabdomyosarcomas	5.3‡	4.9
ixb - Fibrosarcomas, peripheral nerve sheath & other fibromatous neoplasms	1.1	1.3
ixc - Kaposi sarcoma	~	~
ixd - Other specified soft tissue sarcomas	4.5‡	5.0
ixe - Unspecified soft tissue sarcomas	1.8‡	1.1
X - Germ Cell & Trophoblastic Tumors & Neoplasms of Gonads	9.2‡	11.8
xax - Intracranial and intraspinal germ cell tumors	1.6‡	1.9
xaxb - Malignant extracranial and extragonadal germ cell tumors	1.4	1.6
xaxc - Malignant gonadal germ cell tumors	5.7‡	7.8
xaxd - Gonadal carcinomas	~	0.4
xaxe - Other and unspecified malignant gonadal tumors	~	0.2
XI - Other Malignant Epithelial Neoplasms & Malignant Melanomas	14.7‡	17.0
xiia - Adrenocortical carcinomas	~	0.2
xiib - Thyroid carcinomas	5.8‡	7.1
xiic - Nasopharyngeal carcinomas	0.8‡	0.6
xiid - Malignant melanomas	4.0‡	5.1
xiie - Skin carcinomas	~	0.1
xiif - Other and unspecified carcinomas	3.8	3.9
XII - Other & Unspecified Malignant Neoplasms	~	0.6

* Average annual rate per million, age-adjusted to the 2000 US standard million population

† Although the Georgia Comprehensive Cancer Registry started collecting data on benign CNS tumors in 2004, the current report discusses only malignant tumors.

~ Rates are not calculated where the count is less than sixteen.

*** Counts less than five and those that allow calculation of counts less than five are concealed for confidentiality purposes.