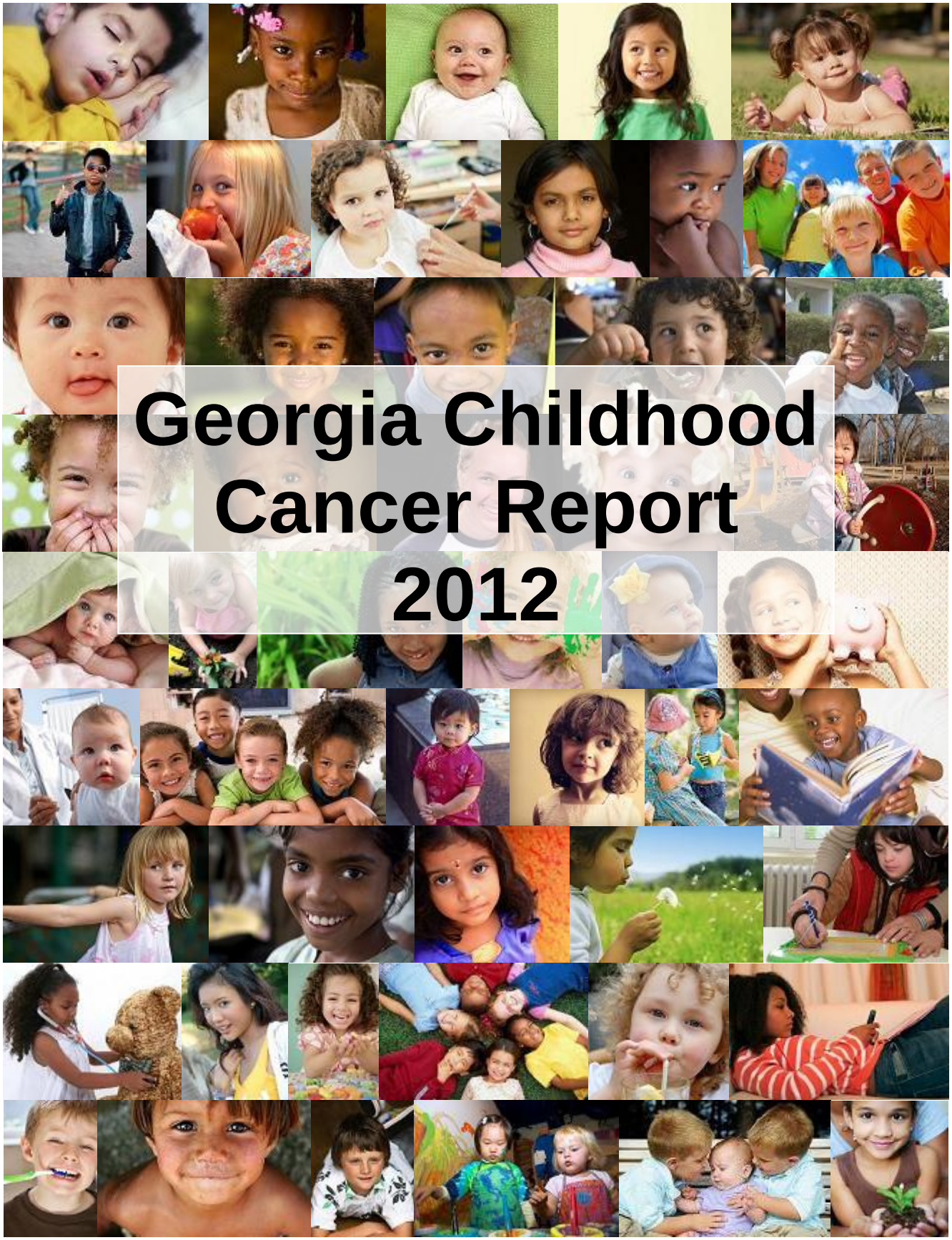

Georgia Childhood Cancer Report 2012

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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 1999-2008 *(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, 1999-2008

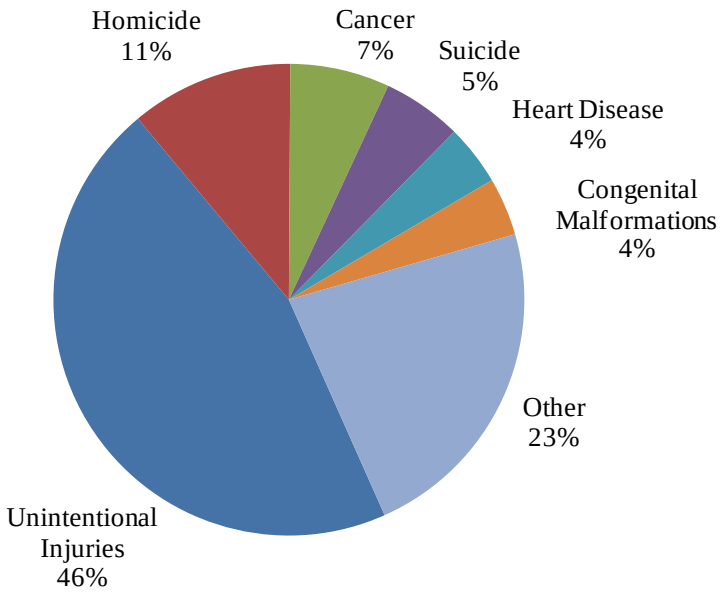


Table 1. Incidence and Mortality for the Top Three Cancer Types in Children Ages 0 to 19 Years, Georgia

	Incidence		Mortality	
	Cases*	**% of Cases**	**Deaths***	**% of Deaths**
Leukemia	103	25%	19	30%
CNS Cancer	76	19%	14	23%
Lymphoma	60	15%	5	7%

*Average number of cases (2000-2009) or deaths (1999-2008) 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 74% 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

According to the American Cancer Society, an estimated 12,060 new cancer cases and 1,340 cancer deaths were expected to occur in the U.S. among children aged 0-14 years in 2012.[1] Despite its rarity, cancer is still the leading cause of death by disease among children between the ages of 1 and 14 years. In the U.S., mortality rates from childhood cancer have declined by about 62% since 1970.

Early detection of cancer is problematic because initial symptoms are usually non-specific. 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 less than 50% before 1970 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 2002-2008 among children age 0 to 19 years is 82%.	The Georgia 5-year relative survival rate for all cancers from 2002-2008 among all ages is 64%.

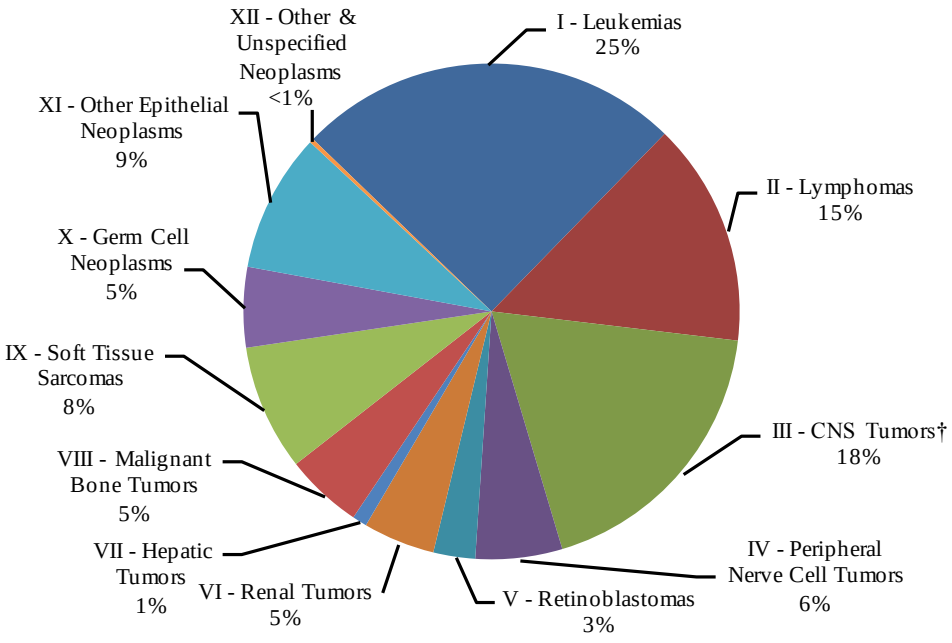
[1] *Cancer in Children*. (2012). Retrieved October 24, 2012 from http://www.cancer.org/cancer/cancerinchildren/detailedguide/index

Childhood Cancer Incidence

Childhood Cancer Incidence in Georgia

- Leukemia is the most common form of childhood cancer, accounting for 25% of all childhood cancer diagnoses between 2000 and 2009 in Georgia *(Figure 2)*.
- Central nervous system (CNS) tumors and lymphomas combined account for about one third of all childhood cancer diagnoses.
- Between 2000 and 2009, there were 4105 cancer diagnoses among children aged 0 to 19 years living in Georgia. The age-adjusted rate for this time period was 151.9 per million *(Table 3)*.
- The highest cancer incidence rate among children aged 0 to 19 years was for leukemia (37.4 per million), followed by CNS neoplasms with a rate of 28.2 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), Ewing sarcomas, 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, 2000-2009



* 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, 2000-2009

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	4105	151.9	2175	156.8	1930	146.6
I - Leukemias, Myeloproliferative & Myelodysplastic Diseases	1029	37.4	546	39.1	483	35.7
ia - Lymphoid leukemia	723	26.1	395	28.0	328	24.0
ib - Acute myeloid leukemia	199	7.4	97	7.1	102	7.7
ic - Chronic myeloproliferative diseases	56	2.1	24	1.7	32	2.4
id - Myelodysplastic syndrome & other myeloproliferative diseases	24	0.9	15	~	9	~
ie - Unspecified and other specified leukemias	27	1.0	15	~	12	~
II - Lymphomas & Reticuloendothelial Neoplasms	599	23.1	370	27.8	229	18.2
iia - Hodgkin lymphoma	296	11.5	167	12.6	129	10.3
iib - Non-Hodgkin lymphoma (except Burkitt)	212	8.2	134	10.0	78	6.2
iic - Burkitt lymphoma	75	2.9	57	4.3	18	~
iid - Miscellaneous lymphoreticular neoplasms	5	~	<5	~	<5	~
iie - Unspecified lymphomas	11	~	***	~	<5	~
III - Central Nervous System & Miscellaneous Intracranial & Intraspinal Neoplasms†	760	28.2	403	29.3	357	27.1
iiia - Ependymomas and choroid plexus tumor	57	2.0	28	2.0	29	2.0
iiib - Astrocytomas	378	14.2	197	14.3	181	14.0
iiic - Intracranial and intraspinal embryonal tumors	158	5.8	91	6.6	67	4.9
iiid - Other gliomas	143	5.4	74	5.5	69	5.3
iiie - Other specified intracranial and intraspinal neoplasms	13	~	***	~	***	~
iiif - Unspecified intracranial and intraspinal neoplasms	11	~	***	~	<5	~
IV - Neuroblastoma & Other Peripheral Nervous Cell Tumors	232	7.8	133	8.6	99	7.0
V - Retinoblastomas	112	3.6	54	3.4	58	3.9
VI - Renal Tumors	192	6.6	91	6.0	101	7.2
via - Nephroblastoma and other nonepithelial renal tumors	172	5.9	81	5.3	91	6.4
vib - Renal carcinomas	***	~	***	~	***	~
vic - Unspecified malignant renal tumors	<5	~	<5	~	<5	~
VII - Hepatic Tumors	39	1.3	21	1.4	18	~
viia - Hepatoblastoma	29	1.0	16	~	13	~
viib - Hepatic carcinomas	***	~	***	~	***	~
viic - Unspecified malignant hepatic tumors	<5	~	<5	~	<5	~
VIII - Malignant Bone Tumors	207	8.0	118	8.9	89	7.1
viiia - Osteosarcomas	119	4.7	64	4.9	55	4.4
viiib - Chondrosarcomas	<5	~	<5	~	<5	~
viiic - Ewing tumor and related sarcomas of bone	73	2.8	45	3.4	28	2.2
viiid - Other specified malignant bone tumors	<5	~	<5	~	<5	~
viiie - Unspecified malignant bone tumors	8	~	***	~	<5	~
IX - Soft Tissue & Other Extraosseous Sarcomas	337	12.7	186	13.6	151	11.7
ixa - Rhabdomyosarcomas	133	4.9	73	5.2	60	4.6
ixb - Fibrosarcomas, peripheral nerve sheath & other fibromatous neoplasms	29	1.1	15	~	14	~
ixc - Kaposi sarcoma	<5	~	<5	~	<5	~
ixd - Other specified soft tissue sarcomas	127	4.9	70	5.2	57	4.5
ixe - Unspecified soft tissue sarcomas	***	~	***	~	***	~
X - Germ Cell & Trophoblastic Tumors & Neoplasms of Gonads	215	8.1	115	8.4	100	7.8
xa - Intracranial and intraspinal germ cell tumors	34	1.3	21	1.6	13	~
xb - Malignant extracranial and extragonadal germ cell tumors	40	1.4	11	~	29	2.1
xc - Malignant gonadal germ cell tumors	128	4.9	82	6.0	46	3.7
xd - Gonadal carcinomas	8	~	<5	~	***	~
xe - Other and unspecified malignant gonadal tumors	5	~	<5	~	***	~
XI - Other Malignant Epithelial Neoplasms & Malignant Melanomas	372	14.4	136	10.2	236	18.9
xia - Adrenocortical carcinomas	<5	~	<5	~	<5	~
xib - Thyroid carcinomas	136	5.3	23	1.7	113	9.1
xic - Nasopharyngeal carcinomas	23	0.9	13	~	10	~
xid - Malignant melanomas	115	4.4	51	3.8	64	5.1
xie - Skin carcinomas	<5	~	<5	~	<5	~
xif - Other and unspecified carcinomas	93	3.6	45	3.4	48	3.9
XII - Other & Unspecified Malignant Neoplasms	11	~	<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 twenty.

*** 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, 2000-2009

	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	1370	199.5	711	108.0	782	118.9	1242	190.6
I - Leukemias, Myeloproliferative & Myelodysplastic Diseases	448	65.2	208	31.6	177	26.9	196	30.1
II - Lymphomas & Reticuloendothelial Neoplasms	53	7.7	102	15.5	137	20.8	307	47.1
III - CNS & Miscellaneous Intracranial & Intraspinal Neoplasms†	259	37.7	205	31.1	177	26.9	119	18.3
IV - Neuroblastoma & Other Peripheral Nervous Cell Tumors	187	27.2	28	4.3	8	~	9	~
V - Retinoblastomas	110	16.0	<5	~	<5	~	<5	~
VI - Renal Tumors	135	19.7	39	5.9	9	~	9	~
VII - Hepatic Tumors	***	~	<5	~	<5	~	5	~
VIII - Malignant Bone Tumors	15	~	32	4.9	66	10.0	94	14.4
IX - Soft Tissue & Other Extraosseous Sarcomas	82	11.9	55	8.4	92	14.0	108	16.6
X - Germ Cell & Trophoblastic Tumors & Neoplasms of Gonads	40	5.8	13	~	37	5.6	125	19.2
XI - Other Malignant Epithelial Neoplasms & Malignant Melanomas	10	~	21	3.2	75	11.4	266	40.8
XII - Other & Unspecified Malignant Neoplasms	<5	~	<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.

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

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

Childhood Cancer Incidence Rates by Georgia Public Health District

- Among the Georgia Public Health Districts, childhood cancer incidence rates ranged from 119.4 per million to 174.1 per million *(Table 5)*.
- Health Districts 1-1, 2, 3-1, 3-4, 5-2 9-1, and 10 had significantly higher rates than the overall state average, while Districts 3-2, 3-3, 4, 5-1, 7, 8-2, and 9-2 had significantly lower rates.
- See Appendix C for a list of counties included in each Health District.

Table 5. Age-Adjusted Childhood Cancer Incidence Rates*† by Health District, Ages 0 to 19 Years, Georgia, 2000-2009

Georgia Rate = 151.9

Health District	Rate per Million	Health District	Rate per Million
1.1 Northwest	174.1‡	5.1 South Central	120.4‡
1.2 North Georgia	151.4	5.2 North Central	163.5‡
2.0 North	168.2‡	6.0 East Central	151.0
3.1 Cobb-Douglas	163.8‡	7.0 West Central	141.7‡
3.2 Fulton	126.3‡	8.1 South	153.0
3.3 Clayton	119.4‡	8.2 Southwest	134.0‡
3.4 East Metro	162.1‡	9.1 Coastal	157.4‡
3.5 DeKalb	152.0	9.2 Southeast	149.2‡
4.0 LaGrange	149.2‡	10.0 Northeast	156.8‡

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

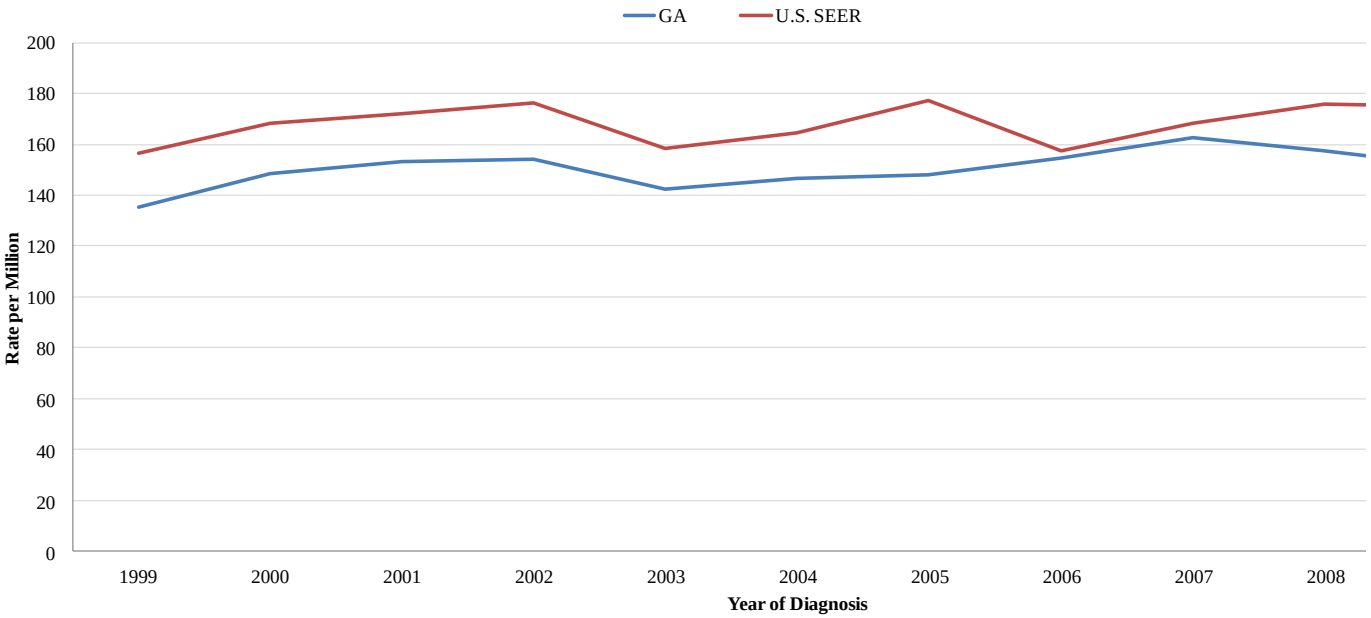
† Although the Georgia Comprehensive Cancer Registry started collecting data on benign CNS tumors in 2004, the current report discusses only malignant tumors.

‡ 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 0.9% per year from 1999 to 2009 (*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‡, 1999-2009



* 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 (SEER) 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 1999 and 2008 *(Figure 4)*.
- Central nervous system (CNS) neoplasms are second, responsible for 23% of all childhood cancer deaths.
- Between 1999 and 2008, there were 624 cancer deaths among Georgia's children aged 0 to 19 years. The age-adjusted rate for this time period was 21.6 per million *(Table 6)*.
- The highest cancer mortality rate among children aged 0 to 19 years was for leukemia (6.6 per million), followed by CNS neoplasms with a rate of 5.0 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 remains the most common cause of cancer death throughout childhood.

Figure 4. Childhood Cancer Mortality, Ages 0 to 19 Years, Georgia, 1999-2008

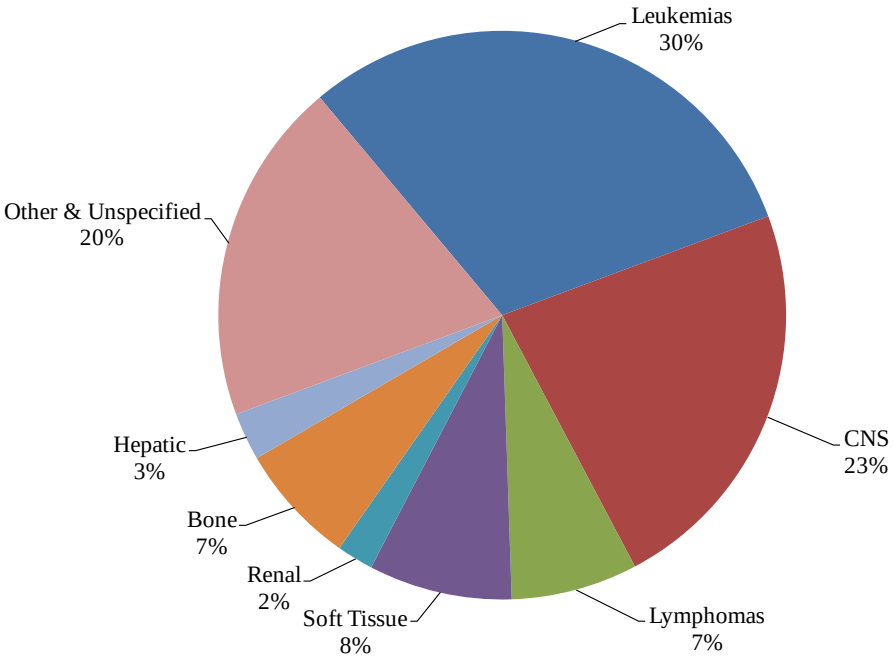


Table 6. Age-Adjusted Childhood Cancer Mortality Rates*, Ages 0 to 19 Years, Georgia, 1999-2008

	Both Sexes		Males		Females	
	Deaths	Rate per Million	Deaths	Rate per Million	Deaths	Rate per Million
All Types	624	21.6	338	22.9	286	20.2
Leukemias	190	6.6	93	6.3	97	6.5
CNS	143	5.0	78	5.3	65	4.4
Lymphomas & Other Reticuloendothelial	45	1.6	27	1.9	18	~
Soft Tissue	51	1.8	30	2.0	21	1.4
Renal	13	~	5	~	8	~
Bone	43	1.5	30	2.1	13	~
Hepatic	17	~	8	~	9	~
Other & Unspecified	122	4.1	67	4.4	55	3.7

* Average annual rate per million, age-adjusted to the 2000 US standard million population
~ Rates are not calculated where the count is less than twenty

Table 7. Age-Specific Childhood Cancer Mortality Rates*, Ages 0 to 19 Years, Georgia, 1999-2008

	Ages 0 to 4		Ages 5 to 9		Ages 10 to 14		Ages 15 to 19	
	Deaths	Rate per Million	Deaths	Rate per Million	Deaths	Rate per Million	Deaths	Rate per Million
All Types	138	18.5	154	21.4	124	17.3	208	29.3
Leukemias	39	5.2	50	7.0	36	5.0	65	9.1
CNS	31	4.2	48	6.7	33	4.6	31	4.4
Lymphomas & Other Reticuloendothelial	<5	~	<5	~	12	~	26	3.7
Soft Tissue	7	~	12	~	5	~	27	3.8
Renal	<5	~	6	~	<5	~	<5	~
Bone	<5	~	<5	~	12	~	27	3.8
Hepatic	8	~	<5	~	<5	~	<5	~
Other & Unspecified	46	6.2	29	4.0	19	~	28	3.9

* Average annual rate per million, age-adjusted to the 2000 US standard million population
~ Rates are not calculated where the count is less than twenty

Childhood Cancer Mortality Rates by Georgia Public Health District

- Among the Georgia Public Health Districts, childhood cancer mortality rates ranged from 14.7 per million to 32.9 per million *(Table 8).*
- Health Districts 3-5 and 9-2 had significantly higher rates than the state average, while District 3-2 had a significantly lower rate.
- Rates were not calculated for Health Districts 3-3 or 5-1 because there were fewer than twenty deaths.
- See Appendix C for a list of counties included in each Health District.

Table 8. Age-Adjusted Childhood Cancer Mortality Rates by Health District, Ages 0 to 19 Years, Georgia, 1999-2008

Georgia Rate = 21.6

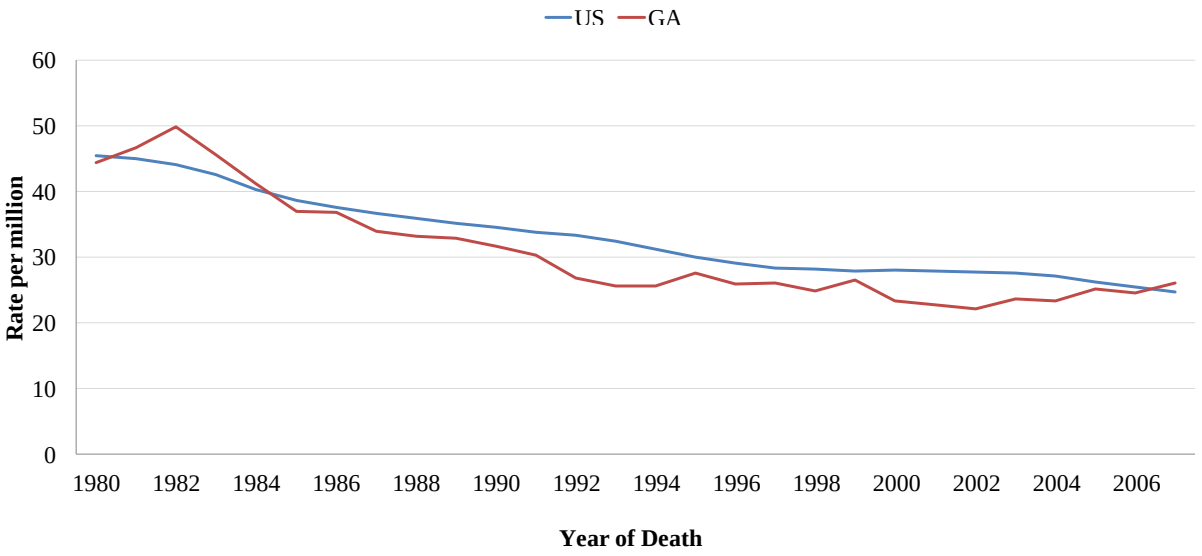
Health District	Rate per Million	Health District	Rate per Million
1.1 Northwest	28.1	5.1 South Central	~
1.2 North Georgia	16.3	5.2 North Central	22.6
2.0 North	22.1	6.0 East Central	24.1
3.1 Cobb-Douglas	21.9	7.0 West Central	27.3
3.2 Fulton	14.7‡	8.1 South	27.6
3.3 Clayton	~	8.2 Southwest	24.5
3.4 East Metro	19.0	9.1 Coastal	23.6
3.5 DeKalb	31.0‡	9.2 Southeast	32.9‡
4.0 LaGrange	19.2	10.0 Northeast	21.5

* Average annual rate per million, age-adjusted to the 2000 US standard million population
‡ Rate is significantly higher or lower than the state rate (p<.05)
~ Rates are not calculated where the count is less than twenty

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 1992 *(Figure 5)*. For the next decade, rates decreased at a more modest rate of about 2.0% per year. But childhood cancer mortality appears to have been on the rise in Georgia since 2002, and the reasons for this are unclear. Nationally, childhood cancer mortality rates have been fairly steadily decreasing 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, 1980-2007



* 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 2002 and 2008 *(Table 9)*. Georgia children diagnosed with hepatic tumors fared 18 percent worse than U.S. children. Georgia males with sympathetic nervous system tumors fared 12 percent better than U.S. males. Georgia females with bone tumors fared 13 percent better than U.S. females.
- Females experienced better survival than males overall, but this varied by cancer type.
- In Georgia, children with retinoblastoma had the highest survival rate (99.0 percent), while children with hepatic tumors had the lowest (55.8 percent).

Table 9. Five-Year Relative Childhood Cancer Survival Rates, Ages 0 to 19 Years, Georgia and U.S. SEER*, 2002-2008

	State of Georgia			U.S. SEER		
	Total	Males	Females	Total	Males	Females
All Types	81.5	80.2	82.8	81.2	80.1	82.6
Leukemia	80.2	78.7	81.9	80.7	79.8	81.9
Lymphomas and Reticuloendothelial Neoplasms	85.8	86.5	84.6	90.0	89.7	90.3
CNS Neoplasms	73.8	70.7	77.0	72.1	70.8	73.6
Sympathetic Nervous System Tumors	79.3	83.1	74.0	75.4	74.5	76.3
Retinoblastoma	99.0	97.6	100.0	97.8	96.5	99.4
Renal Tumors	89.8	96.5	84.3	88.7	90.3	87.1
Hepatic Tumors	55.8	-	-	67.8	68.8	65.8
Malignant Bone Tumors	71.7	66.0	79.1	68.9	67.9	70.3
Soft Tissue Sarcomas	73.9	74.4	73.4	71.0	69.6	72.7
Germ Cell & Other Gonadal Neoplasms	92.4	95.7	88.3	91.2	91.4	90.8

* United States Surveillance, Epidemiology, and End Results (SEER) Program

Childhood Leukemia

What is it?
Leukemia is a cancer of the blood-forming cells.[2] Most of the time, 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 about 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 86%. Acute myelogenous leukemia (AML) represents most of the remaining leukemias in children. U.S. five-year relative survival for children with AML is 61%.

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 and 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 25% of all malignant childhood cancer incidence *(Figure 2)*.
- Between 2000 and 2009, there were 1029 cases of leukemia in children. The age-adjusted rate was 37.4 per million. This is significantly lower than the U.S. SEER rate of 42.9 per million *(Appendix D)*.
- Males were 10% 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 2002 and 2008 was 80.2% *(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 1999 and 2008, there were 190 deaths from leukemia among children. The age-adjusted rate was 6.6 per million *(Table 6)*.
- Males and females were equally affected *(Table 6)*.
- The highest rates were among children over age 15 years *(Table 7)*.

[2] *Childhood Leukemia*. (2012). Retrieved October 24, 2012 from http://www.cancer.org/cancer/leukemiainchildren/detailedguide/index

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 may occur and both 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 diagnosed in U.S. children under the age of twenty. Survival for children with CNS cancer is poorest among infants but improves with increasing age. U.S. five-year relative survival rates have improved over time to 72%.

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.

Most tumors that develop within the brain start in cells called astrocytes and are called astrocytomas. Most astrocytomas can spread widely throughout normal brain tissue, making them very hard to remove by surgery. Some special types of low-grade astrocytomas called non-infiltrating astrocytomas tend to 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 2% of brain tumors in children are oligodendrogliomas.

About 5% of CNS tumors 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 15% of childhood CNS tumors 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 2000 and 2009, there were 760 cases of malignant CNS cancer in children. The age-adjusted rate was 28.2 per million. This is significantly lower than the U.S. SEER rate of 30.1 per million *(Appendix D)*.
- Males were about 8% more likely than 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 2002 and 2008 was 73.8% *(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 23% of all childhood cancer mortality *(Figure 4)*.
- Between 1999 and 2008, there were 143 deaths from CNS cancer among children. The age-adjusted rate was 5.0 per million *(Table 6)*.
- Males were about 20% 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*. (2012). Retrieved October 24, 2012 from http://www.cancer.org/cancer/braincnstumorsinchildren/detailedguide/index

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 4% 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 also makes up about 4% 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 83%.

Types of Childhood NHL
Lymphoblastic lymphoma accounts for about 30% of NHL in children. It is most common in teenagers, 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.

Small non-cleaved NHL accounts for about 40% to 50% of childhood NHL in the US. It is most often seen in boys around the age of 5 to 10 years old.These lymphomas are divided into two groups: Burkitt and non-Burkitt. Small non-cleaved NHL is one of the fastest growing cancers known. It may spread to other organs including the brain and must be treated quickly.

Large cell lymphoma accounts for about 25% of all NHL in children. 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 2000 and 2009, there were 599 cases of lymphoma in children. The age-adjusted rate was 23.1 per million. This is significantly lower than the U.S. SEER rate of 24.6 per million *(Appendix D)*.
- Males were 53% 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 2002 and 2008 was 85.8% *(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 1999 and 2008, there were 45 deaths from lymphoma among children. The age-adjusted rate was 1.6 per million *(Table 6)*.
- Males were 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*. (2012). Retrieved October 24, 2012 from http://www.cancer.org/cancer/non-hodgkinlymphomainchildren/detailedguide/index

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. About 2 of 3 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 65%. 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 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 2000 and 2009, there were 337 cases of soft tissue sarcoma in children. The age-adjusted rate was 12.7 per million. This is similar to the U.S. SEER rate of 12.5 per million *(Appendix D)*.
- Males were 16% 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 2002 and 2008 was 73.9% *(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 8% of all childhood cancer mortality *(Figure 4)*.
- Between 1999 and 2008, there were 51 deaths from soft tissue sarcoma among children. The age-adjusted rate was 1.8 per million *(Table 6)*.
- Males were 43% 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*. (2012). Retrieved October 24, 2012 from http://www.cancer.org/cancer/rhabdomyosarcoma/detailedguide/index

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. Another third 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 7% 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 75%. 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 sixth among cancer diagnoses for children ages 0 to 19 years in Georgia, accounting for 6% of all malignant childhood cancer incidence *(Figure 2)*.
- Between 2000 and 2009, there were 232 cases of peripheral nerve cell cancer in children. The age-adjusted rate was 7.8 per million. This is lower than the U.S. SEER rate of 8.8 per million, but this difference is not significant *(Appendix D)*.
- Males were 23% more likely than females to be diagnosed with peripheral nerve cell cancer *(Table 3)*.
- Nearly all 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 2002 and 2008 was 79.3% *(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*. (2012). Retrieved October 24, 2012 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 67%, depending on whether the tumor has spread and how it responds to treatment.

Ewing's family of tumors (EFT) accounts for about 1% 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 68%.

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 bone and multiple hereditary osteochondromas, increase the risk for developing osteosarcoma. Also at an increased risk are children with Li-Fraumeni syndrome or retinoblastoma.

Studies of children with EFT have not found risk factors linked to radiation, chemicals, or any other environmental exposures. Scientists have found few factors related to the risk of developing EFT. EFT occurs most often in the white population and is extremely 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 2000 and 2009, there were 207 cases of bone cancer in children. The age-adjusted rate was 8.0 per million. This is lower than the U.S. SEER rate of 8.6 per million, but this difference is not significant *(Appendix D)*.
- Males were 25% 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 2002 and 2008 was 71.7% *(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 7% of all childhood cancer mortality *(Figure 4)*.
- Between 1999 and 2008, there were 43 deaths 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*. (2012). Retrieved October 24, 2012 from http://www.cancer.org/cancer/osteosarcoma/detailedguide/index
[8] *Ewing Family of Tumors*. (2012). Retrieved October 24, 2012 from http://www.cancer.org/cancer/ewingfamilyoftumors/detailedguide/index

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 89%.

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. About 95% of 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 2000 and 2009, there were 192 cases of renal cancer in children. The age-adjusted rate was 6.6 per million. This is similar to the U.S. SEER rate of 6.4 per million *(Appendix D)*.
- Males were 17% 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 2002 and 2008 was 89.8% *(Table 9)*.

Renal Cancer Mortality in Georgia Children

- Renal cancer ranks seventh among cancer deaths for children ages 0 to 19 years in Georgia, accounting for 2% of all childhood cancer mortality *(Figure 4)*.
- Between 1999 and 2008, there were 13 deaths 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*. (2012). Retrieved October 24, 2012 from http://www.cancer.org/cancer/wilmstumor/detailedguide/index

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 Comprehensive 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 will 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 Comprehensive 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 1999-2008 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 1999-2009 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, Third Edition (ICCC-3) groupings were used. For more information on this classification scheme, please visit the International Association of Cancer Registries on the web at http://www.iacr.com.fr/.

Childhood cancer survival data for Georgia and childhood cancer incidence and survival data for the United States were obtained from Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2011 Sub (1973-2009 varying) - Linked To County Attributes - Total U.S., 1969-2010 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2012, based on the November 2011 submission. Incidence and survival data were categorized using the ICCC-3.

Childhood cancer mortality trend data for Georgia and the United States were obtained from Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Mortality - All COD, Aggregated With State, Total U.S. (1969-2009) <Katrina/Rita Population Adjustment>, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2012. 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 1999-2009 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 2000 through 2009.

Mortality 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 mortality rates are ten-year average annual rates for the period 1999 through 2008.

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://health.state.ga.us/programs/gccr/.

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

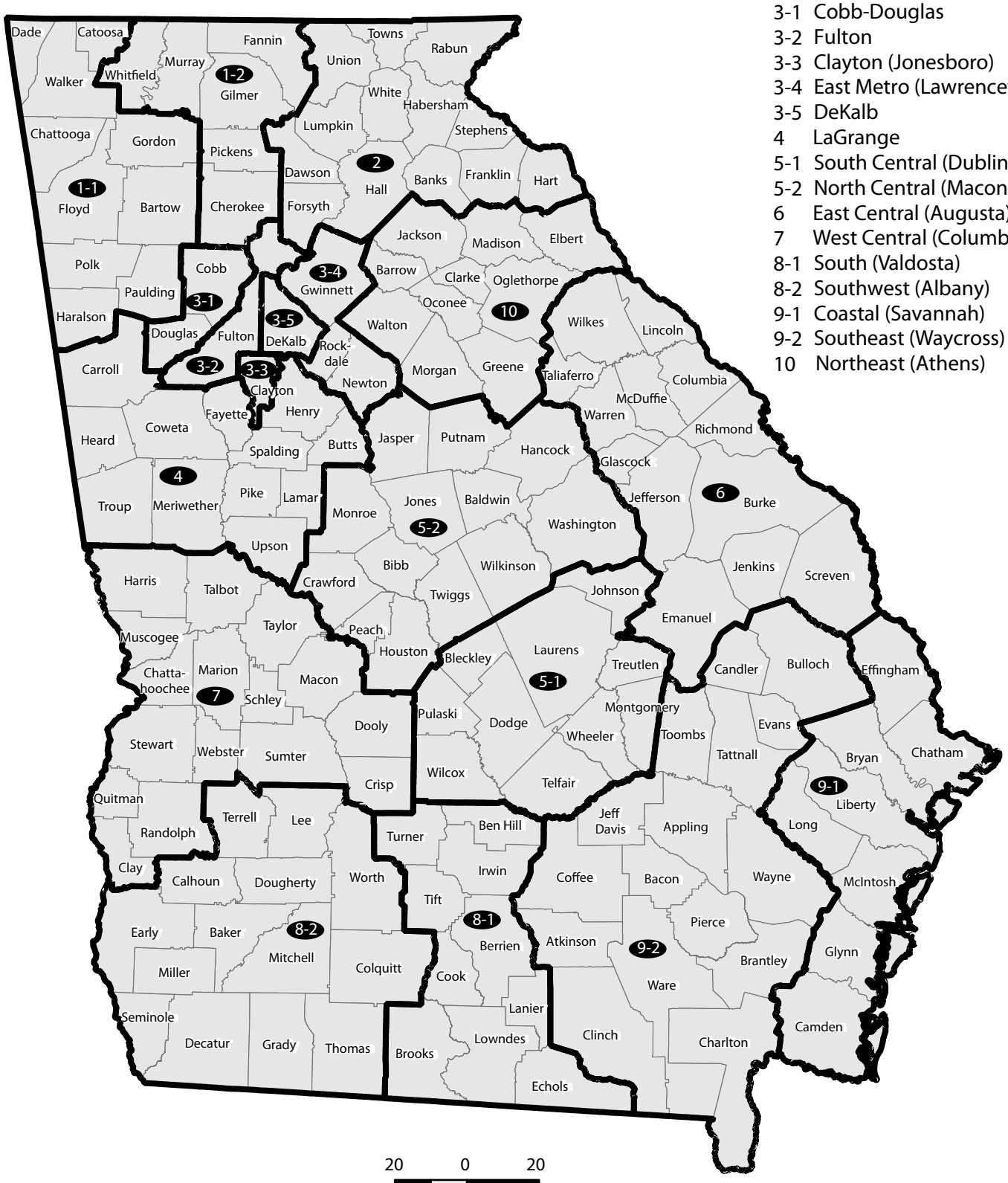
The International Classification of Childhood Cancer, Third Edition (ICCC-3) groupings were used. For more information, please contact the International Association of Cancer Registries (www.iacr.com.fr/).

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, Dooly, 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)

Georgia Department of Community Health

Appendix D

Age-Adjusted Childhood Malignant Cancer Incidence Rates*†, Ages 0 to 19 Years, Georgia Versus U.S. SEER, 2000-2009

	Rate per Million	
	Georgia	U.S. SEER
All Types	151.9‡	169.5
I - Leukemias, Myeloproliferative & Myelodysplastic Diseases	37.4‡	46.2
ia - Lymphoid leukemia	26.1‡	33.8
ib - Acute myeloid leukemia	7.4	8.2
ic - Chronic myeloproliferative diseases	2.1	1.8
id - Myelodysplastic syndrome & other myeloproliferative diseases	0.9	1.3
ie - Unspecified and other specified leukemias	1.0	1.1
II - Lymphomas & Reticuloendothelial Neoplasms	23.1‡	24.3
iia - Hodgkin lymphoma	11.5	12.1
iib - Non-Hodgkin lymphoma (except Burkitt)	8.2	8.6
iic - Burkitt lymphoma	2.9	2.5
iid - Miscellaneous lymphoreticular neoplasms	~	0.8
iie - Unspecified lymphomas	~	0.3
III - Central Nervous System & Miscellaneous Intracranial & Intraspinal Neoplasms†	28.2	29.3
iiia - Ependymomas and choroid plexus tumor	2.0	2.6
iiib - Astrocytomas	14.2	14.3
iiic - Intracranial and intraspinal embryonal tumors	5.8	6.3
iiid - Other gliomas	5.4	5.2
iiie - Other specified intracranial and intraspinal neoplasms	~	0.5
iiif - Unspecified intracranial and intraspinal neoplasms	~	0.3
IV - Neuroblastoma & Other Peripheral Nervous Cell Tumors	7.8	7.7
V - Retinoblastomas	3.6	3.1
VI - Renal Tumors	6.6	6.2
via - Nephroblastoma and other nonepithelial renal tumors	5.9	5.6
vib - Renal carcinomas	~	0.6
vic - Unspecified malignant renal tumors	~	0.0
VII - Hepatic Tumors	1.3‡	2.2
viia - Hepatoblastoma	1.0‡	1.6
viib - Hepatic carcinomas	~	0.6
viic - Unspecified malignant hepatic tumors	~	0.0
VIII - Malignant Bone Tumors	8.0‡	9.0
viiia - Osteosarcomas	4.7	5.3
viiib - Chondrosarcomas	~	0.4
viiic - Ewing tumor and related sarcomas of bone	2.8	2.8
viiid - Other specified malignant bone tumors	~	0.4
viiie - Unspecified malignant bone tumors	~	0.2
IX - Soft Tissue & Other Extraosseous Sarcomas	12.7	12.2
ixa - Rhabdomyosarcomas	4.9	4.8
ixb - Fibrosarcomas, peripheral nerve sheath & other fibromatous neoplasms	1.1	1.4
ixc - Kaposi sarcoma	~	0.0
ixd - Other specified soft tissue sarcomas	4.9	4.9
ixe - Unspecified soft tissue sarcomas	~	1.1
X - Germ Cell & Trophoblastic Tumors & Neoplasms of Gonads	8.1‡	11.7
xa - Intracranial and intraspinal germ cell tumors	1.3	1.9
xb - Malignant extracranial and extragonadal germ cell tumors	1.4	1.6
xc - Malignant gonadal germ cell tumors	4.9‡	7.6
xd - Gonadal carcinomas	~	0.4
xe - Other and unspecified malignant gonadal tumors	~	0.2
XI - Other Malignant Epithelial Neoplasms & Malignant Melanomas	14.4‡	16.8
xia - Adrenocortical carcinomas	~	0.2
xib - Thyroid carcinomas	5.3‡	6.6
xic - Nasopharyngeal carcinomas	0.9	0.5
xid - Malignant melanomas	4.4‡	5.6
xie - Skin carcinomas	~	0.1
xif - Other and unspecified carcinomas	3.6	3.8
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.

‡ Georgia rate is significantly higher or lower than the U.S. SEER rate ($p<.05$)

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