PEDIATRIC CANCER IN IDAHO 2003-2012

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CDRI Cancer Data Registry of Idaho

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The Idaho Hospital Association (IHA) contracts with, and receives funding from, the Idaho Department of Health and Welfare, Division of Public Health, to provide a statewide cancer surveillance system: the Cancer Data Registry of Idaho (CDRI).

The statewide cancer registry database is a product of collaboration among many report sources, including hospitals, physicians, surgery centers, pathology laboratories, and other states in which Idaho residents are diagnosed and/or treated for cancer. Their cooperation in reporting timely, accurate, and complete cancer data is acknowledged and sincerely appreciated.

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Pediatric Cancer in Idaho, 2003-2012

Although relatively rare in comparison with cancer in older adults, cancer is the second leading cause of death in persons aged 1-14 years. The epidemiology of cancer among children differs markedly from that of adults, both in the patterns of anatomic sites involved and the predominant histologic types. Most notably, the tumors diagnosed in children frequently involve the hematopoietic and central nervous systems or are of mesenchymal origin. In contrast, malignancies of epithelial tissues, which are predominant in adults, are uncommon in children. Similar to adult cancers, the etiology of many childhood cancers remains unclear.

The Cancer Data Registry of Idaho (CDRI) receives several requests per year from physicians and others for data on pediatric cancer incidence for the State of Idaho. This report describes the incidence of pediatric cancers in Idaho, with comparisons to data from the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program and the US Centers for Disease Control and Prevention's National Program of Cancer Registries (NPCR).[1-2] SEER currently collects and publishes cancer incidence and survival data from population-based cancer registries covering approximately 26 percent of the US population and is considered the standard for quality among cancer registries around the world. NPCR supports central cancer registries in 45 states, the District of Columbia, Puerto Rico, and the U.S. Pacific Island Jurisdictions. These data represent 96% of the U.S. population. Together, NPCR and SEER collect data for the entire U.S. population. Combined NPCR and SEER data are used in this report for pediatric cancer incidence rankings by state.

METHODS

The data analyzed for this report include cancers diagnosed between 2003 and 2012 among Idaho residents less than 20 years of age. Cases were grouped according to the International Classification of Childhood Cancer (ICCC) based on site and morphology coded according to ICD-O-3.[3]

A total of 886 cases were diagnosed among Idaho resident children under the age of 20 between 2003 and 2012. This number includes 802 malignant cancers and 68 benign and borderline behavior neoplasms. It was not possible to assign a group code of the ICCC system to 17 cases. Sixteen cases were in situ, which are not included in the ICCC system. Health District was assigned from county of residence at time of diagnosis. All rates presented were calculated per million population, and are averages for the period 2003 through 2012 (rates per million, rather than per 100,000, are commonly used for pediatric cancers). Age-adjustment was performed using the direct method to the 2000 U.S. standard population. Cancer incidence, mortality and survival statistics were calculated using SEER*Stat.[4] State rankings were obtained from the United States Cancer Statistics Restricted Access File.[2]

RESULTS

A total of 853 cases that met the study criteria were diagnosed among Idaho residents aged less than 20 years between 2003 and 2012, yielding an overall age-adjusted rate of 185.9 cases per million population. In comparison, the SEER rate for Whites was 209.6 cases per million population for 2010-2012. The distribution of pediatric cancers by ICCC grouping was very similar for Idaho and SEER Regions. Idaho's pediatric rate of lymphomas and reticuloendothelial neoplasms (ICCC major classification category II) was about 30% lower than the rate for SEER Whites. For no other ICCC category did Idaho show a statistically significantly different rate from SEER Regions based on the comparison of 95% confidence intervals.

For all races combined, Idaho ranked 31st highest among states in pediatric (ages 0-19) cancer incidence 2003-2011.[2] This result is partially related to differences in the distribution of race by state. Pediatric cancer incidence is higher among Whites, and Idaho has a higher proportion of White residents than many states. Among Whites, Idaho ranked 34th in pediatric cancer incidence.

Over 80% of children aged less than 20 years diagnosed with malignant cancer survived at least 5 years after their diagnosis, both in Idaho and SEER Regions. For no ICCC major classification category, nor overall, was there a statistically significant difference in 5-year relative survival between Idaho and SEER cases.

Pediatric cancer incidence increased at a rate of about 0.6% per year in Idaho from 1975 to 2012. This parallels the long term increase observed in SEER Regions from 1973 to 2012 of about 0.7% per year.

Health District 3 had a statistically significantly higher ($p<.05$) rate of ICCC major classification category X (germ cell & trophoblastic tumors & neoplasms of gonads) than the State of Idaho. Health District 4 had a statistically significantly higher rate, and Health Districts 2 and 6 had statistically significantly lower rates, of ICCC major classification category XI (other malignant epithelial neoplasms and melanomas) than the State of Idaho. This may indicate underreporting of melanomas and thyroid carcinomas from Health Districts 2 and 6. CDRI is working to increase reporting of cancer cases by pathology laboratories and physicians statewide. For no other ICCC major classification category was there a statistically significant difference between any health district and the State of Idaho.

From 2003 to 2013, 120 of Idaho's children aged 0-19 died from some form of cancer.[5] The leading types of cancer mortality were leukemia and brain and other central nervous system. While pediatric cancer incidence rates have increased over time, mortality rates have decreased. From 1975-2012, pediatric cancer mortality rates have decreased about 2% per year, in Idaho and the U.S.[5,6] The annual rates plotted for Idaho demonstrate large year-to-year variability that is expected due to the relatively small numbers of deaths per year. Idaho ranked 43rd highest among states in pediatric (ages 0-19) cancer mortality 2003-2011.[6]

CONCLUSIONS

These data demonstrate strong similarity in pediatric cancer incidence and survival patterns between Idaho and SEER Regions. Compared with cancer in adults, there is less geographic variability in pediatric cancer incidence.

Largely because of improvements in therapy for pediatric cancers, there has been a decrease in mortality rates over time. Data collected by CDRI for 2013 show that approximately 35% of pediatric patients participated in clinical trials, a rate much higher than that for adults (2-3%).

While over 80% of children diagnosed with cancer survive at least 5 years, it has been shown that adult survivors of childhood cancer have higher prevalence of adverse health outcomes later in life and are at risk for higher health care expenditures and lost productivity, compared to adults without a history of cancer.[7,8] Education, intervention programs, and ongoing follow-up care are important for improving health and economic outcomes associated with cancer survivorship in this population.

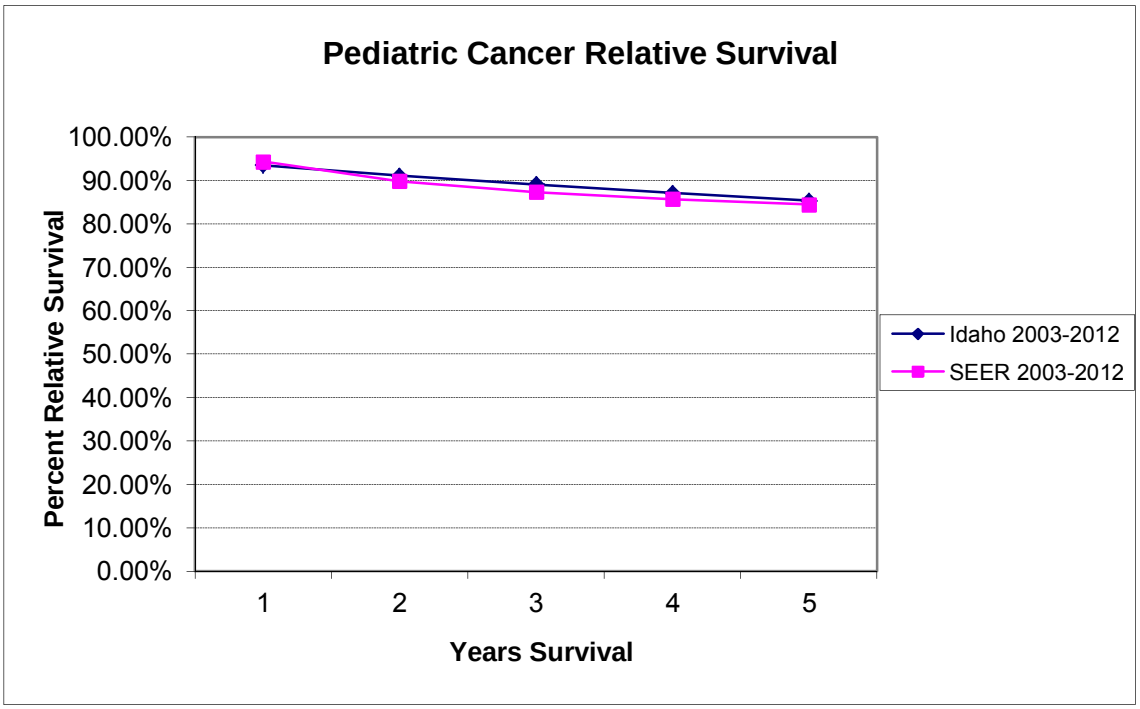
Pediatric Cancer Incidence in Idaho and SEER Regions (Ages 0-19)

Site/Type of Cancer	Idaho 2003-2012			SEER 2010-2012		
	Rate	Cases	Pop	Rate	Cases	Pop
All Sites Combined	185.9	853	4,564,724	209.6	5,059	23,982,041
I Leukemias, myeloproliferative & myelodysplastic diseases	44.5	206	4,564,724	53.8	1,295	23,982,041
I(a) Lymphoid leukemias	34.1	158	4,564,724	40.5	974	23,982,041
I(b) Acute myeloid leukemias	6.5	30	4,564,724	9.0	217	23,982,041
I(c) Chronic myeloproliferative diseases	1.6	7	4,564,724	1.8	44	23,982,041
I(d) Myelodysplastic syndrome and other myeloproliferative	1.5	7	4,564,724	1.4	34	23,982,041
I(e) Unspecified and other specified leukemias	0.9	4	4,564,724	1.1	26	23,982,041
II Lymphomas and reticuloendothelial neoplasms	22.7	103	4,564,724	32.6	786	23,982,041
II(a) Hodgkin lymphomas	12.0	54	4,564,724	14.1	341	23,982,041
II(b) Non-Hodgkin lymphomas (except Burkitt lymphoma)	6.6	30	4,564,724	10.4	250	23,982,041
II(c) Burkitt lymphoma	1.8	8	4,564,724	3.1	73	23,982,041
II(d) Miscellaneous lymphoreticular neoplasms	2.1	10	4,564,724	4.8	116	23,982,041
II(e) Unspecified lymphomas	0.2	1	4,564,724	0.2	6	23,982,041
III CNS and misc intracranial and intraspinal neoplasms	41.4	189	4,564,724	46.9	1,129	23,982,041
III(a) Ependymomas and choroid plexus tumor	2.6	12	4,564,724	4.4	106	23,982,041
III(b) Astrocytomas	17.5	80	4,564,724	16.3	390	23,982,041
III(c) Intracranial and intraspinal embryonal tumors	6.1	28	4,564,724	6.4	154	23,982,041
III(d) Other gliomas	3.9	18	4,564,724	4.5	109	23,982,041
III(e) Other specified intracranial/intraspinal neoplasms	11.1	50	4,564,724	14.3	347	23,982,041
III(f) Unspecified intracranial and intraspinal neoplasms	0.2	1	4,564,724	1.0	23	23,982,041
IV Neuroblastoma and other peripheral nervous cell tumors	8.6	41	4,564,724	7.9	192	23,982,041
IV(a) Neuroblastoma and ganglioneuroblastoma	8.4	40	4,564,724	7.8	189	23,982,041
IV(b) Other peripheral nervous cell tumors	0.2	1	4,564,724	0.1	3	23,982,041
V Retinoblastoma	3.2	15	4,564,724	3.0	74	23,982,041
VI Renal tumors	5.9	28	4,564,724	6.2	151	23,982,041
VI(a) Nephroblastoma and other nonepithelial renal tumors	5.7	27	4,564,724	5.7	139	23,982,041
VI(b) Renal carcinomas	0.2	1	4,564,724	0.5	12	23,982,041
VI(c) Unspecified malignant renal tumors	0.0	0	4,564,724	0.0	0	23,982,041
VII Hepatic tumors	2.6	12	4,564,724	3.1	76	23,982,041
VII(a) Hepatoblastoma	1.9	9	4,564,724	2.4	59	23,982,041
VII(b) Hepatic carcinomas	0.7	3	4,564,724	0.7	16	23,982,041
VII(c) Unspecified malignant hepatic tumors	0.0	0	4,564,724	0.0	1	23,982,041
VIII Malignant bone tumors	10.0	45	4,564,724	8.4	201	23,982,041
VIII(a) Osteosarcomas	7.1	32	4,564,724	5.0	120	23,982,041
VIII(b) Chondrosarcomas	0.2	1	4,564,724	0.1	3	23,982,041
VIII(c) Ewing tumor and related sarcomas of bone	2.7	12	4,564,724	2.9	69	23,982,041
VIII(d) Other specified malignant bone tumors	0.0	0	4,564,724	0.2	6	23,982,041
VIII(e) Unspecified malignant bone tumors	0.0	0	4,564,724	0.1	3	23,982,041
IX Soft tissue and other extraosseous sarcomas	12.2	56	4,564,724	12.3	296	23,982,041
IX(a) Rhabdomyosarcomas	3.9	18	4,564,724	5.1	122	23,982,041
IX(b) Fibrosarcomas, peripheral nerve & other fibrous	1.5	7	4,564,724	0.8	20	23,982,041
IX(c) Kaposi sarcoma	0.0	0	4,564,724	0.0	1	23,982,041
IX(d) Other specified soft tissue sarcomas	4.4	20	4,564,724	5.3	128	23,982,041
IX(e) Unspecified soft tissue sarcomas	2.4	11	4,564,724	1.0	25	23,982,041
X Germ cell & trophoblastic tumors & neoplasms of gonads	12.5	57	4,564,724	14.1	342	23,982,041
X(a) Intracranial & intraspinal germ cell tumors	1.1	5	4,564,724	2.0	47	23,982,041
X(b) Extracranial & extragonadal germ cell tumors	1.3	6	4,564,724	1.5	37	23,982,041
X(c) Malignant gonadal germ cell tumors	9.2	42	4,564,724	9.7	236	23,982,041
X(d) Gonadal carcinomas	0.9	4	4,564,724	0.7	17	23,982,041
X(e) Other and unspecified malignant gonadal tumors	0.0	0	4,564,724	0.2	5	23,982,041

Pediatric Cancer Incidence in Idaho and SEER Regions (Ages 0-19) - continued

Site/Type of Cancer	Idaho 2003-2012			SEER 2010-2012		
	Rate	Cases	Pop	Rate	Cases	Pop
XI Other malignant epithelial neoplasms and melanomas	21.9	99	4,564,724	20.5	500	23,982,041
XI(a) Adrenocortical carcinomas	0.0	0	4,564,724	0.4	10	23,982,041
XI(b) Thyroid carcinomas	10.2	46	4,564,724	10.4	253	23,982,041
XI(c) Nasopharyngeal carcinomas	0.0	0	4,564,724	0.3	8	23,982,041
XI(d) Malignant melanomas	7.5	34	4,564,724	4.7	114	23,982,041
XI(e) Skin carcinomas	0.0	0	4,564,724	0.0	1	23,982,041
XI(f) Other and unspecified carcinomas	4.2	19	4,564,724	4.7	114	23,982,041
XII Other and unspecified malignant neoplasms	0.4	2	4,564,724	0.7	17	23,982,041
XII(a) Other specified malignant tumors	0.4	2	4,564,724	0.4	9	23,982,041
XII(b) Other unspecified malignant tumors	0.0	0	4,564,724	0.3	8	23,982,041
Not classified by ICCC or in situ	7.2	33	4,564,724	7.2	174	23,982,041

Rates are per 1,000,000 and age-adjusted to the 2000 U.S. standard.
SEER data are for White race. Cases and rates are for benign, borderline, and malignant behavior.
Statistical Note: Rates based upon 10 or fewer cases (numerator) should be interpreted with caution.



Five-Year Relative Cancer Survival by Major ICCC Classification Category

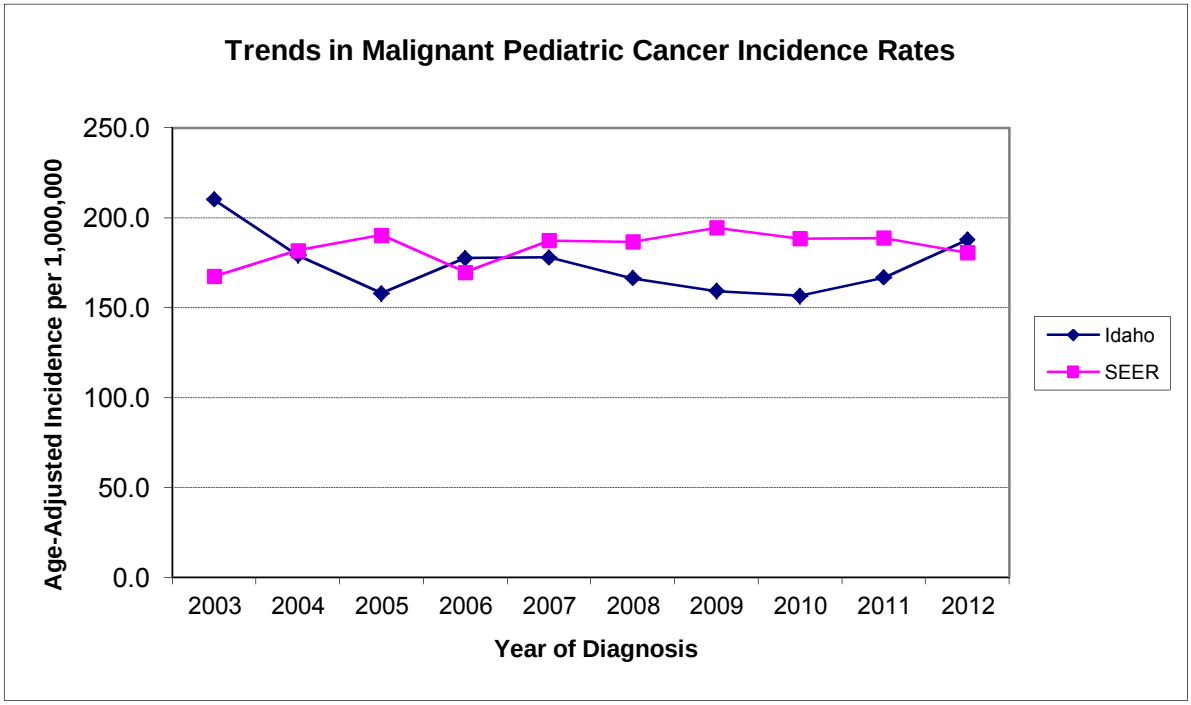
Site/Type of Cancer	Idaho 2003-2012			SEER 2003-2012		
	Cases	% Survival	95% CI	Cases	% Survival	95% CI
All Sites Combined	759	85.3%	82.4% - 87.8%	14,702	84.4%	83.8% - 85.1%
I Leukemias, myeloproliferative & myelodysplastic diseases	182	86.5%	80.2% - 90.9%	4,048	84.7%	83.4% - 86.0%
II Lymphomas and reticuloendothelial neoplasms	96	95.2%	86.9% - 98.3%	2,106	91.7%	90.2% - 92.9%
III CNS and misc intracranial and intraspinal neoplasms	132	80.7%	72.2% - 86.9%	2,441	75.5%	73.6% - 77.4%
IV Neuroblastoma and other peripheral nervous cell tumors	41	79.3%	60.1% - 90.0%	662	80.7%	77.0% - 83.9%
V Retinoblastoma	15	91.9%	52.8% - 98.9%	265	97.3%	93.8% - 98.8%
VI Renal tumors	28	89.0%	62.3% - 97.2%	502	87.1%	83.3% - 90.1%
VII Hepatic tumors	12	66.3%	32.9% - 85.9%	238	73.6%	66.8% - 79.2%
VIII Malignant bone tumors	41	69.3%	52.1% - 81.4%	731	70.7%	66.6% - 74.4%
IX Soft tissue and other extraosseous sarcomas	56	77.0%	62.6% - 86.5%	970	75.2%	71.9% - 78.1%
X Germ cell & trophoblastic tumors & neoplasms of gonads	57	89.7%	78.1% - 95.4%	1,135	93.5%	91.6% - 94.9%
XI Other malignant epithelial neoplasms and melanomas	97	91.4%	83.2% - 95.7%	1,566	94.0%	92.5% - 95.2%
XII Other and unspecified malignant neoplasms	2	+	+ - +	38	91.5%	75.2% - 97.3%

+ The statistic could not be calculated.

Malignant Pediatric Cancer Incidence in Idaho and SEER Regions (Ages 0-19)

Year of Diagnosis	Idaho 2003-2012 Rate	Cases	Pop	SEER 2003-2012 Rate	Cases	Pop
Total	173.7	798	4,564,724	183.6	14,988	81,008,095
2003	210.2	90	424,477	167.5	1,384	8,246,604
2004	179.2	78	429,860	182.0	1,504	8,213,472
2005	158.1	70	439,230	190.5	1,569	8,166,849
2006	177.7	81	449,429	169.9	1,394	8,130,741
2007	177.9	83	460,456	187.5	1,535	8,099,740
2008	166.5	78	468,822	186.7	1,528	8,093,508
2009	159.4	76	472,822	194.6	1,586	8,075,140
2010	156.7	75	474,859	188.5	1,524	8,032,090
2011	166.8	79	473,550	188.8	1,520	7,996,124
2012	187.7	88	471,219	180.7	1,444	7,953,827

Rates are per 1,000,000 and age-adjusted to the 2000 U.S. standard.



Pediatric Cancer Incidence in Idaho (Ages 0-19) by Health District, Major Classification Categories

Site/Type of Cancer	Health District 1			Health District 2			Health District 3		
	Rate	95% CI	Cases	Rate	95% CI	Cases	Rate	95% CI	Cases
All Sites Combined	175.2	141.8 - 214.0	96	105.8	69.9 - 153.9	28	200.4	170.4 - 234.1	159
I Leukemias, myeloproliferative & myelodysplastic diseases	49.1	32.0 - 71.9	26	21.4	7.0 - 49.6	5	45.4	32.0 - 62.7	37
II Lymphomas and reticuloendothelial neoplasms	24.6	13.5 - 41.5	14	21.7	7.8 - 48.3	6	27.2	16.8 - 41.5	21
III CNS and misc intracranial and intraspinal neoplasms	28.8	16.5 - 46.9	16	24.4	9.6 - 51.6	7	46.3	32.6 - 63.8	37
IV Neuroblastoma and other peripheral nervous cell tumors	9.6	3.1 - 22.3	5	8.5	1.0 - 30.3	2	5.8	1.9 - 13.7	5
V Retinoblastoma	1.9	0.0 - 10.5	1	0.0	0.0 - 15.0	0	2.3	0.3 - 8.6	2
VI Renal tumors	9.5	3.1 - 22.0	5	0.0	0.0 - 15.0	0	10.5	4.8 - 20.0	9
VII Hepatic tumors	5.7	1.2 - 16.5	3	0.0	0.0 - 15.0	0	0.0	0.0 - 4.6	0
VIII Malignant bone tumors	10.7	3.9 - 23.5	6	12.5	2.6 - 36.3	3	7.7	2.8 - 16.8	6
IX Soft tissue and other extraosseous sarcomas	7.0	1.9 - 18.0	4	4.2	0.1 - 22.9	1	6.3	2.0 - 14.7	5
X Germ cell & trophoblastic tumors & neoplasms of gonads	10.7	3.9 - 23.4	6	10.2	2.0 - 31.6	3	22.4	13.1 - 35.8	17
XI Other malignant epithelial neoplasms and melanomas	17.6	8.4 - 32.6	10	3.0	0.1 - 19.8	1	26.4	16.1 - 40.6	20
XII Other and unspecified malignant neoplasms	0.0	0.0 - 6.8	0	0.0	0.0 - 15.0	0	0.0	0.0 - 4.6	0

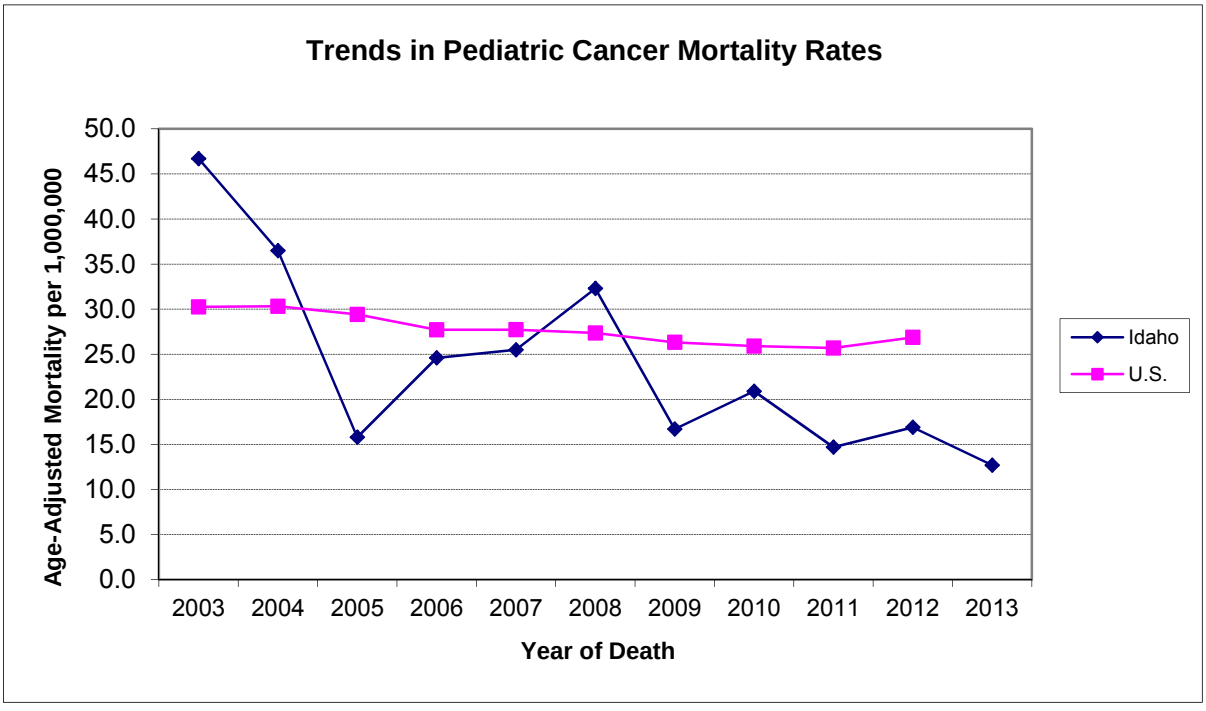
Site/Type of Cancer	Health District 4			Health District 5			Health District 6			Health District 7		
	Rate	95% CI	Cases	Rate	95% CI	Cases	Rate	95% CI	Cases	Rate	95% CI	Cases
All Sites Combined	216.0	190.4 - 244.0	259	186.6	152.4 - 226.1	104	187.6	152.9 - 227.7	102	154.8	126.4 - 187.6	104
I Leukemias…	57.1	44.5 - 72.1	70	49.4	32.8 - 71.5	28	29.1	16.6 - 47.3	16	36.4	23.3 - 54.2	24
II Lymphomas…	19.5	12.4 - 29.2	23	28.9	16.5 - 46.9	16	20.9	10.4 - 37.2	11	16.4	8.2 - 29.4	11
III CNS and…	40.3	29.8 - 53.2	49	45.2	29.2 - 66.6	25	57.6	39.1 - 81.8	31	35.6	22.8 - 53.1	24
IV Neuroblastoma…	11.2	6.1 - 18.8	14	6.7	1.8 - 17.3	4	12.2	4.9 - 25.3	7	5.7	1.5 - 14.7	4
V Retinoblastoma	2.4	0.5 - 7.1	3	5.1	1.1 - 15.2	3	5.3	1.1 - 15.6	3	4.2	0.9 - 12.5	3
VI Renal tumors	5.7	2.3 - 11.7	7	1.7	0.0 - 9.6	1	3.6	0.4 - 13.0	2	5.9	1.6 - 15.1	4
VII Hepatic tumors	5.6	2.2 - 11.6	7	1.7	0.0 - 9.6	1	0.0	0.0 - 6.7	0	1.7	0.0 - 8.8	1
VIII Malignant bone tumors	8.5	4.1 - 15.7	10	14.8	6.4 - 28.9	8	13.3	5.3 - 27.2	7	8.2	2.7 - 18.8	5
IX Soft tissue…	18.5	11.6 - 28.0	22	7.4	2.0 - 18.8	4	21.4	11.0 - 37.4	12	11.5	5.0 - 22.8	8
X Germ cell…	12.2	6.7 - 20.4	14	5.4	1.1 - 15.7	3	16.6	7.6 - 31.6	9	6.9	2.2 - 16.3	5
XI Other malig epithelial…	35.0	25.0 - 47.6	40	20.3	10.2 - 36.3	11	7.6	2.1 - 19.3	4	19.3	10.3 - 33.1	13
XII Other/unspecified…	0.0	0.0 - 3.1	0	0.0	0.0 - 6.5	0	0.0	0.0 - 6.7	0	2.9	0.3 - 10.5	2

Rates are per 1,000,000 and age-adjusted to the 2000 U.S. standard.
Confidence intervals (CIs) are 95% for rates.
Statistical Note: Rates based upon 10 or fewer cases (numerator) should be interpreted with caution.

Pediatric Cancer Mortality in Idaho and the U.S. (Ages 0-19)

Year of Death	Idaho 2003-2013			U.S. 2003-2012		
	Rate	Deaths	Pop	Rate	Deaths	Pop
Total	23.7	120	5,036,161	27.7	22,962	825,135,432
2003	46.7	20	424,477	30.3	2,466	81,425,816
2004	36.5	16	429,860	30.3	2,481	81,754,354
2005	15.8	7	439,230	29.4	2,420	82,005,260
2006	24.6	11	449,429	27.7	2,291	82,324,418
2007	25.5	12	460,456	27.7	2,302	82,749,431
2008	32.3	15	468,822	27.4	2,286	83,118,264
2009	16.7	8	472,822	26.3	2,200	83,280,391
2010	20.9	10	474,859	25.9	2,160	83,180,117
2011	14.7	7	473,550	25.7	2,135	82,814,893
2012	16.9	8	471,219	26.9	2,221	82,482,488
2013	12.7	6	471,437			

Rates are per 1,000,000 and age-adjusted to the 2000 U.S. standard.



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