PEDIATRIC CANCER IN IDAHO 2005-2014

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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 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, 2005-2014

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 28 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 2005 and 2014 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 870 cases were diagnosed among Idaho resident children under the age of 20 between 2005 and 2014. This number includes 786 malignant cancers and 68 benign and borderline behavior neoplasms. It was not possible to assign a group code of the ICCC system to 16 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 Idaho incidence rates presented were calculated per million population, and are averages for the period 2005 through 2014 (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 838 cases that met the study criteria were diagnosed among Idaho residents aged less than 20 years between 2005 and 2014, yielding an overall age-adjusted rate of 179.4 cases per million population. In comparison, the SEER rate for Whites was 213.1 cases per million population for 2012-2014. 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 27th highest among states in pediatric (ages 0-19) cancer incidence 2005-2013.[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 0.5% per year in Idaho from 1975 to 2014. This parallels the long term increase observed in SEER Regions from 1973 to 2014 of about 0.7% per year.

Health District 4 had a statistically significantly higher rate of pediatric cancer incidence and Health District 2 had statistically significantly lower rate. For Health District 4, the significantly higher overall rate was due to higher rates for melanomas and thyroid carcinomas. Lower rates of these cancers in Health Districts 2 and 6 may indicate underreporting. CDRI is working to increase reporting of cancer cases by pathology laboratories and physicians statewide. The overall lower rate of pediatric cancer incidence in Health District 2 may be due to cases being treated in Washington State and not being reported to Idaho via interstate data exchange. CDRI is exploring alternate means for capturing information on any such cases. For no other ICCC major classification category was there a statistically significant difference between any health district and the state of Idaho.

From 2005 to 2015, 100 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 1975-2014, 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 50th highest among states and the District of Columbia in pediatric (ages 0-19) cancer mortality 2005-2014.[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. Some children have a hereditary predisposition of cancer. A 2015 study that tested children and adolescents with cancer revealed that 8.5% had predisposing gene mutations: 16.7% in patients with non-CNS solid tumors, 8.6% in patients with CNS tumors, and 4.4% in patients with leukemia.[7]

Largely because of improvements in therapy for pediatric cancers, there has been a decrease in mortality rates over time. Data collected by CDRI for 2015 show that over 20% of pediatric patients participated in clinical trials, a rate much higher than that for adults (2%).

While over 80% of children diagnosed with cancer survive at least five 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.[8,9] Education, intervention programs, and ongoing follow-up care are important for improving health and economic outcomes associated with cancer survivorship in this population.

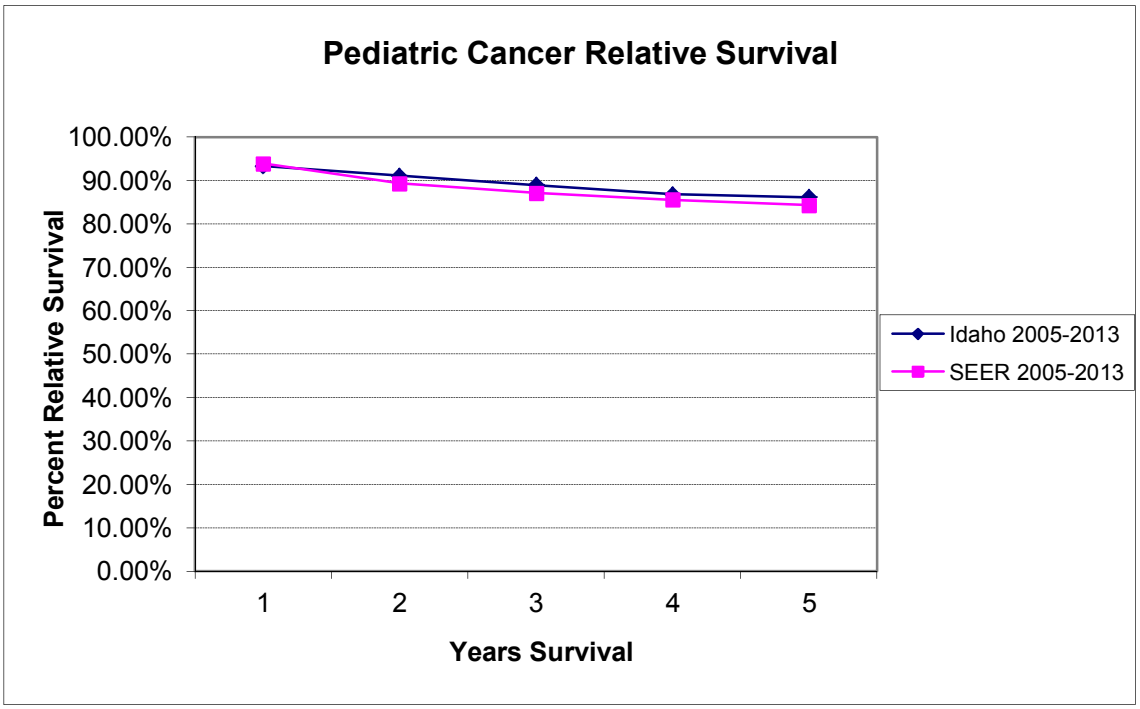
Pediatric Cancer Incidence in Idaho and SEER Regions (Ages 0-19)

Site/Type of Cancer	Idaho 2005-2014			SEER 2012-2014		
	Rate	Cases	Pop	Rate	Cases	Pop
All Sites Combined	179.4	838	4,659,165	213.1	5,074	23,732,108
I Leukemias, myeloproliferative & myelodysplastic diseases	43.4	205	4,659,165	52.6	1,254	23,732,108
I(a) Lymphoid leukemias	33.9	160	4,659,165	39.7	947	23,732,108
I(b) Acute myeloid leukemias	5.9	28	4,659,165	8.4	199	23,732,108
I(c) Chronic myeloproliferative diseases	1.3	6	4,659,165	1.3	32	23,732,108
I(d) Myelodysplastic syndrome and other myeloproliferative	1.2	6	4,659,165	1.5	36	23,732,108
I(e) Unspecified and other specified leukemias	1.1	5	4,659,165	1.7	40	23,732,108
II Lymphomas and reticuloendothelial neoplasms	23.0	106	4,659,165	32.2	765	23,732,108
II(a) Hodgkin lymphomas	11.4	52	4,659,165	12.9	307	23,732,108
II(b) Non-Hodgkin lymphomas (except Burkitt lymphoma)	7.6	35	4,659,165	10.5	248	23,732,108
II(c) Burkitt lymphoma	1.5	7	4,659,165	2.7	64	23,732,108
II(d) Miscellaneous lymphoreticular neoplasms	2.3	11	4,659,165	5.8	137	23,732,108
II(e) Unspecified lymphomas	0.2	1	4,659,165	0.4	9	23,732,108
III CNS and misc intracranial and intraspinal neoplasms	40.5	189	4,659,165	48.6	1,155	23,732,108
III(a) Ependymomas and choroid plexus tumor	3.3	16	4,659,165	4.2	99	23,732,108
III(b) Astrocytomas	17.8	83	4,659,165	17.2	407	23,732,108
III(c) Intracranial and intraspinal embryonal tumors	4.9	23	4,659,165	5.2	125	23,732,108
III(d) Other gliomas	3.2	15	4,659,165	5.4	128	23,732,108
III(e) Other specified intracranial/intraspinal neoplasms	10.4	48	4,659,165	15.6	371	23,732,108
III(f) Unspecified intracranial and intraspinal neoplasms	0.9	4	4,659,165	1.1	25	23,732,108
IV Neuroblastoma and other peripheral nervous cell tumors	8.9	43	4,659,165	8.9	214	23,732,108
IV(a) Neuroblastoma and ganglioneuroblastoma	8.7	42	4,659,165	8.6	207	23,732,108
IV(b) Other peripheral nervous cell tumors	0.2	1	4,659,165	0.3	7	23,732,108
V Retinoblastoma	2.7	13	4,659,165	3.0	72	23,732,108
VI Renal tumors	6.7	32	4,659,165	5.9	141	23,732,108
VI(a) Nephroblastoma and other nonepithelial renal tumors	6.0	29	4,659,165	5.3	126	23,732,108
VI(b) Renal carcinomas	0.7	3	4,659,165	0.6	15	23,732,108
VI(c) Unspecified malignant renal tumors	0.0	0	4,659,165	0.0	0	23,732,108
VII Hepatic tumors	2.3	11	4,659,165	2.6	62	23,732,108
VII(a) Hepatoblastoma	1.7	8	4,659,165	2.0	48	23,732,108
VII(b) Hepatic carcinomas	0.7	3	4,659,165	0.6	13	23,732,108
VII(c) Unspecified malignant hepatic tumors	0.0	0	4,659,165	0.0	1	23,732,108
VIII Malignant bone tumors	9.0	41	4,659,165	9.2	218	23,732,108
VIII(a) Osteosarcomas	5.9	27	4,659,165	5.1	120	23,732,108
VIII(b) Chondrosarcomas	0.0	0	4,659,165	0.3	6	23,732,108
VIII(c) Ewing tumor and related sarcomas of bone	2.6	12	4,659,165	3.3	78	23,732,108
VIII(d) Other specified malignant bone tumors	0.4	2	4,659,165	0.5	11	23,732,108
VIII(e) Unspecified malignant bone tumors	0.0	0	4,659,165	0.1	3	23,732,108
IX Soft tissue and other extraosseous sarcomas	11.1	52	4,659,165	12.0	284	23,732,108
IX(a) Rhabdomyosarcomas	3.8	18	4,659,165	4.5	106	23,732,108
IX(b) Fibrosarcomas, peripheral nerve & other fibrous	1.3	6	4,659,165	1.1	27	23,732,108
IX(c) Kaposi sarcoma	0.0	0	4,659,165	0.0	0	23,732,108
IX(d) Other specified soft tissue sarcomas	3.7	17	4,659,165	5.3	125	23,732,108
IX(e) Unspecified soft tissue sarcomas	2.4	11	4,659,165	1.1	26	23,732,108
X Germ cell & trophoblastic tumors & neoplasms of gonads	11.5	53	4,659,165	13.7	327	23,732,108
X(a) Intracranial & intraspinal germ cell tumors	1.3	6	4,659,165	2.3	55	23,732,108
X(b) Extracranial & extragonadal germ cell tumors	1.5	7	4,659,165	1.6	38	23,732,108
X(c) Malignant gonadal germ cell tumors	8.3	38	4,659,165	8.9	214	23,732,108
X(d) Gonadal carcinomas	0.4	2	4,659,165	0.5	13	23,732,108
X(e) Other and unspecified malignant gonadal tumors	0.0	0	4,659,165	0.3	7	23,732,108

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

Site/Type of Cancer	Idaho 2005-2014			SEER 2012-2014		
	Rate	Cases	Pop	Rate	Cases	Pop
XI Other malignant epithelial neoplasms and melanomas	19.7	90	4,659,165	23.9	570	23,732,108
XI(a) Adrenocortical carcinomas	0.0	0	4,659,165	0.3	7	23,732,108
XI(b) Thyroid carcinomas	9.2	42	4,659,165	12.4	295	23,732,108
XI(c) Nasopharyngeal carcinomas	0.0	0	4,659,165	0.3	8	23,732,108
XI(d) Malignant melanomas	6.5	30	4,659,165	5.0	119	23,732,108
XI(e) Skin carcinomas	0.0	0	4,659,165	0.1	2	23,732,108
XI(f) Other and unspecified carcinomas	3.9	18	4,659,165	5.8	139	23,732,108
XII Other and unspecified malignant neoplasms	0.6	3	4,659,165	0.5	12	23,732,108
XII(a) Other specified malignant tumors	0.6	3	4,659,165	0.2	5	23,732,108
XII(b) Other unspecified malignant tumors	0.0	0	4,659,165	0.3	7	23,732,108
Not classified by ICCC or in situ	6.9	32	4,659,165	7.8	185	23,732,108

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

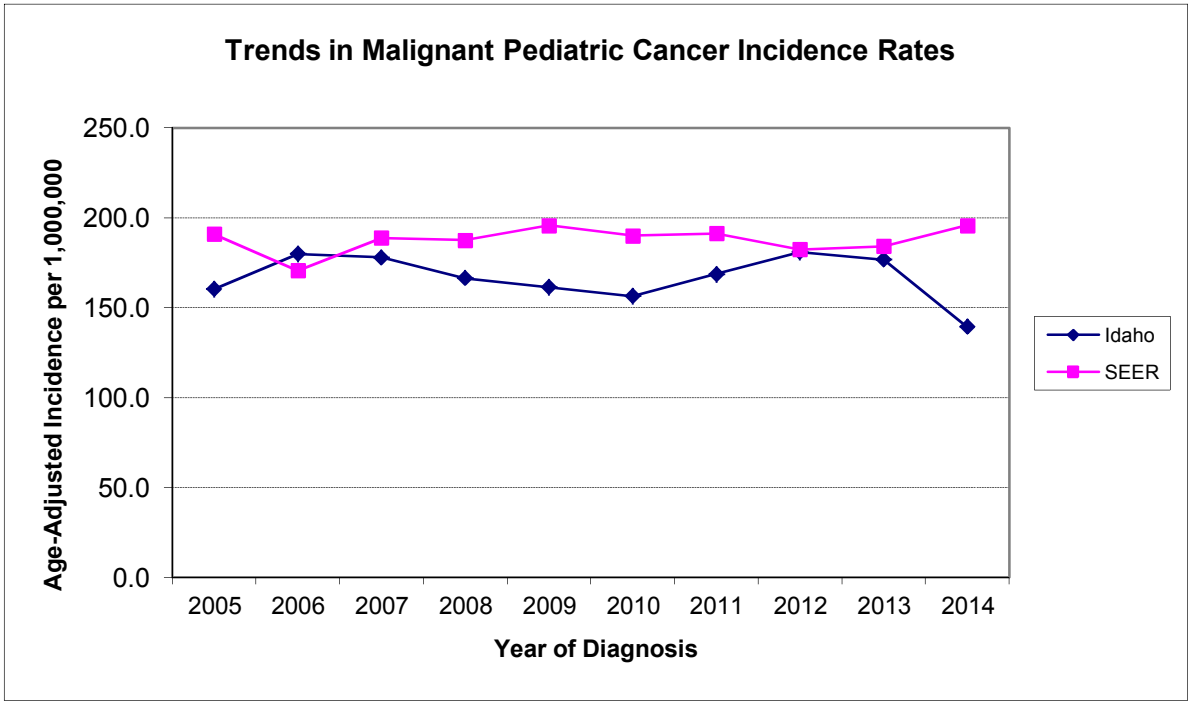
Site/Type of Cancer	Idaho 2005-2013			SEER 2005-2013		
	Cases	% Survival	95% CI	Cases	% Survival	95% CI
All Sites Combined	632	86.1%	83.0% - 88.8%	13,313	84.3%	83.6% - 85.0%
I Leukemias, myeloproliferative & myelodysplastic diseases	124	88.5%	81.3% - 93.1%	3,668	84.5%	83.2% - 85.8%
II Lymphomas and reticuloendothelial neoplasms	83	97.4%	88.8% - 99.4%	1,871	92.8%	91.4% - 94.0%
III CNS and misc intracranial and intraspinal neoplasms	119	80.2%	70.7% - 86.9%	2,220	74.4%	72.4% - 76.3%
IV Neuroblastoma and other peripheral nervous cell tumors	42	83.7%	65.9% - 92.7%	616	80.7%	76.8% - 84.0%
V Retinoblastoma	11	100.3%	+ - +	232	96.2%	92.0% - 98.2%
VI Renal tumors	29	82.2%	58.2% - 93.1%	459	89.1%	85.5% - 91.9%
VII Hepatic tumors	11	53.2%	20.9% - 77.5%	210	74.4%	67.2% - 80.2%
VIII Malignant bone tumors	36	69.4%	50.2% - 82.4%	666	71.2%	67.2% - 74.8%
IX Soft tissue and other extraosseous sarcomas	46	76.9%	60.9% - 87.0%	866	73.7%	70.3% - 76.8%
X Germ cell & trophoblastic tumors & neoplasms of gonads	48	89.8%	76.6% - 95.8%	1,026	93.2%	91.3% - 94.7%
XI Other malignant epithelial neoplasms and melanomas	80	93.4%	84.4% - 97.3%	1,450	93.7%	92.2% - 95.0%
XII Other and unspecified malignant neoplasms	3	+	+ - +	29	92.7%	73.1% - 98.2%

+ The statistic could not be calculated.

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

Year of Diagnosis	Idaho 2005-2014			SEER 2005-2014		
	Rate	Cases	Pop	Rate	Cases	Pop
Total	166.9	780	4,659,165	187.8	15,195	80,330,078
2005	160.3	71	439,230	191.0	1,573	8,166,849
2006	180.0	82	449,429	170.7	1,401	8,130,741
2007	177.9	83	460,456	188.9	1,546	8,099,740
2008	166.5	78	468,822	187.6	1,535	8,093,508
2009	161.5	77	472,822	195.8	1,596	8,075,140
2010	156.6	75	475,171	190.2	1,538	8,033,259
2011	168.8	80	473,740	191.4	1,542	7,998,733
2012	181.0	85	471,782	182.4	1,458	7,953,056
2013	176.8	83	472,335	184.2	1,461	7,911,855
2014	139.3	66	475,378	195.8	1,545	7,867,197

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, 2005-2014

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	166.5	134.2 - 204.2	92	103.8	68.0 - 151.8	27	188.1	159.5 - 220.3	154
I Leukemias, myeloproliferative & myelodysplastic diseases	39.0	24.2 - 59.7	21	17.2	4.7 - 43.5	4	46.3	32.9 - 63.4	39
II Lymphomas and reticuloendothelial neoplasms	24.4	13.3 - 41.1	14	19.9	6.4 - 46.8	5	28.9	18.3 - 43.3	23
III CNS and misc intracranial and intraspinal neoplasms	26.9	15.0 - 44.4	15	33.4	15.1 - 64.4	9	41.3	28.6 - 57.8	34
IV Neuroblastoma and other peripheral nervous cell tumors	11.4	4.2 - 24.7	6	8.4	1.0 - 29.9	2	6.9	2.5 - 15.2	6
V Retinoblastoma	1.9	0.0 - 10.4	1	0.0	0.0 - 15.0	0	2.3	0.3 - 8.6	2
VI Renal tumors	9.3	3.0 - 21.7	5	3.0	0.1 - 19.9	1	10.3	4.7 - 19.7	9
VII Hepatic tumors	7.5	2.1 - 19.2	4	0.0	0.0 - 15.0	0	0.0	0.0 - 4.5	0
VIII Malignant bone tumors	5.3	1.1 - 15.7	3	8.5	1.0 - 30.2	2	7.5	2.7 - 16.2	6
IX Soft tissue and other extraosseous sarcomas	12.5	5.0 - 25.8	7	4.3	0.1 - 23.1	1	4.9	1.3 - 12.5	4
X Germ cell & trophoblastic tumors & neoplasms of gonads	10.6	3.9 - 23.3	6	6.1	0.7 - 24.5	2	20.5	11.7 - 33.1	16
XI Other malignant epithelial neoplasms and melanomas	17.5	8.4 - 32.4	10	3.0	0.1 - 19.9	1	19.1	10.7 - 31.4	15
XII Other and unspecified malignant neoplasms	0.0	0.0 - 6.8	0	0.0	0.0 - 15.0	0	0.0	0.0 - 4.5	0

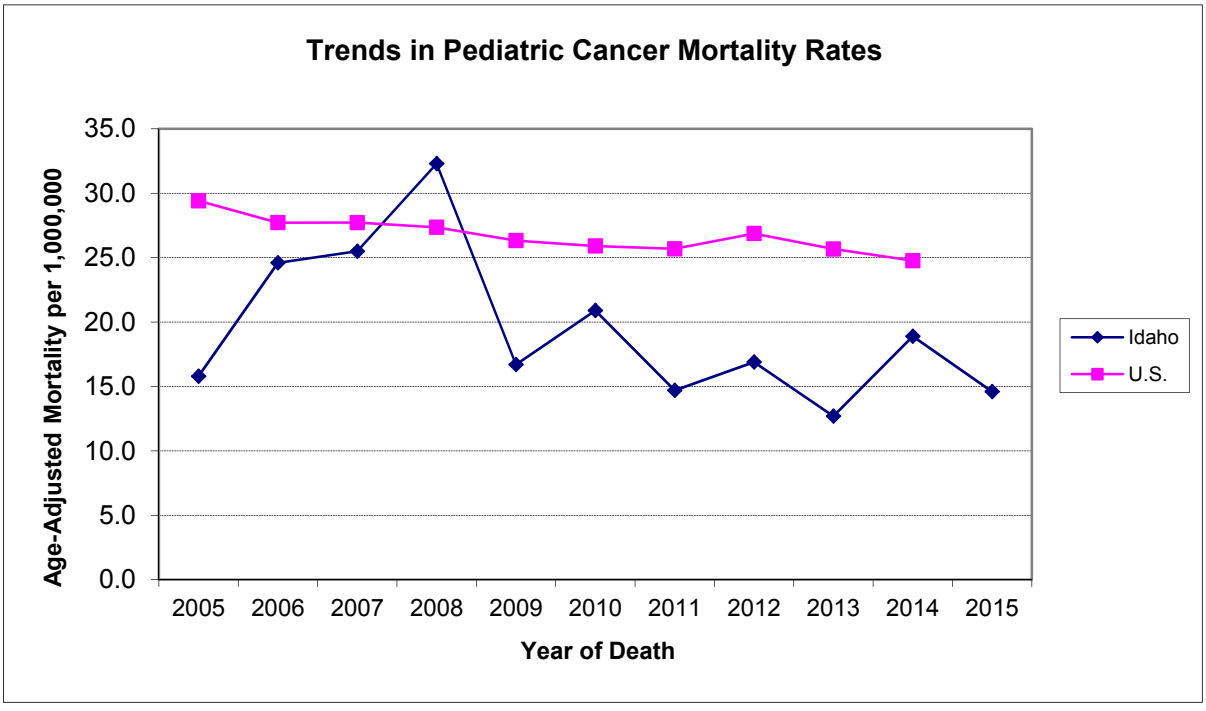
Site/Type of Cancer	Health District 4			Health District 5			Health District 6			Health District 7		
	Rate	95% CI	Cases	Rate	95% CI	Cases	Rate	95% CI	Cases	Rate	95% CI	Cases
All Sites Combined	212.5	187.4 - 239.9	261	178.1	145.0 - 216.5	101	172.7	139.5 - 211.4	94	157.1	128.8 - 189.8	108
I Leukemias…	55.2	42.9 - 69.9	69	50.2	33.6 - 72.1	29	25.3	13.8 - 42.6	14	42.4	28.3 - 60.9	29
II Lymphomas…	25.7	17.4 - 36.4	31	23.2	12.3 - 39.6	13	19.0	9.1 - 34.9	10	13.2	6.0 - 25.1	9
III CNS and…	37.6	27.6 - 50.0	47	51.0	34.1 - 73.2	29	54.0	36.2 - 77.5	29	38.2	24.9 - 56.0	26
IV Neuroblastoma…	11.1	6.1 - 18.6	14	4.9	1.0 - 14.5	3	12.2	4.9 - 25.3	7	6.8	2.2 - 16.1	5
V Retinoblastoma	1.6	0.2 - 5.8	2	1.6	0.0 - 9.4	1	7.0	1.9 - 18.0	4	4.1	0.8 - 12.1	3
VI Renal tumors	5.6	2.2 - 11.5	7	3.4	0.4 - 12.3	2	5.2	1.1 - 15.5	3	7.2	2.3 - 16.8	5
VII Hepatic tumors	4.7	1.7 - 10.4	6	0.0	0.0 - 6.4	0	0.0	0.0 - 6.7	0	1.6	0.0 - 8.6	1
VIII Malignant bone tumors	9.8	5.1 - 17.1	12	16.5	7.6 - 31.2	9	9.6	3.1 - 22.1	5	6.2	1.7 - 15.7	4
IX Soft tissue…	16.4	10.0 - 25.3	20	5.6	1.2 - 16.1	3	17.7	8.5 - 32.6	10	9.9	4.0 - 20.5	7
X Germ cell…	11.0	5.8 - 18.7	13	7.2	1.9 - 18.2	4	13.3	5.4 - 27.3	7	6.9	2.2 - 16.2	5
XI Other malig epithelial…	33.8	24.2 - 46.0	40	14.7	6.3 - 28.7	8	7.6	2.1 - 19.3	4	17.8	9.2 - 31.0	12
XII Other/unspecified…	0.0	0.0 - 3.0	0	0.0	0.0 - 6.4	0	1.7	0.0 - 9.9	1	2.8	0.3 - 10.3	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 2005-2015			U.S. 2005-2014		
	Rate	Deaths	Pop	Rate	Deaths	Pop
Total	19.4	100	5,136,573	26.7	22,169	826,436,872
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	475,171	25.9	2,160	83,185,451
2011	14.7	7	473,740	25.7	2,135	82,840,327
2012	16.9	8	471,782	26.9	2,221	82,500,154
2013	12.7	6	472,335	25.7	2,116	82,277,037
2014	18.9	9	475,378	24.8	2,038	82,156,139
2015	14.6	7	477,408			

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



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