

PEDIATRIC CANCER IN IDAHO 2004-2013

April 2016

A Publication of the



ACKNOWLEDGMENTS

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.

CDRI would also like to thank the Division of Public Health, Idaho Department of Health and Welfare, and the Comprehensive Cancer Alliance for Idaho for their continued partnership and for using CDRI data as a tool in cancer control and prevention.

We acknowledge the Centers for Disease Control and Prevention for its support of CDRI under cooperative agreement 1U58DP003882. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

SUGGESTED CITATION:

Johnson CJ, Carson SL. *Pediatric Cancer in Idaho, 2004-2013*. Boise, ID: Cancer Data Registry of Idaho; April 2016.

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Pediatric Cancer in Idaho, 2004-2013

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 2004 and 2013 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 877 cases were diagnosed among Idaho resident children under the age of 20 between 2004 and 2013. This number includes 791 malignant cancers and 70 benign and borderline behavior neoplasms. It was not possible to assign a group code of the ICCC system to 18 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 2004 through 2013 (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 843 cases that met the study criteria were diagnosed among Idaho residents aged less than 20 years between 2004 and 2013, yielding an overall age-adjusted rate of 182.0 cases per million population. In comparison, the SEER rate for Whites was 209.6 cases per million population for 2011-2013. 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 35th highest among states in pediatric (ages 0-19) cancer incidence 2004-2012.² 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 37th 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 2013. This parallels the long term increase observed in SEER Regions from 1973 to 2013 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 2004 to 2014, 109 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 1975-2013, 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 49th highest among states and the District of Columbia in pediatric (ages 0-19) cancer mortality 2004-2013.⁶

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 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.^{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 2004-2013			SEER 2011-2013		
	Rate	Cases	Pop	Rate	Cases	Pop
All Sites Combined	182.0	843	4,612,476	209.6	5,027	23,863,995
I Leukemias, myeloproliferative & myelodysplastic diseases	44.5	208	4,612,476	53.3	1,278	23,863,995
I(a) Lymphoid leukemias	34.2	160	4,612,476	40.5	970	23,863,995
I(b) Acute myeloid leukemias	6.6	31	4,612,476	8.6	206	23,863,995
I(c) Chronic myeloproliferative diseases	1.1	5	4,612,476	1.5	37	23,863,995
I(d) Myelodysplastic syndrome and other myeloproliferative	1.5	7	4,612,476	1.2	30	23,863,995
I(e) Unspecified and other specified leukemias	1.1	5	4,612,476	1.5	35	23,863,995
II Lymphomas and reticuloendothelial neoplasms	21.0	96	4,612,476	31.2	747	23,863,995
II(a) Hodgkin lymphomas	10.8	49	4,612,476	13.3	320	23,863,995
II(b) Non-Hodgkin lymphomas (except Burkitt lymphoma)	6.6	30	4,612,476	9.4	223	23,863,995
II(c) Burkitt lymphoma	1.5	7	4,612,476	2.6	61	23,863,995
II(d) Miscellaneous lymphoreticular neoplasms	1.9	9	4,612,476	5.7	135	23,863,995
II(e) Unspecified lymphomas	0.2	1	4,612,476	0.3	8	23,863,995
III CNS and misc intracranial and intraspinal neoplasms	41.9	194	4,612,476	47.2	1,128	23,863,995
III(a) Ependymomas and choroid plexus tumor	3.2	15	4,612,476	4.4	105	23,863,995
III(b) Astrocytomas	17.7	82	4,612,476	16.1	383	23,863,995
III(c) Intracranial and intraspinal embryonal tumors	6.2	29	4,612,476	5.6	135	23,863,995
III(d) Other gliomas	3.2	15	4,612,476	5.0	120	23,863,995
III(e) Other specified intracranial/intraspinal neoplasms	10.9	50	4,612,476	14.9	358	23,863,995
III(f) Unspecified intracranial and intraspinal neoplasms	0.6	3	4,612,476	1.1	27	23,863,995
IV Neuroblastoma and other peripheral nervous cell tumors	9.0	43	4,612,476	8.8	213	23,863,995
IV(a) Neuroblastoma and ganglioneuroblastoma	8.7	42	4,612,476	8.6	208	23,863,995
IV(b) Other peripheral nervous cell tumors	0.2	1	4,612,476	0.2	5	23,863,995
V Retinoblastoma	2.5	12	4,612,476	3.3	79	23,863,995
VI Renal tumors	6.5	31	4,612,476	5.6	136	23,863,995
VI(a) Nephroblastoma and other nonepithelial renal tumors	5.9	28	4,612,476	5.1	123	23,863,995
VI(b) Renal carcinomas	0.7	3	4,612,476	0.5	13	23,863,995
VI(c) Unspecified malignant renal tumors	0.0	0	4,612,476	0.0	0	23,863,995
VII Hepatic tumors	2.5	12	4,612,476	2.8	67	23,863,995
VII(a) Hepatoblastoma	1.9	9	4,612,476	2.2	53	23,863,995
VII(b) Hepatic carcinomas	0.7	3	4,612,476	0.5	13	23,863,995
VII(c) Unspecified malignant hepatic tumors	0.0	0	4,612,476	0.0	1	23,863,995
VIII Malignant bone tumors	9.0	41	4,612,476	9.1	217	23,863,995
VIII(a) Osteosarcomas	6.2	28	4,612,476	5.2	125	23,863,995
VIII(b) Chondrosarcomas	0.0	0	4,612,476	0.1	2	23,863,995
VIII(c) Ewing tumor and related sarcomas of bone	2.4	11	4,612,476	3.2	77	23,863,995
VIII(d) Other specified malignant bone tumors	0.4	2	4,612,476	0.4	9	23,863,995
VIII(e) Unspecified malignant bone tumors	0.0	0	4,612,476	0.2	4	23,863,995
IX Soft tissue and other extraosseous sarcomas	11.2	52	4,612,476	11.4	272	23,863,995
IX(a) Rhabdomyosarcomas	3.5	16	4,612,476	4.6	111	23,863,995
IX(b) Fibrosarcomas, peripheral nerve & other fibrous	1.5	7	4,612,476	0.8	18	23,863,995
IX(c) Kaposi sarcoma	0.0	0	4,612,476	0.0	1	23,863,995
IX(d) Other specified soft tissue sarcomas	4.1	19	4,612,476	5.1	121	23,863,995
IX(e) Unspecified soft tissue sarcomas	2.2	10	4,612,476	0.9	21	23,863,995
X Germ cell & trophoblastic tumors & neoplasms of gonads	12.4	57	4,612,476	13.6	327	23,863,995
X(a) Intracranial & intraspinal germ cell tumors	1.3	6	4,612,476	2.1	50	23,863,995
X(b) Extracranial & extragonadal germ cell tumors	1.1	5	4,612,476	1.5	35	23,863,995
X(c) Malignant gonadal germ cell tumors	9.4	43	4,612,476	9.3	225	23,863,995
X(d) Gonadal carcinomas	0.7	3	4,612,476	0.5	13	23,863,995
X(e) Other and unspecified malignant gonadal tumors	0.0	0	4,612,476	0.2	4	23,863,995

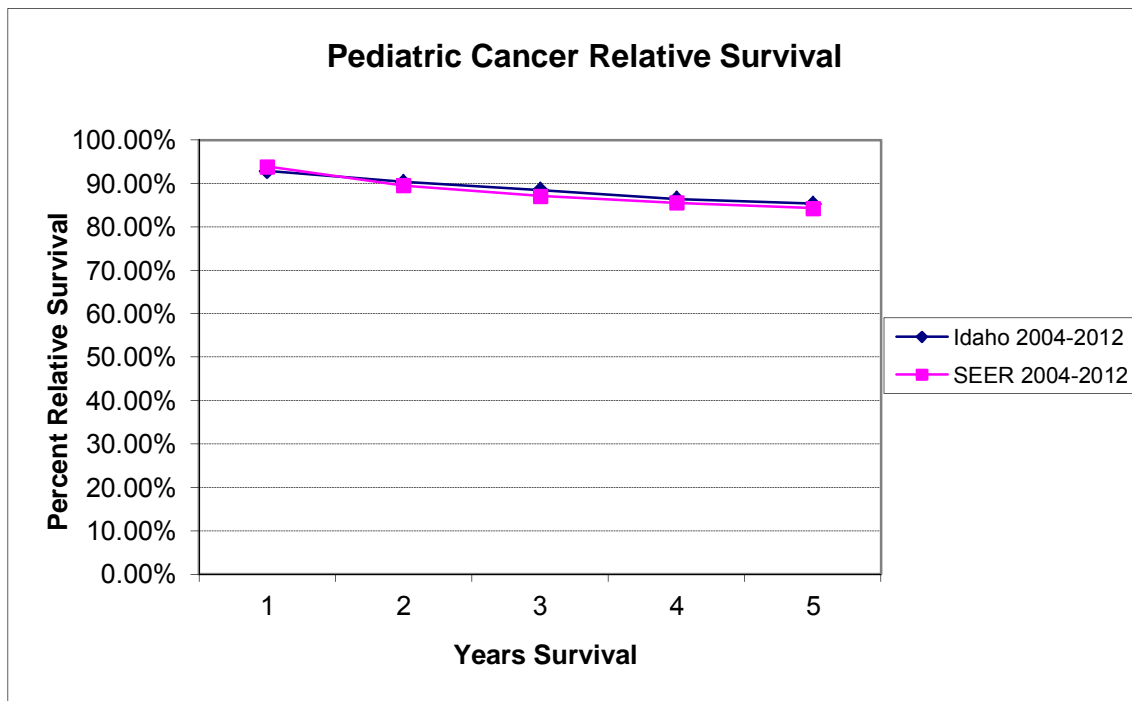
Pediatric Cancer Incidence in Idaho and SEER Regions (Ages 0-19) - continued

Site/Type of Cancer	Idaho 2004-2013			SEER 2011-2013		
	Rate	Cases	Pop	Rate	Cases	Pop
XI Other malignant epithelial neoplasms and melanomas	20.7	94	4,612,476	22.7	547	23,863,995
XI(a) Adrenocortical carcinomas	0.0	0	4,612,476	0.3	6	23,863,995
XI(b) Thyroid carcinomas	9.5	43	4,612,476	11.3	274	23,863,995
XI(c) Nasopharyngeal carcinomas	0.0	0	4,612,476	0.2	6	23,863,995
XI(d) Malignant melanomas	7.5	34	4,612,476	5.1	124	23,863,995
XI(e) Skin carcinomas	0.0	0	4,612,476	0.0	1	23,863,995
XI(f) Other and unspecified carcinomas	3.7	17	4,612,476	5.7	136	23,863,995
XII Other and unspecified malignant neoplasms	0.6	3	4,612,476	0.7	16	23,863,995
XII(a) Other specified malignant tumors	0.6	3	4,612,476	0.4	10	23,863,995
XII(b) Other unspecified malignant tumors	0.0	0	4,612,476	0.2	6	23,863,995
Not classified by ICCC or in situ	7.4	34	4,612,476	7.3	175	23,863,995

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

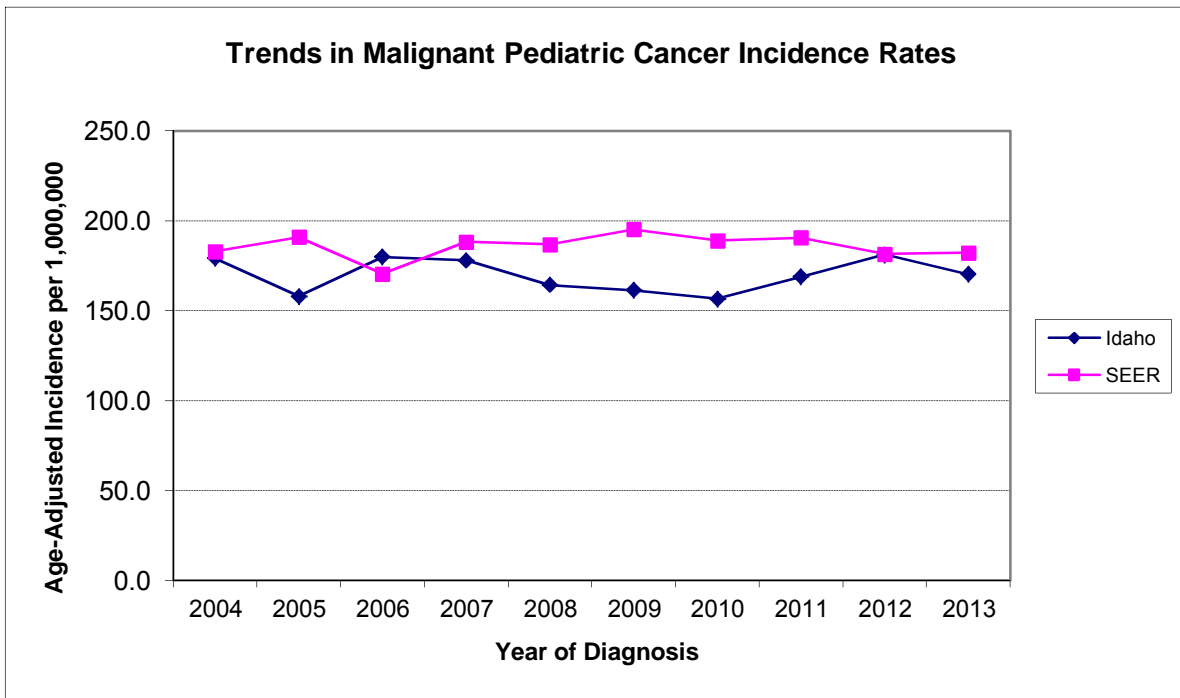
Site/Type of Cancer	Idaho 2004-2012			SEER 2004-2012		
	Cases	% Survival	95% CI	Cases	% Survival	95% CI
All Sites Combined	638	85.3%	82.1% - 88.0%	13,333	84.3%	83.6% - 85.0%
I Leukemias, myeloproliferative & myelodysplastic diseases	131	86.2%	78.8% - 91.1%	3,688	84.6%	83.3% - 85.9%
II Lymphomas and reticuloendothelial neoplasms	79	95.1%	84.6% - 98.5%	1,880	92.3%	90.8% - 93.5%
III CNS and misc intracranial and intraspinal neoplasms	117	82.2%	73.4% - 88.4%	2,211	74.5%	72.5% - 76.4%
IV Neuroblastoma and other peripheral nervous cell tumors	39	81.7%	62.0% - 91.8%	616	80.8%	77.0% - 84.1%
V Retinoblastoma	12	87.8%	37.8% - 98.3%	243	96.5%	92.6% - 98.3%
VI Renal tumors	28	89.0%	62.3% - 97.2%	454	87.8%	84.0% - 90.7%
VII Hepatic tumors	11	63.1%	28.8% - 84.3%	211	73.5%	66.3% - 79.4%
VIII Malignant bone tumors	33	67.7%	47.8% - 81.4%	665	72.6%	68.6% - 76.1%
IX Soft tissue and other extraosseous sarcomas	47	75.9%	60.5% - 86.0%	873	73.5%	70.0% - 76.6%
X Germ cell & trophoblastic tumors & neoplasms of gonads	51	88.5%	75.7% - 94.8%	1,049	93.4%	91.6% - 94.9%
XI Other malignant epithelial neoplasms and melanomas	88	91.7%	83.0% - 96.1%	1,413	94.1%	92.6% - 95.3%
XII Other and unspecified malignant neoplasms	2	+	+ - +	30	96.8%	76.4% - 99.6%

+ The statistic could not be calculated.

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

Year of Diagnosis	Idaho 2004-2013			SEER 2004-2013		
	Rate	Cases	Pop	Rate	Cases	Pop
Total	169.8	787	4,612,476	185.9	15,108	80,675,890
2004	179.2	78	429,860	183.0	1,512	8,213,472
2005	158.1	70	439,230	191.0	1,573	8,166,849
2006	180.0	82	449,429	170.5	1,399	8,130,741
2007	177.9	83	460,456	188.4	1,542	8,099,740
2008	164.3	77	468,822	186.8	1,529	8,093,508
2009	161.4	77	472,822	195.3	1,592	8,075,140
2010	156.6	75	474,853	189.1	1,529	8,032,445
2011	168.9	80	473,430	190.6	1,535	7,997,388
2012	181.2	85	471,434	181.6	1,451	7,952,586
2013	170.3	80	472,140	182.2	1,446	7,914,021

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, 2004-2013

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	176.3	143.0 - 215.2	97	115.0	77.2 - 165.0	30	199.7	170.0 - 233.1	161
I Leukemias, myeloproliferative & myelodysplastic diseases	44.9	28.7 - 66.7	24	21.4	7.0 - 49.5	5	45.7	32.4 - 62.8	38
II Lymphomas and reticuloendothelial neoplasms	26.3	14.7 - 43.5	15	22.9	8.3 - 50.6	6	25.5	15.6 - 39.4	20
III CNS and misc intracranial and intraspinal neoplasms	28.9	16.5 - 46.9	16	37.6	17.8 - 70.0	10	45.6	32.1 - 62.8	37
IV Neuroblastoma and other peripheral nervous cell tumors	11.5	4.2 - 24.9	6	8.4	1.0 - 30.0	2	6.9	2.5 - 15.2	6
V Retinoblastoma	1.9	0.0 - 10.4	1	0.0	0.0 - 15.0	0	1.2	0.0 - 6.7	1
VI Renal tumors	9.4	3.0 - 21.8	5	3.0	0.1 - 19.8	1	10.4	4.8 - 19.8	9
VII Hepatic tumors	7.6	2.1 - 19.3	4	0.0	0.0 - 15.0	0	0.0	0.0 - 4.5	0
VIII Malignant bone tumors	5.4	1.1 - 15.8	3	8.4	1.0 - 30.0	2	7.6	2.8 - 16.5	6
IX Soft tissue and other extrasosseous sarcomas	10.6	3.9 - 23.2	6	4.2	0.1 - 23.0	1	7.4	2.7 - 16.2	6
X Germ cell & trophoblastic tumors & neoplasms of gonads	10.7	3.9 - 23.3	6	6.0	0.7 - 24.4	2	24.6	14.8 - 38.4	19
XI Other malignant epithelial neoplasms and melanomas	19.3	9.6 - 34.7	11	3.0	0.1 - 19.8	1	24.7	14.8 - 38.4	19
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	207.8	182.9 - 235.1	252	175.9	142.9 - 214.2	99	180.0	146.1 - 219.4	98	153.9	125.8 - 186.4	105
I Leukemias...	54.9	42.6 - 69.6	68	50.6	33.9 - 72.7	29	28.9	16.5 - 47.0	16	41.7	27.6 - 60.2	28
II Lymphomas...	19.4	12.3 - 29.1	23	25.3	13.8 - 42.3	14	19.0	9.1 - 34.9	10	10.2	4.1 - 21.0	7
III CNS and...	38.8	28.6 - 51.5	48	49.7	33.0 - 71.8	28	54.0	36.1 - 77.5	29	38.0	24.8 - 55.8	26
IV Neuroblastoma...	11.1	6.1 - 18.7	14	4.9	1.0 - 14.7	3	12.2	4.9 - 25.3	7	6.9	2.2 - 16.3	5
V Retinoblastoma	1.6	0.2 - 5.8	2	3.3	0.4 - 12.1	2	5.3	1.1 - 15.6	3	4.1	0.8 - 12.2	3
VI Renal tumors	5.6	2.3 - 11.6	7	3.4	0.4 - 12.5	2	3.6	0.4 - 13.0	2	7.2	2.3 - 16.9	5
VII Hepatic tumors	5.6	2.2 - 11.5	7	0.0	0.0 - 6.5	0	0.0	0.0 - 6.7	0	1.7	0.0 - 8.7	1
VIII Malignant bone tumors	9.2	4.6 - 16.4	11	16.6	7.6 - 31.3	9	9.6	3.1 - 22.2	5	7.9	2.6 - 18.2	5
IX Soft tissue...	15.9	9.6 - 24.8	19	5.6	1.2 - 16.1	3	21.1	10.9 - 37.0	12	7.1	2.3 - 16.7	5
X Germ cell...	11.2	6.0 - 19.1	13	5.4	1.1 - 15.6	3	17.0	7.8 - 32.2	9	6.9	2.2 - 16.2	5
XI Other malign epithelial...	34.4	24.6 - 46.9	40	11.1	4.1 - 24.0	6	7.6	2.1 - 19.3	4	19.4	10.3 - 33.2	13
XII Other/unspecified...	0.0	0.0 - 3.0	0	0.0	0.0 - 6.5	0	1.7	0.0 - 9.9	1	2.8	0.3 - 10.4	2

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

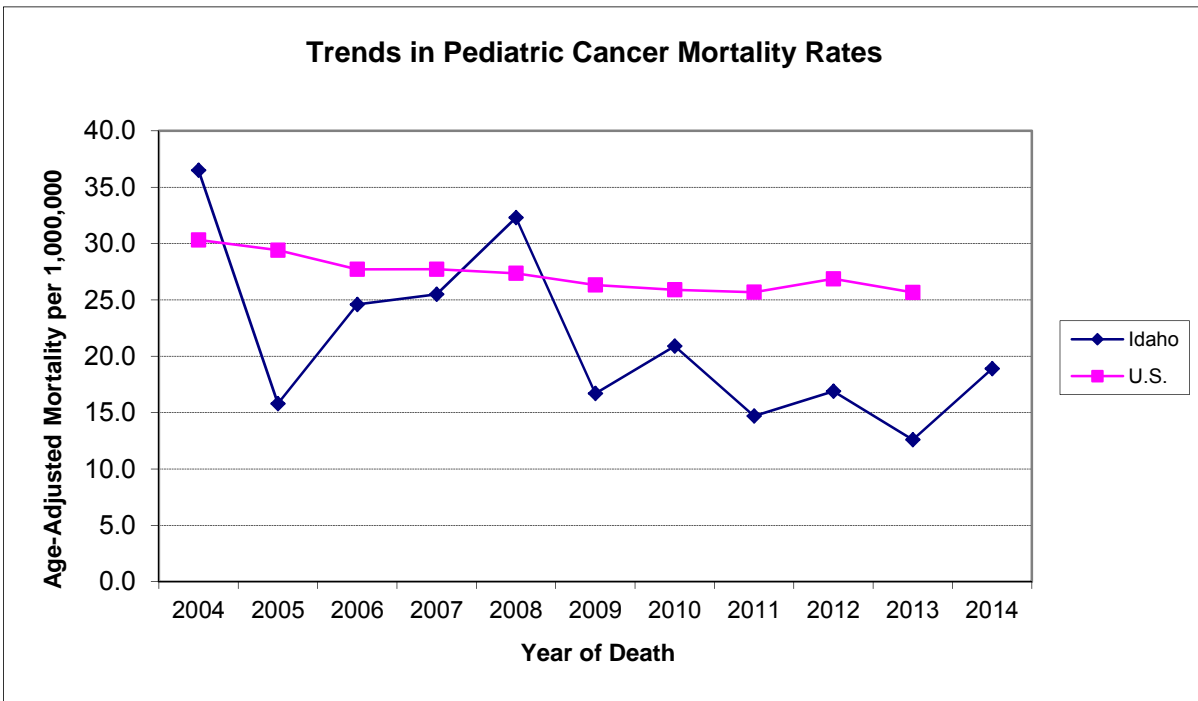
Confidence intervals (CIs) are 95% for rates.

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 2004-2014			U.S. 2004-2013		
	Rate	Deaths	Pop	Rate	Deaths	Pop
Total	21.4	109	5,087,270	27.3	22,612	826,057,684
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	474,853	25.9	2,160	83,185,431
2011	14.7	7	473,430	25.7	2,135	82,840,576
2012	16.9	8	471,434	26.9	2,221	82,503,131
2013	12.6	6	472,140	25.7	2,116	82,296,428
2014	18.9	9	474,794			

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



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