PEDIATRIC CANCER IN IDAHO 2009-2018

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CDRI Cancer Data Registry of Idaho

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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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CANCER DATA REGISTRY OF IDAHO
P.O. Box 1278
Boise, Idaho 83701-1278
208-489-1380 (phone)
https://www.idcancer.org

Idaho Hospital Association

IDAHO DEPARTMENT OF HEALTH & WELFARE

Pediatric Cancer in Idaho, 2009-2018

Although relatively rare in comparison with cancer in older adults, cancer is the second leading cause of death in persons aged 1-19 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 publishes cancer incidence and survival data from population-based cancer registries covering approximately 35 percent of the US population and is considered the standard for quality among cancer registries around the world. NPCR supports central cancer registries in 46 states, the District of Columbia, Puerto Rico, the U.S. Pacific Island Jurisdictions, and the U.S. Virgin Islands. These data represent 97% 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 2009 and 2018 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 943 cases were diagnosed among Idaho resident children under the age of 20 between 2009 and 2018. This number includes 838 malignant cancers and 87 benign and borderline behavior neoplasms. Forty-two cases were excluded from analysis because they are not defined in the ICCC system (24 cases) or they were in situ, which are not included in the ICCC system (18 cases). 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 2009 through 2018 (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 NPCR and SEER Incidence Public Use Data File.[2]

RESULTS

A total of 901 cases that met the study criteria were diagnosed among Idaho residents aged less than 20 years between 2009 and 2018, yielding an overall age-adjusted rate of 188.7 cases per million population (Table 1). In comparison, the SEER rate was 206.9 cases per million population for 2009-2018. The distribution of pediatric cancers by ICCC grouping was very similar for Idaho and SEER Regions. For no ICCC major classification 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 36th highest among states in pediatric (ages 0-19) cancer incidence 2009-2017.[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 41st in pediatric cancer incidence.

Over 85% 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 (Table 2 and Figure 1). For no ICCC major classification category, nor overall, was there a statistically significant difference in 5-year relative survival between Idaho and SEER cases.

Table 3 and Figure 2 show malignant pediatric cancer incidence in Idaho and SEER Regions by year of diagnosis for 2009 to 2018. Idaho incidence rates are slightly lower than SEER rates for most years and show more variability year-to-year due to smaller numbers of cases. Pediatric cancer incidence increased at a rate of about 0.6% per year in Idaho from 1975 to 2018. This parallels the long-term increase observed in SEER Regions from 1975 to 2018 of about 0.8% per year.

Table 4 shows pediatric cancer incidence in Idaho by health district for the ICCC major classification categories for the period 2009 to 2018. For all sites combined, no health district had a statistically significantly higher or lower rate than the state of Idaho, based on the comparison of 95% confidence intervals. Health Districts 5 and 7 had statistically significantly lower rates of lymphomas and reticuloendothelial neoplasms. Health District 1 had a statistically significantly higher incidence rate of hepatic tumors. Health District 3 had a statistically significantly lower rate of ICCC classification category IX – soft tissue and other extraosseous sarcomas, and Health District 6 had a significantly higher rate. For no other ICCC major classification category was there a statistically significant difference between any health district and the state of Idaho.

From 2009 to 2019, 112 of Idaho's children aged 0-19 died from some form of cancer (Table 5).[5] The leading types of cancer mortality were brain and other central nervous system and leukemia (data not shown). While pediatric cancer incidence rates have increased over time, pediatric cancer mortality rates have decreased about 2% per year during 1975-2018 in Idaho and the U.S.[5,6] Figure 3 depicts trends in pediatric cancer mortality rates from 2009 to 2019. 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. Nonetheless, pediatric cancer mortality increased significantly in Idaho from 2009-2019. Idaho ranked 47th highest (fifth lowest) among states and the District of Columbia in pediatric (ages 0-19) cancer mortality 2009-2018.[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 2018 show that about 13% of pediatric patients participated in clinical trials, a rate much higher than that for adults (4%).

While over 85% of children diagnosed with cancer survive at least five years, studies show 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 childhood 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.

Table 1. Pediatric (Ages 0-19) Cancer Incidence in Idaho and SEER Regions

Site/Type of Cancer	Idaho 2009-2018			SEER 2009-2018		
	Rate	Cases	Pop	Rate	Cases	Pop
All Sites Combined	188.7	901	4,784,765	206.9	23,138	111,333,182
I Leukemias, myeloproliferative & myelodysplastic diseases	44.8	216	4,784,765	50.4	5,638	111,333,182
I(a) Lymphoid leukemias	35.8	173	4,784,765	36.5	4,081	111,333,182
I(b) Acute myeloid leukemias	5.8	28	4,784,765	8.7	970	111,333,182
I(c) Chronic myeloproliferative diseases	1.3	6	4,784,765	2.1	238	111,333,182
I(d) Myelodysplastic syndrome and other myeloproliferative	0.6	3	4,784,765	1.6	179	111,333,182
I(e) Unspecified and other specified leukemias	1.3	6	4,784,765	1.5	170	111,333,182
II Lymphomas and reticuloendothelial neoplasms	26.5	126	4,784,765	30.1	3,363	111,333,182
II(a) Hodgkin lymphomas	11.5	54	4,784,765	12.0	1,342	111,333,182
II(b) Non-Hodgkin lymphomas (except Burkitt lymphoma)	9.6	46	4,784,765	10.6	1,184	111,333,182
II(c) Burkitt lymphoma	1.3	6	4,784,765	2.5	280	111,333,182
II(d) Miscellaneous lymphoreticular neoplasms	3.9	19	4,784,765	4.6	514	111,333,182
II(e) Unspecified lymphomas	0.2	1	4,784,765	0.4	43	111,333,182
III CNS and misc intracranial and intraspinal neoplasms	43.5	208	4,784,765	48.3	5,386	111,333,182
III(a) Ependymomas and choroid plexus tumor	3.5	17	4,784,765	4.3	485	111,333,182
III(b) Astrocytomas	18.6	89	4,784,765	15.9	1,767	111,333,182
III(c) Intracranial and intraspinal embryonal tumors	4.6	22	4,784,765	5.8	644	111,333,182
III(d) Other gliomas	3.7	18	4,784,765	5.2	575	111,333,182
III(e) Other specified intracranial/intraspinal neoplasms	11.4	54	4,784,765	15.9	1,784	111,333,182
III(f) Unspecified intracranial and intraspinal neoplasms	1.7	8	4,784,765	1.2	131	111,333,182
IV Neuroblastoma and other peripheral nervous cell tumors	8.5	41	4,784,765	8.3	932	111,333,182
IV(a) Neuroblastoma and ganglioneuroblastoma	8.3	40	4,784,765	8.0	901	111,333,182
IV(b) Other peripheral nervous cell tumors	0.2	1	4,784,765	0.3	31	111,333,182
V Retinoblastoma	2.1	10	4,784,765	3.1	351	111,333,182
VI Renal tumors	6.6	32	4,784,765	6.7	754	111,333,182
VI(a) Nephroblastoma and other nonepithelial renal tumors	5.8	28	4,784,765	6.1	681	111,333,182
VI(b) Renal carcinomas	0.9	4	4,784,765	0.6	72	111,333,182
VI(c) Unspecified malignant renal tumors	0.0	0	4,784,765	0.0	1	111,333,182
VII Hepatic tumors	2.7	13	4,784,765	2.7	303	111,333,182
VII(a) Hepatoblastoma	1.9	9	4,784,765	2.0	230	111,333,182
VII(b) Hepatic carcinomas	0.8	4	4,784,765	0.6	72	111,333,182
VII(c) Unspecified malignant hepatic tumors	0.0	0	4,784,765	0.0	1	111,333,182
VIII Malignant bone tumors	7.8	37	4,784,765	9.1	1,009	111,333,182
VIII(a) Osteosarcomas	5.3	25	4,784,765	5.4	600	111,333,182
VIII(b) Chondrosarcomas	0.0	0	4,784,765	0.3	31	111,333,182
VIII(c) Ewing tumor and related sarcomas of bone	1.5	7	4,784,765	2.9	317	111,333,182
VIII(d) Other specified malignant bone tumors	1.1	5	4,784,765	0.4	43	111,333,182
VIII(e) Unspecified malignant bone tumors	0.0	0	4,784,765	0.2	18	111,333,182
IX Soft tissue and other extraosseous sarcomas	11.5	55	4,784,765	12.2	1,364	111,333,182
IX(a) Rhabdomyosarcomas	3.7	18	4,784,765	4.4	489	111,333,182
IX(b) Fibrosarcomas, peripheral nerve & other fibrous	0.8	4	4,784,765	1.3	147	111,333,182
IX(c) Kaposi sarcoma	0.0	0	4,784,765	0.1	7	111,333,182
IX(d) Other specified soft tissue sarcomas	4.6	22	4,784,765	5.1	565	111,333,182
IX(e) Unspecified soft tissue sarcomas	2.3	11	4,784,765	1.4	156	111,333,182
X Germ cell & trophoblastic tumors & neoplasms of gonads	13.2	62	4,784,765	13.1	1,473	111,333,182
X(a) Intracranial & intraspinal germ cell tumors	1.9	9	4,784,765	2.5	280	111,333,182
X(b) Extracranial & extragonadal germ cell tumors	1.3	6	4,784,765	1.6	177	111,333,182
X(c) Malignant gonadal germ cell tumors	9.4	44	4,784,765	8.2	924	111,333,182
X(d) Gonadal carcinomas	0.4	2	4,784,765	0.5	57	111,333,182
X(e) Other and unspecified malignant gonadal tumors	0.2	1	4,784,765	0.3	35	111,333,182

Table 1. Pediatric (Ages 0-19) Cancer Incidence in Idaho and SEER Regions - continued

Site/Type of Cancer	Idaho 2009-2018			SEER 2009-2018		
	Rate	Cases	Pop	Rate	Cases	Pop
XI Other malignant epithelial neoplasms and melanomas	21.3	100	4,784,765	22.3	2,500	111,333,182
XI(a) Adrenocortical carcinomas	0.6	3	4,784,765	0.2	25	111,333,182
XI(b) Thyroid carcinomas	10.0	47	4,784,765	10.6	1,188	111,333,182
XI(c) Nasopharyngeal carcinomas	0.0	0	4,784,765	0.5	57	111,333,182
XI(d) Malignant melanomas	4.7	22	4,784,765	3.9	438	111,333,182
XI(e) Skin carcinomas	0.0	0	4,784,765	0.1	14	111,333,182
XI(f) Other and unspecified carcinomas	6.0	28	4,784,765	6.9	778	111,333,182
XII Other and unspecified malignant neoplasms	0.2	1	4,784,765	0.6	65	111,333,182
XII(a) Other specified malignant tumors	0.2	1	4,784,765	0.4	42	111,333,182
XII(b) Other unspecified malignant tumors	0.0	0	4,784,765	0.2	23	111,333,182
Not classified by ICCC or in situ	8.9	42	4,784,765	8.3	928	111,333,182

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

Figure 1. Pediatric Cancer Relative Survival

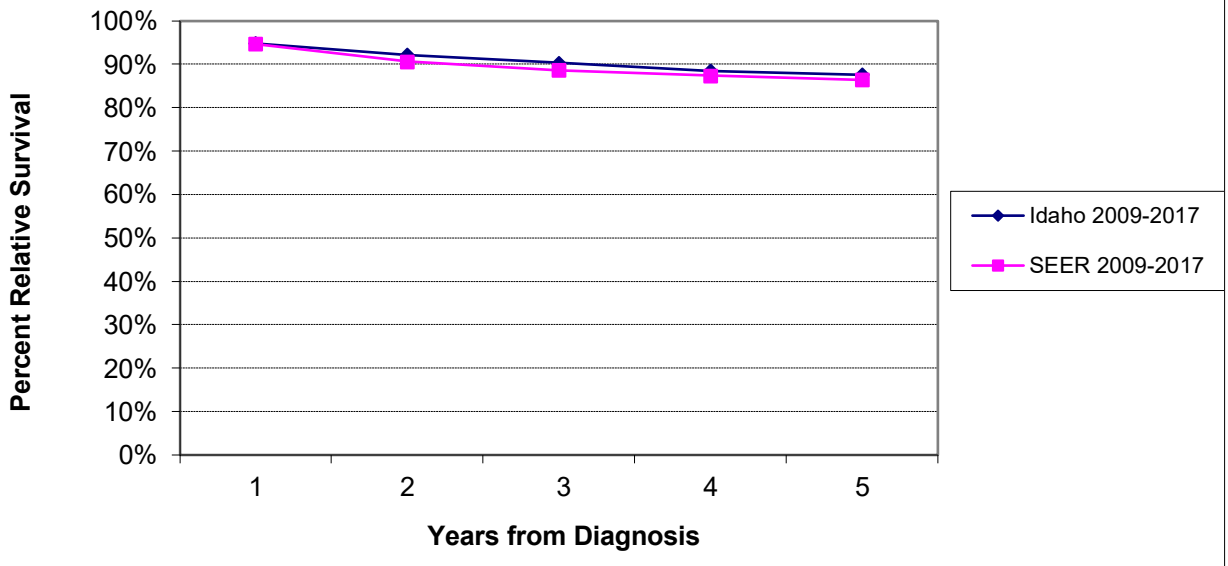


Table 2. Five-Year Relative Cancer Survival by Major ICCC Classification Category

Site/Type of Cancer	Idaho 2009-2017			SEER 2009-2017		
	Cases	% Survival	95% CI	Cases	% Survival	95% CI
All Sites Combined	747	87.7%	84.8% - 90.0%	13,922	86.4%	85.8% - 87.0%
I Leukemias, myeloproliferative & myelodysplastic diseases	185	91.9%	86.5% - 95.2%	3,798	86.1%	84.9% - 87.3%
II Lymphomas and reticuloendothelial neoplasms	112	96.5%	90.4% - 98.7%	2,202	94.2%	93.1% - 95.2%
III CNS and misc intracranial and intraspinal neoplasms	134	81.6%	73.3% - 87.6%	2,209	76.5%	74.6% - 78.4%
IV Neuroblastoma and other peripheral nervous cell tumors	39	81.2%	61.8% - 91.4%	584	83.9%	80.3% - 87.0%
V Retinoblastoma	9	100.6%	+ - +	223	95.1%	90.3% - 97.6%
VI Renal tumors	26	81.8%	57.9% - 92.9%	479	92.5%	89.3% - 94.7%
VII Hepatic tumors	12	73.4%	37.9% - 90.7%	195	78.8%	72.0% - 84.1%
VIII Malignant bone tumors	31	55.3%	34.3% - 72.0%	665	71.7%	67.6% - 75.3%
IX Soft tissue and other extraosseous sarcomas	52	81.7%	65.9% - 90.6%	834	76.2%	72.8% - 79.2%
X Germ cell & trophoblastic tumors & neoplasms of gonads	58	91.7%	80.5% - 96.6%	998	93.3%	91.4% - 94.8%
XI Other malignant epithelial neoplasms and melanomas	88	94.0%	83.9% - 97.9%	1,698	95.5%	94.3% - 96.5%
XII Other and unspecified malignant neoplasms	1	+	+ - +	37	91.4%	75.1% - 97.2%

+ The statistic could not be calculated.

Table 3. Malignant Pediatric (Ages 0-19) Cancer Incidence in Idaho and SEER Regions

Year of Diagnosis	Idaho 2009-2018			SEER 2009-2018		
	Rate	Cases	Pop	Rate	Cases	Pop
Total	176.3	842	4,784,765	188.2	21,048	111,333,182
2009	163.5	78	472,822	184.4	2,103	11,294,405
2010	160.9	77	475,084	186.5	2,116	11,267,150
2011	170.7	81	473,836	185.2	2,093	11,223,784
2012	191.3	90	472,242	183.4	2,061	11,178,767
2013	185.0	87	472,827	182.7	2,043	11,147,397
2014	162.5	77	475,405	193.7	2,159	11,110,641
2015	188.8	90	478,085	200.4	2,229	11,085,473
2016	195.4	94	483,243	193.2	2,143	11,061,154
2017	184.7	90	489,002	185.9	2,054	11,019,198
2018	159.0	78	492,219	186.7	2,047	10,945,213

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

Figure 2. Trends in Malignant Pediatric Cancer Incidence Rates

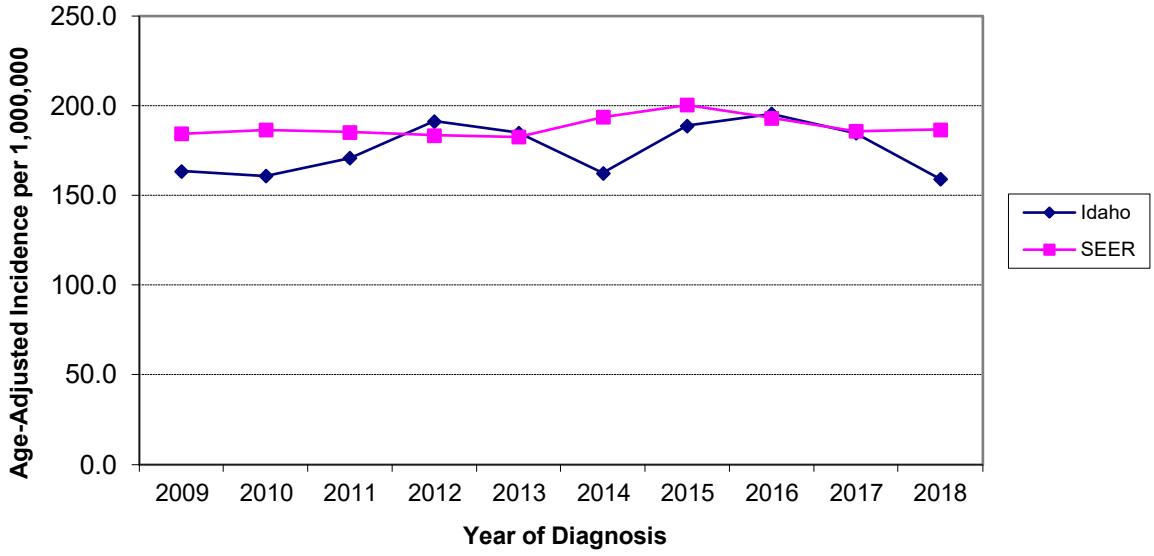


Table 4. Pediatric (Ages 0-19) Cancer Incidence in Idaho by Health District, Major Classification Categories, 2009-2018

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	188.0	153.8 - 227.6	105	146.8	104.0 - 201.6	39	190.9	162.5 - 222.8	161
I Leukemias, myeloproliferative & myelodysplastic diseases	45.2	29.2 - 66.7	25	20.2	6.5 - 47.2	5	46.4	33.2 - 63.2	40
II Lymphomas and reticuloendothelial neoplasms	28.2	16.1 - 45.9	16	25.2	9.3 - 54.6	6	34.6	23.1 - 49.6	29
III CNS and misc intracranial and intraspinal neoplasms	32.0	19.0 - 50.7	18	43.9	22.5 - 77.5	12	44.8	31.7 - 61.5	38
IV Neuroblastoma and other peripheral nervous cell tumors	9.3	3.0 - 21.5	5	16.6	4.5 - 42.3	4	5.9	1.9 - 13.8	5
V Retinoblastoma	0.0	0.0 - 6.7	0	0.0	0.0 - 14.8	0	2.5	0.3 - 8.8	2
VI Renal tumors	5.4	1.1 - 15.9	3	3.1	0.1 - 20.0	1	4.6	1.3 - 11.8	4
VII Hepatic tumors	9.3	3.0 - 21.5	5	0.0	0.0 - 14.8	0	0.0	0.0 - 4.4	0
VIII Malignant bone tumors	7.2	1.9 - 18.4	4	4.3	0.1 - 23.2	1	10.7	4.9 - 20.3	9
IX Soft tissue and other extraosseous sarcomas	10.6	3.9 - 23.2	6	8.4	1.0 - 29.9	2	3.5	0.7 - 10.4	3
X Germ cell & trophoblastic tumors & neoplasms of gonads	15.9	7.3 - 30.3	9	9.4	1.9 - 29.6	3	18.4	10.3 - 30.3	15
XI Other malignant epithelial neoplasms and melanomas	24.9	13.6 - 41.9	14	15.7	5.1 - 38.4	5	19.5	11.1 - 31.6	16
XII Other and unspecified malignant neoplasms	0.0	0.0 - 6.7	0	0.0	0.0 - 14.8	0	0.0	0.0 - 4.4	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	204.7	180.6 - 231.1	261	174.6	142.4 - 211.8	103	207.0	170.4 - 249.1	112	170.2	141.1 - 203.6	120
I Leukemias…	51.7	40.0 - 65.8	66	51.6	35.0 - 73.3	31	34.5	20.8 - 54.0	19	42.0	28.3 - 60.0	30
II Lymphomas…	36.2	26.5 - 48.3	46	8.7	2.8 - 20.1	5	26.2	14.3 - 43.9	14	14.3	6.8 - 26.2	10
III CNS and…	39.4	29.4 - 51.9	51	51.9	35.3 - 73.7	31	50.4	33.2 - 73.4	27	44.4	30.2 - 63.0	31
IV Neuroblastoma…	10.4	5.5 - 17.8	13	4.8	1.0 - 14.2	3	14.5	6.3 - 28.6	8	4.1	0.8 - 12.0	3
V Retinoblastoma	1.6	0.2 - 5.8	2	3.3	0.4 - 12.0	2	5.4	1.1 - 15.8	3	1.3	0.0 - 7.6	1
VI Renal tumors	7.1	3.2 - 13.4	9	6.4	1.8 - 16.6	4	10.7	3.9 - 23.4	6	6.8	2.2 - 16.0	5
VII Hepatic tumors	4.7	1.7 - 10.3	6	0.0	0.0 - 6.3	0	1.8	0.0 - 10.0	1	1.5	0.0 - 8.1	1
VIII Malignant bone tumors	6.2	2.7 - 12.2	8	10.2	3.8 - 22.3	6	7.6	2.1 - 19.4	4	7.2	2.3 - 16.7	5
IX Soft tissue…	14.0	8.3 - 22.2	18	6.9	1.9 - 17.6	4	23.8	12.6 - 40.7	13	12.4	5.7 - 23.6	9
X Germ cell…	11.2	6.1 - 18.7	14	9.0	2.9 - 20.7	5	19.1	9.2 - 35.0	10	8.3	3.0 - 18.1	6
XI Other malig epithelial…	22.1	14.7 - 32.0	28	21.9	11.3 - 38.0	12	11.2	4.1 - 24.4	6	27.9	16.8 - 43.4	19
XII Other/unspecified…	0.0	0.0 - 2.9	0	0.0	0.0 - 6.3	0	1.8	0.0 - 10.3	1	0.0	0.0 - 5.1	0

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

Confidence intervals (CIs) are 95% for rates.

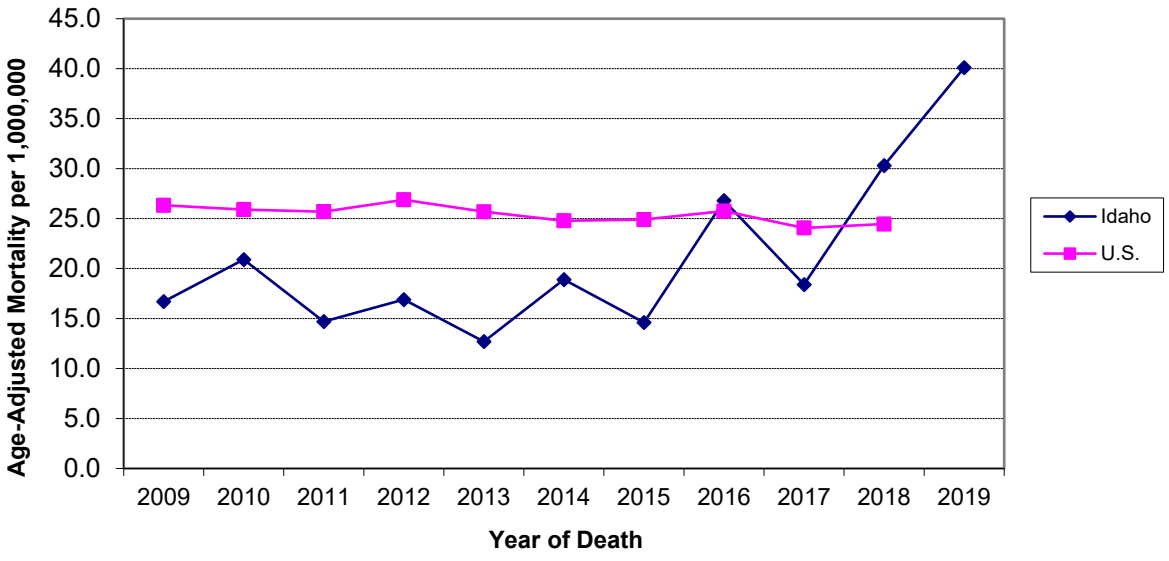
Statistical Note: Rates based upon 10 or fewer cases (numerator) should be interpreted with caution.

Table 5. Pediatric (Ages 0-19) Cancer Mortality in Idaho and the U.S.

Year of Death	Idaho 2009-2019			U.S. 2009-2018		
	Rate	Deaths	Pop	Rate	Deaths	Pop
Total	21.3	112	5,280,938	25.4	21,022	824,371,032
2009	16.7	8	472,822	26.3	2,200	83,280,391
2010	20.9	10	475,084	25.9	2,160	83,181,903
2011	14.7	7	473,836	25.7	2,135	82,827,710
2012	16.9	8	472,242	26.9	2,221	82,483,581
2013	12.7	6	472,827	25.7	2,116	82,246,791
2014	18.9	9	475,405	24.8	2,038	82,108,087
2015	14.6	7	478,085	24.9	2,047	82,082,905
2016	26.8	13	483,243	25.7	2,118	82,110,969
2017	18.4	9	489,002	24.1	1,977	82,066,030
2018	30.3	15	492,219	24.5	2,010	81,982,665
2019	40.1	20	496,173			

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

Figure 3. Trends in Pediatric Cancer Mortality Rates



References

1. Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER Research Data, 13 Registries, Nov 2020 Sub (1992-2018) - Linked To County Attributes - Time Dependent (1990-2018) Income/Rurality, 1969-2019 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, released April 2021, based on the November 2020 submission.
2. National Program of Cancer Registries and Surveillance, Epidemiology, and End Results SEER*Stat Database: NPCR and SEER Incidence - U.S. Cancer Statistics 2001-2017 Public Use Research Database, 2019 Submission (2001-2017), United States Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute. Released June 2020. Accessed at www.cdc.gov/cancer/uscs/public-use.
3. International Classification of Childhood Cancer (ICCC). ICCC based on ICD-O-3/WHO 2008. Accessed at https://seer.cancer.gov/iccc/iccc-who2008.html on May 19, 2021.
4. Surveillance Research Program, National Cancer Institute SEER*Stat software (https://seer.cancer.gov/seerstat/) version 8.3.9.
5. Final 2019 mortality data. Bureau of Vital Records and Health Statistics, Idaho Department of Health and Welfare; October 2020.
6. Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Mortality - All COD, Aggregated With State, Total U.S. (1969-2018) <Katrina/Rita Population Adjustment>, National Cancer Institute, DCCPS, Surveillance Research Program, released May 2020. Underlying mortality data provided by NCHS (www.cdc.gov/nchs).
7. Zhang J, Walsh MF, Wu G, Edmonson MN, Gruber TA, Easton J et al. Germline mutations in predisposition genes in pediatric cancer. N Engl J Med. 2015 Dec 10;373(24):2336-2346. doi: 10.1056/NEJMoa1508054. Epub 2015 Nov 18.
8. Hudson MM, Ness JJ, Gurney JG, Mulrooney DA, Chemaitilly W, Krull KR et al. Clinical ascertainment of health outcomes among adults treated for childhood cancer. JAMA. 2013;309(22):2371-2381. doi:10.1001/jama.2013.6296.
9. Guy GP, Yabroff KR, Ekwueme DU, Wilder Smith A, Dowling EC, Rechis R et al. Estimating the health and economic burden of cancer among those diagnosed as adolescents and young adults. Health Aff. 2014;33(6):1024-1031. doi: 10.1377/hlthaff.2013.1425.