Neuro-Oncology

Neuro-Oncology 17:iv1–iv62, 2015.
doi:10.1093/neuonc/nov189

CBTRUS Statistical Report: Primary Brain and Central Nervous System Tumors Diagnosed in the United States in 2008-2012

Quinn T. Ostrom M.A., M.P.H.[1,2*], Haley Gittleman M.S.[1,2*], Jordonna Fulop R.N.[1], Max Liu[3], Rachel Blanda[4], Courtney Kromer B.A.[5], Yingli Wolinsky Ph.D., M.B.A.[1,2], Carol Kruchko B.A.[2], and Jill S. Barnholtz-Sloan Ph.D.[1,2]

[1]*Case Comprehensive Cancer Center, Case Western Reserve University School of Medicine, Cleveland, OH USA*
[2]*Central Brain Tumor Registry of the United States, Hinsdale, IL USA*
[3]*Solon High School, Solon, OH USA*
[4]*Georgetown University, Washington D.C. USA*
[5]*Case Western Reserve University School of Medicine, Cleveland, OH USA*
*Contributed equally to this Report.

Introduction

The objective of the *CBTRUS Statistical Report: Primary Brain and Central Nervous System Tumors Diagnosed in the United States in 2008-2012* is to provide a comprehensive summary of the current descriptive epidemiology of primary brain and central nervous system (CNS) tumors in the United States (US) population. CBTRUS obtained the latest available data on all newly diagnosed primary brain and CNS tumors from the Centers for Disease Control and Prevention (CDC), National Program of Cancer Registries (NPCR), and the National Cancer Institute (NCI), Surveillance, Epidemiology and End Results (SEER) program for diagnosis years 2008-2012. Incidence counts and rates of primary malignant and non-malignant brain and CNS tumors are documented by histology, gender, age, race and Hispanic ethnicity. Mortality and relative survival rates for selected malignant histologies calculated using SEER data for the period 1995-2012 are also presented.

Background

CBTRUS is a unique professional research organization that focuses exclusively on providing quality statistical data on the population-based incidence of primary brain and CNS tumors in the US (for more information on CBTRUS see: http://www.cbtrus.org/aboutus.html). CBTRUS was incorporated as a non-profit 501(c)(3) in 1992 following a study conducted by the American Brain Tumor Association (ABTA) to determine the feasibility of a central registry focused on primary brain and CNS tumors in the US.

CBTRUS is currently the only population-based site-specific registry in the US that works in partnership with a public cancer surveillance organization, the CDC's NPCR, and from which data are directly received under a special agreement. This agreement permits transfer of data through the National Program of Central Registries Cancer Surveillance System (NPCR-CSS) Submission Specifications mechanism,[1] the system utilized for collection of central (state) cancer data as mandated in 1992 by Public Law 102-515, the Cancer Registries Amendment Act.[2] This mandate was expanded to include non-malignant brain tumors diagnosed in 2004 and later with the 2002 passage of Public Law 107–260.[3] CBTRUS researchers combine the NPCR data with data from the SEER program[4] of the NCI, which was established for national cancer surveillance in the early 1970s. All data from NPCR and SEER originate from tumor registrars who adhere to the Uniform Data Standards (UDS) for malignant and non-malignant brain and CNS tumors as directed by the North American Association of Cancer Registries (NAACCR) (http://www.naaccr.org). Along with the UDS, there are quality control checks and a system for rating each central cancer registry (CCR) to further insure that these data are reported as accurately and completely as possible. As a surveillance partner, CBTRUS can, therefore, report high quality data on brain and CNS tumors with histological specificity useful to the communities it serves. Its database is comprised of the largest histology-specific aggregation of population-based data limited to the incidence of primary brain and CNS tumors in the US. Aggregate information on all cancers from all CCR in the United States, including primary brain and CNS, is available from the *United States Cancer Statistics*.[5]

For this eighteenth statistical report and fourth report published as a supplement to *Neuro-Oncology*, the official journal of the Society for Neuro-Oncology (http://www.soc-neuro-onc.org), CBTRUS continues its past efforts to provide the most up-to-date population-based incidence rates for all primary brain and CNS tumors by histology, age, gender, race, and Hispanic ethnicity. These data have been organized by clinically relevant histology groupings and reflect the *2007 WHO Classification of Tumours of the Central Nervous System*.[6,7] These data provide important information for allocation and planning of specialty healthcare services such as clinical trials, disease prevention and control programs, and research activities. These data may also lead to clues that will stimulate research into the causes of this terrible group of diseases.

Technical Notes

Data Collection

CBTRUS does not collect data directly from patients' medical records. As noted, data for CBTRUS analyses come from the NPCR and SEER programs. By law, all primary malignant and non-malignant brain tumors are reportable diseases. Hence, tumor registrars in treatment centers collect these data and send this information to CCR in their states where they are collated and de-identified and sent to NPCR and SEER. Brain and CNS tumors are reported using the site definition described in Public Law 107-260.[3] On an annual basis, NPCR secures permission from CCR to release their data on brain and CNS tumors to CBTRUS. CCR plays an essential role in the collection process, diagrammatically presented in Figure 1. These data are population-based and, therefore, by definition, represent a comprehensive documentation of all cancers diagnosed within a geographic region over a period of time.

CBTRUS obtained incidence data from 51 CCR (46 NPCR and 5 SEER) that include cases of malignant and non-malignant (benign and uncertain) primary brain and CNS tumors. The population-based CCR include 50 state registries and the District of Columbia. **Data were requested for all newly-diagnosed primary malignant and non-malignant tumors from 2008 to 2012 at any of the following anatomic sites: brain, meninges, spinal cord, cranial nerves, and other parts of the central nervous system, pituitary and pineal glands, and olfactory tumors of the nasal cavity** (Table 1).[8]

NPCR provided data on 350,531 primary brain and CNS tumors diagnosed from 2008 to 2012. An additional 14,705 primary brain and CNS tumor case records for the time period were obtained from SEER. These data were combined into a single data set for analyses. A total of 8,378 records (2.3%) were deleted from the final analytic data set for one or more of the following reasons: invalid site/histology combination, duplicate records that included a less accurate reporting source than microscopic confirmation (e.g. radiographic versus microscopic confirmation), duplicate records for bilateral vestibular schwannoma or meningioma, duplicate record for recurrent disease, and errors in time sequence of diagnosis. The final analytic data set included 356,858 records from all 51 population-based CCR.

Age-adjusted incidence rates per 100,000 population for the entire US for selected other cancers were obtained from the United States Cancer Statistics (USCS),[5] produced by the CDC and the NCI, via CDC Wide-ranging Online Data for Epidemiologic Research (WONDER), for the purpose of comparison with brain and CNS tumor incidence rates.[9] This database includes both NPCR and SEER data and represents approximately 100% of the US population.

Survival data for malignant brain and CNS tumors were obtained from 18 SEER registries for the years 1995 to 2012. This dataset provides population-based information for approximately 26% of the US population,[10] and is a subset of the data used for the incidence calculations presented in this report. Survival information derived from active patient follow-up is not available in the data that CBTRUS receives from NPCR registries, so the SEER data are used for the generation of these tables.

Mortality data used in this report are from the National Center for Health Statistics and include deaths where primary brain or CNS tumor was listed as cause of death on the death certificate for individuals from all 50 states and the District of Columbia. These data were obtained via SEER*Stat[11] (for malignant brain tumors and comparison cancers) and CDC

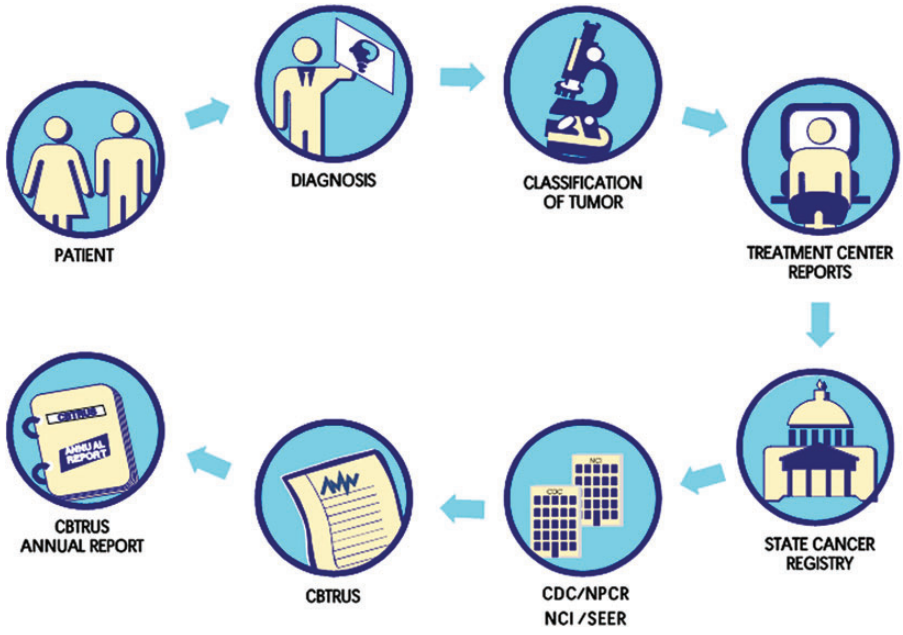


Fig. 1. Schematic of Cancer Registration Process for CBTRUS Reporting.

WONDER[12] (for non-malignant brain tumors). Both of these sources provide data from the National Vital Statistics System, which includes death certification data for 100% of the US population.

Definitions

Measures in Surveillance Epidemiology

This report presents the following population-based measures: incidence rates, mortality rates, and relative survival rates (for more information on definitions of terms and measures used see: http://www.cbtrus.org/glossary/glossary1.html).

Comparing incidence rates between statistical reports from different reporting agencies or previous CBTRUS statistical reports is not recommended due to differences in case definition, data collection, rate calculations, and/or reporting delays.

Classification by Behavior, Histology and WHO Grade

There are over 100 histologically distinct types of primary central nervous system (CNS) tumors, each with its own spectrum of clinical presentations, treatments, and outcomes. This report uses the most recent 2012 CBTRUS histology grouping scheme (Table 2a). The classification scheme utilizes ICD-O-3 codes[8] and may include morphology codes that were not previously reported to CBTRUS.[13] Tables 2b and 2c list malignant only and non-malignant only histologies, respectively. In this report, incidence rates are provided by major histology grouping and detailed histology.

Unlike other types of cancer, brain tumors are not staged. They are classified according to the World Health Organization (WHO) 2000 *Classification of Tumours of the Central Nervous System*[14] which assigns a grade (grade I through grade IV) based on predicted clinical behavior. Though the WHO classification scheme was also updated in 2007, this updated scheme has not been fully implemented by US CCR. These grading assignments are recorded by cancer registrars as Collaborative Stage Site-Specific Factor 1 - World Health Organization (WHO) Grade Classification according to the American Joint Commission on Cancer's (AJCC) Collaborative Staging (CS) schema.[15] Cancer staging is a critical component of determining cancer prognosis and treatment in clinical care, by providing a rubric for evaluating how much cancer is in a person's body and where the cancer is located. The AJCC CS schema provides a consistent framework for recording variables related to staging. This variable has been a required component of cancer registry data collection for brain and CNS tumors since 2004 for SEER registries, and since 2011 for NPCR registries. A previous study by CBTRUS analyzed the completeness and concordance of WHO grading in SEER data from 2004-2011, and found that both of these factors have improved significantly over time.[16] **As a result, CBTRUS reports statistics related to this variable for the first time in the *CBTRUS Statistical Report: Primary Brain and Central Nervous System Tumors Diagnosed in the United States in 2008-2012*.**

Gliomas are tumors that arise from glial or precursor cells and include astrocytoma, glioblastoma, oligodendroglioma, ependymoma, mixed glioma, malignant glioma, not otherwise specified (NOS), and a few rare histologies. Because there is no standard definition for gliomas, CBTRUS defines glioma as ICD-O-3 histology codes 9380-9384, and 9391-9460 as starred in Tables 2a, 2b, and 2c. It is also important to note that the statistics for lymphomas and hematopoietic neoplasms contained in this report refer only to those lymphomas and hematopoietic neoplasms that arise in the brain and CNS.

This report also utilizes the International Classification of Childhood Cancer (ICCC) grouping system for pediatric cancers. ICCC categories for this report were generated using the SEER Site/Histology ICCC-3 Recode[17] based on the ICCC, Third edition[18] and 2008 WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues (See the CBTRUS website for additional information on this classification scheme: http://www.cbtrus.org). The ICCC was developed in 1996 with subsequent changes made to correlate with revisions to ICD-O in order to provide a standard classification of childhood tumors for comparing incidence and survival across regions and time periods. As shown, the Table 17 age-group category total, 0-19 years age-group count, and age-specific and age-adjusted rates are equivalent to those presented throughout this report, even though the histology grouping scheme differs from that used by CBTRUS. The CBTRUS grouping scheme is specific to brain and CNS tumors and correlates with *WHO Classification of Tumours of the Central Nervous System*.

Anatomic Location of Tumor Sites

Various terms are used to describe the regions of the brain and central nervous system. The specific sites used in this report are broadly based on the categories and site codes defined in the SEER Site/Histology Validation List.[19] See Table 1 for an overview of CBTRUS primary site groupings. The CBTRUS Site/Validation List can be found on the CBTRUS website (http://www.cbtrus.org).

Measurement Methods

Counts, means, rates, ratios, proportions, and other relevant statistics were calculated using R 3.1.2 statistical software[20] and/or SEER*Stat 8.2.1.[21] Statistics are suppressed when counts are fewer than 16 within a cell but included in totals except when data from only one cell are suppressed within a category to prevent identification of the number in the suppressed cell. Note that reported percentages may not add up to 100% due to rounding.

Population data for each geographic region were obtained from the SEER program website[22] for the purpose of rate calculation.

Age-adjusted incidence rates and 95% confidence intervals[23] for malignant and non-malignant tumors and for selected histology groupings by gender, race, Hispanic ethnicity, and pediatric, young adult, and adult age groups were estimated per 100,000 population. Age-adjustment was based on one-year age groupings and standardized to the 2000 US standard population. The age distribution of the 2000 US standard population is shown in Appendix A. Combined populations for the regions included in this report are shown in Appendix B and Appendix C.

CBTRUS presents statistics on the pediatric and adolescent age group 0-19 years for clinical relevance and in order to

include and describe specific brain and CNS tumor patterns in age groups 0-4, 5-9, 10-14, and 15-19 years. However, the 0-14 year age group is a standard age category for childhood cancer used by other cancer surveillance organizations and has been included in this report for consistency and comparison purposes. Race categories in this report are all races, white, black, American Indian/Alaskan Native (AIAN), and Asian/Pacific Islander (API). Other race, unspecified, and unknown race are included in statistics that are not race-specific. Hispanic ethnicity was defined using the NAACCR Hispanic Identification Algorithm, version 2, data element, which utilizes a combination of cancer registry data fields (Spanish/Hispanic Origin data element, birthplace, race, and surnames) to directly and indirectly classify cases as Hispanic or non-Hispanic.[24] The NAACCR regional scheme (http://faststats.naaccr.org/usregions.php) was used for statistics reported by region of the US.

Brain Tumor Definition Differences

It should be noted that NPCR, SEER, and NAACCR report brain tumors differently from CBTRUS. The definition of brain and CNS tumors used by these organizations in their published incidence and mortality statistics includes tumors located in the following sites with their ICD-O-3 site codes in parentheses: brain, meninges, and other central nervous system tumors (C70.0-9, C71.0-9, and C72.0-9), but *excludes* lymphoma and leukemia histologies (9590-9989) from all brain and CNS sites.[7]

In contrast, CBTRUS reports data on all tumor morphologies located within the Consensus Conference site definition including lymphoma and other hematopoietic histologies (9590-9989), as well as olfactory tumors of the nasal cavity [C30.0 (9522-9523)].[13] Additionally, CBTRUS reports data on all brain and CNS tumors irrespective of behavior, whereas many reporting organizations may only publish rates for malignant brain and CNS tumors. **It is important to understand these differences in definition, as they influence the direct comparison of published rates.**

In the US, cancer registries and surveillance groups only collect data on primary brain tumors (meaning tumors that originate within the brain) and do not collect data on tumors that metastasize to the brain from other primary sites. As a result, **only primary brain and CNS tumors are included in this report.**

Estimation of Expected Numbers of Brain and CNS Tumors in 2015 and 2016

Estimated numbers of expected malignant and non-malignant brain and CNS tumors were calculated for 2015 and 2016. To project 2015 and 2016 counts of newly diagnosed brain and CNS tumors, age-adjusted annual brain tumor incidence rates were generated for 2000-2012 for malignant tumors, and 2006-2012 for non-malignant tumors. These were generated by state, age, and histologic type. Joinpoint 4.2.0[25] was used to fit regression models to these incidence rates,[26] which were used to predict numbers of cases in future years using the parameter from the selected models. The models allowed for a maximum of 2 joinpoints (1 for non-malignant tumors), a minimum of 3 observations from a joinpoint to either end of the data, and a minimum of 3 observations between joinpoints.[27] Permutation procedures included in Joinpoint were used to select the best fitting model.

Estimation of Mortality Rates for Brain and CNS Tumors

Age-adjusted mortality rates for deaths resulting from all malignant brain and CNS tumors were calculated using the mortality data available in the CDC WONDER Online Database provided by National Center for Health Statistics (NCHS) per 100,000 population.[28] In addition to the total age-adjusted rate for the US, age-adjusted rates are presented by gender and state.

Estimation of Survival Rates

SEER*Stat 8.2.1 statistical software was used to estimate one-, two-, three-, four-, five-, and ten-year relative survival rates for primary malignant brain tumor cases diagnosed between 1995-2012 in eighteen SEER areas.[21,29] This software utilizes life-table (actuarial) methods to compute survival estimates and accounts for current follow-up. Survival was estimated for brain (C71.0-C71.9), meninges (C70.0-C70.9), spinal cord, cranial nerves, and other parts of the central nervous system (C72.0-C72.9), pituitary and pineal glands (C75.1-C75.3), and olfactory tumors of the nasal cavity [C30.0 (9522-9523)]. Second or later primary tumors, cases diagnosed at autopsy, cases in which race or sex is coded as other or unknown, and cases known to be alive but for whom follow-up time could not be calculated, were excluded from the SEER survival data analyses. Survival was not calculated for non-malignant tumors as collection of these cases has only been mandated since 2004, and therefore, not enough time has elapsed to accurately calculate relative survival.

Data Interpretation

The CBTRUS works diligently to support the broader surveillance efforts aimed at improving the collection and reporting of primary brain and CNS tumors. CCR data provided to NPCR and SEER and, subsequently, to CBTRUS vary from year-to-year due to ongoing updates in collection and data refinement aimed to improve completeness and accuracy. **Therefore, it is important to note that data from previous CBTRUS Reports cannot be compared to data in this current report, *CBTRUS Statistical Report: Primary Brain and Central Nervous System Tumors Diagnosed in the United States in 2008-2012*. This current report supersedes all previous reports in terms of coverage of the US population with the most up-to-date information, making these data the most accurate and timely to reference.**

Random fluctuations in average annual rates are common, especially for rates based on small case counts. The CBTRUS policy to suppress data presentation for cells with counts of fewer than 16 cases is consistent with the NPCR policy.

As noted in the *Annual Report to the Nation on the Status of Cancer, 1975-2010, Featuring Prevalence of Comorbidity and Impact on Survival Among Persons With Lung, Colorectal, Breast, or Prostate Cancer* and in the *2013 CBTRUS Statistical Report*, the policy change enacted in 2007 guiding the Veterans Health Administration (VHA) had resulted in underreporting of cancer data—especially for men—to central cancer registries. The ongoing process to clarify this

policy indicates that underreporting for VHA facilities has diminished over time.[30]

Delays in reporting and late ascertainment are a reality and a known issue influencing registry completeness and, consequently, rate underestimations occur, especially for the most recent years.[31] CBTRUS also recognizes that the problem may be even more likely to occur in the reporting of non-malignant brain and CNS tumors, where reporting often comes from non-hospital-based sources, and mandated collection is relatively recent (2004).

CBTRUS editing practices are conducted yearly. These practices are aimed at refining the data for accuracy and clinical relevance and play a role in interpreting these report data. **Exclusion of site and histology combinations considered to be invalid by the consulting neuropathologists who revised the CBTRUS site/histology validation list in 2012 may have the impact of underestimating the incidence of brain and CNS tumors. Editing changes, such as reconsidering paired sites as multiple tumors rather than a single bilateral tumor beginning in 2004, also incorporate updates to the cancer registration coding rules that influence case ascertainment and data collection.**[7]

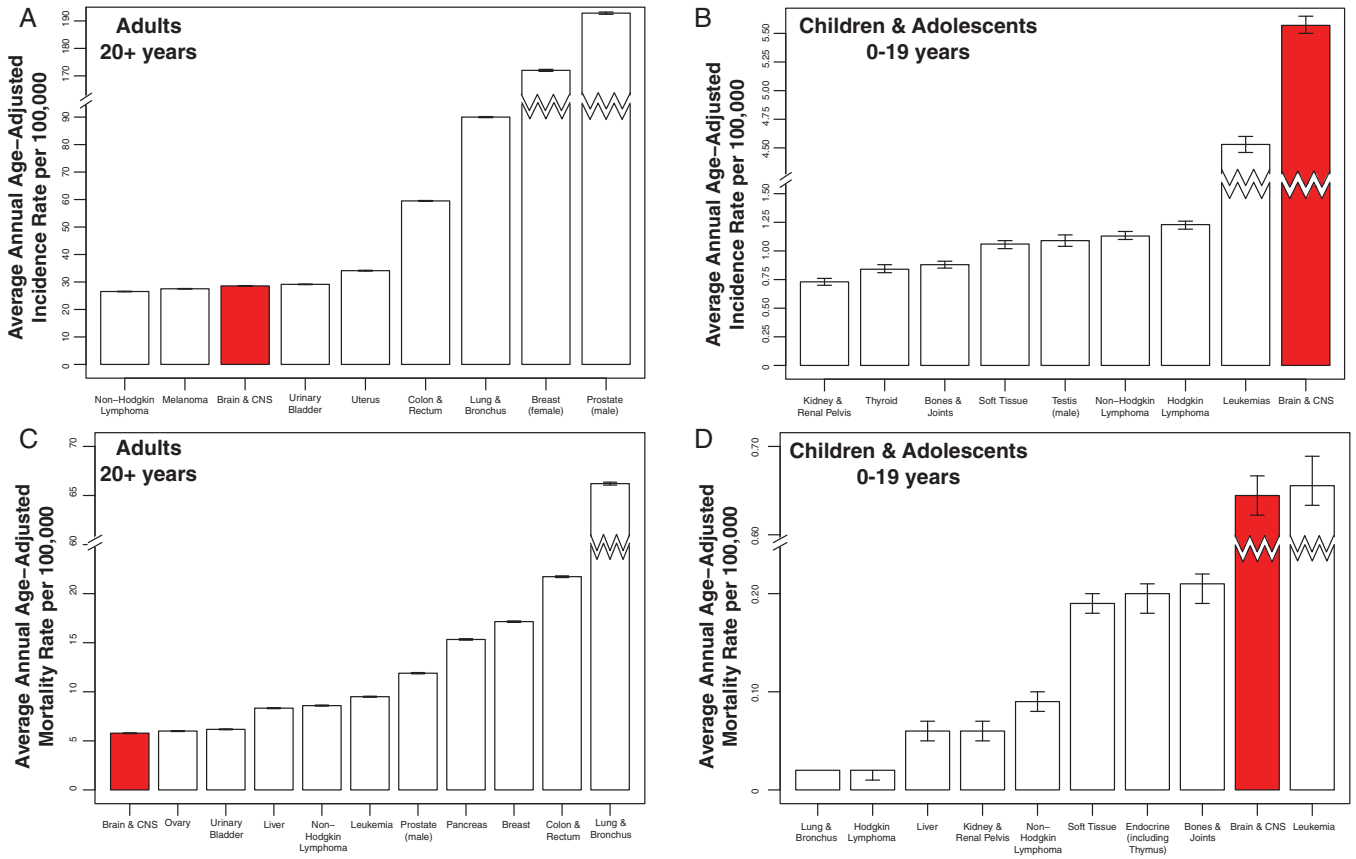
Population estimates used for denominators affect incidence rates. CBTRUS has utilized population estimates based on the 2000 US Census in this report.

Results

Primary Brain and CNS Tumors Incidence and Mortality in Comparison to Other Common Neoplasms in the US

Average annual age-adjusted incidence rates for primary brain and CNS tumors (2008-2012) and a selection of common cancers (2008-2011) in the US are presented by age in Figure 2, A (20+ years) and 2, B (0-19 years). Note: the 2015 CBTRUS Statistical Report does not include USCS data from 2012 as these data were not available at time of publication.

- Prostate and breast cancer are the most common cancers among those age 20+ years in the US, with average annual age-adjusted incidence rates of 192.83 per 100,000 population (males only) and 172.01 per 100,000 (females only) population, respectively.[9]



a. All incidence rates other than Brain & CNS Tumors were estimated using United States Cancer Statistics (USCS). USCS data from 2012 were not available at time of publication.

Fig. 2. Average Annual Age-Adjusted Incidence Rates[a] of All Primary Brain and CNS Tumors in Comparison to Other Common Cancers for A) Adults (Age 20+ years) and B) Children and Adolescents (Age 0-19 years) and Mortality Rates of All Primary Brain and CNS Tumors in Comparison to Other Common Cancers in C) Adults (Age 20+ years) and D) Children and Adolescents (Age 0-19 years), CBTRUS Statistical Report: NPCR and SEER 2008-2012, USCS 2008-2011[b], NCVS 2008-2012.

- Brain and CNS (both malignant and non-malignant) tumors have an average annual age-adjusted incidence of 28.57 per 100,000 population.
- Brain and CNS tumors are the most common cancer among those age 0-19 years, with an average annual age-adjusted incidence rate of 5.57 per 100,000 population. Leukemia is the second most common neoplasm among those age 0-19 years, with an average annual age-adjusted incidence rate of 4.53 per 100,000 population.

Average annual age-adjusted mortality rates for primary brain and CNS tumors and a selection of common cancers in the US are presented by age in Figures 2C (20+ years) and 2D (0-19 years).

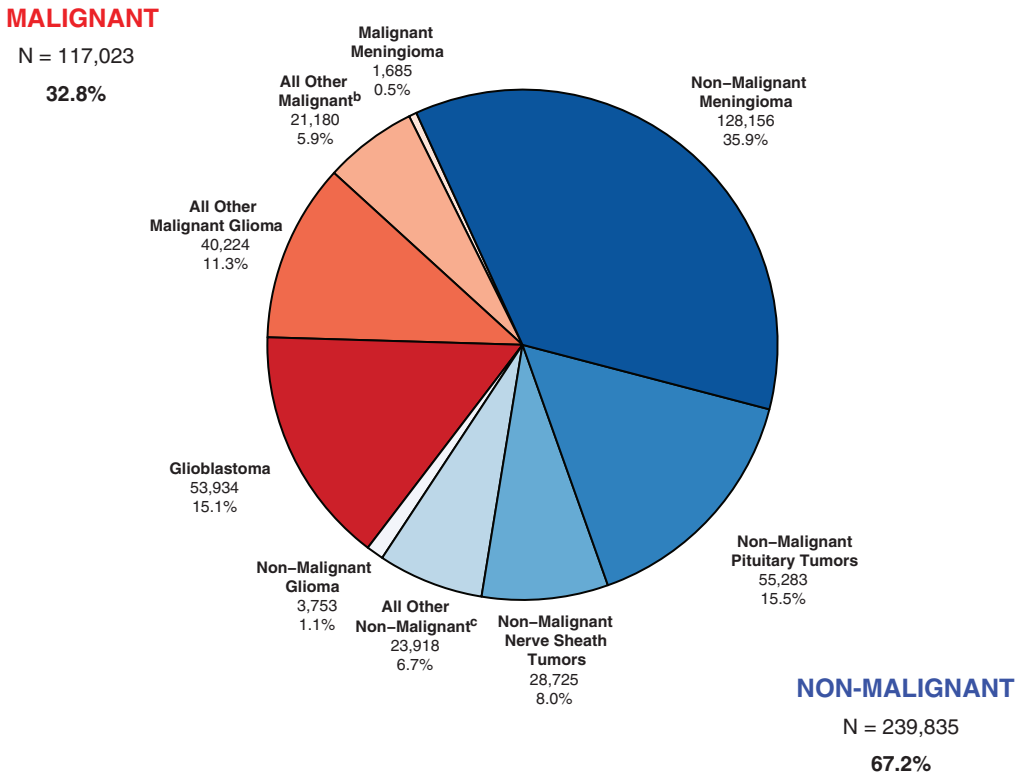
- Lung and bronchus cancer is the largest contributor to cancer mortality in persons age 20+ years in the US, with an average annual age adjusted mortality rate of 66.21 per 100,000. Brain and CNS tumors have an average annual age-adjusted mortality rate of 5.78 per 100,000, which is approximately the same as ovarian cancer (6.00 per 100,000, females only).
- The most common cause of cancer death in persons age 0-19 years is leukemia (0.66 per 100,000), though the average annual age- adjusted mortality rate is approximately the same as primary brain and CNS tumors (0.65 per 100,000).

Primary Brain and CNS Tumors: Distributions and Incidence by Gender, Age, Year, Behavior, WHO Grade and CCR

Counts and rates from the 356,858 incident brain tumors (117,023 malignant; 239,835 non-malignant shown in Figure 3) reported during 2008-2012 by histology and demographic characteristics for all ages are presented in Tables 3–6. The predominant tumor categories by behavior are presented in Figure 3.

Incidence Rates by Gender and Behavior

- Overall, 42.1% of all tumors diagnosed between 2008 and 2012 occurred in males (150,271 tumors) and 57.9% in females (206,565 tumors).



a. Percentages may not add up to 100% due to rounding. b. Includes histologies with ICD-O-3 behavior code of 0 or 1 from Neuronal and Mixed Neuronal Glial Tumors, Tumors of the Pineal Region, Embryonal Tumors, Other Tumors of Cranial and Spinal Nerves, Mesenchymal Tumors, Primary Melanocytic Lesions, Other Neoplasms Related to the Meninges, Other Hemopoietic Neoplasms, Germ Cell Tumors, Cysts and Heterotopias, Craniopharyngioma, Hemangioma, Neoplasm Unspecified and All Other. c. Includes histologies with ICD-O-3 behavior code of 3 from Choroid Plexus Tumors, Neuronal and Mixed Neuronal Glial Tumors, Tumors of the Pineal Region, Embryonal Tumors, Nerve Sheath Tumors, Mesenchymal Tumors, Primary Melanocytic Lesions, Other Neoplasms Related to the Meninges, Lymphoma, Other Hemopoietic Neoplasms, Germ Cell Tumors, Cysts and Heterotopias, Tumors of the Pituitary, Craniopharyngioma, Hemangioma, Neoplasm Unspecified, and All Other.

Fig. 3. Distribution[a] of Primary Brain and CNS Tumors by Behavior (N = 356,858), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.

- Approximately 55.0% of the malignant tumors occurred in males (65,056 tumors) and 45% in females (51,967 tumors).
- Approximately 36.0% of the non-malignant tumors occurred in males (85,616 tumors) and 64% in females (154,219 tumors).

Incidence Rates by Age

The overall average annual age-adjusted incidence rate for 2008-2012 for all primary brain and CNS tumors was 21.97 per 100,000 population (Table 3). The overall incidence rate was 5.57 per 100,000 population for children and adolescents age 0-19 years, 5.37 per 100,000 population for children age 0-14 years (Table 4), and 28.57 per 100,000 population for adults age 20+ years (Table 5). The overall incidence rates of tumors by behavior and age group (age 0-19 years and 20+ years) are shown in Figure 4 and Table 5.

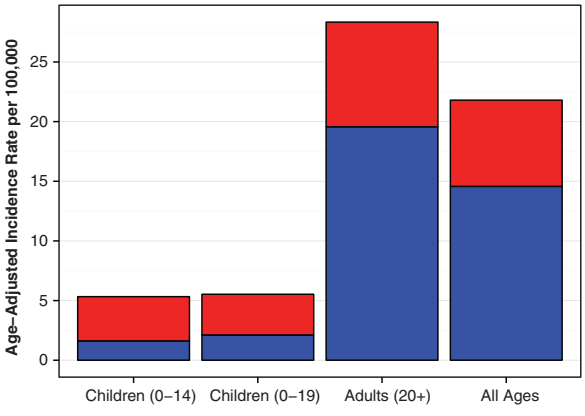
Incidence Rates by Year and Behavior

Figure 5 presents the overall annual age-adjusted incidence rates of all primary brain and CNS tumors by year from 2008 through 2012 and behavior. The incidence rates of all primary brain and CNS tumors for 2008-2012 did not differ significantly by year, both overall and by behavior.

Distribution and Incidence Rates by CCR, Age, WHO Grade, and Behavior

The overall number of reported tumors is listed by CCR in Table 6. The average annual combined 2008-2012 population of 309,129,608 represents approximately 99.9% of the US population for those years.

- Approximately 67.2% of tumors were non-malignant, but there was substantial variation by cancer registry (range: 55.1%-73.3%).



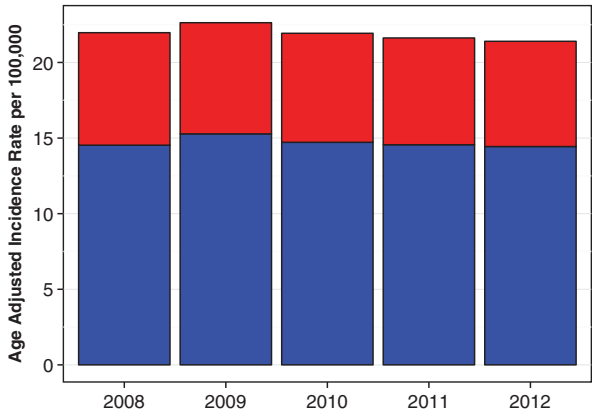
	Children (0–14)	Children (0–19)	Adults (20+)	All Ages
Non–Malignant	1.64	2.15	19.82	14.75
Malignant	3.73	3.42	8.76	7.23
Total	5.37	5.57	28.58	21.98

a. Rates per 100,000 and age-adjusted to the 2000 United States standard population.

Fig. 4. Average Annual Age-Adjusted Incidence Rates[a] of Primary Brain and CNS Tumors by Age and Behavior, CBTRUS Statistical Report: NPCR and SEER, 2008-2012.

The overall number of reported tumors with histologically confirmed diagnosis in 2011 and 2012 is shown by CCR and reported WHO grade in Figure 6.

- Approximately 62.6% of microscopically confirmed tumors had complete coding for WHO grade, but there was substantial variation by CCR (range: 46.4%-75.5%).
- About 71.3% of all tumors had a histologically confirmed diagnosis, with substantial regional variation (range: 49.3%-84.6%).



	2008	2009	2010	2011	2012
Non–Malignant	14.53	15.28	14.72	14.68	14.56
Malignant	7.44	7.35	7.21	7.12	7.02
Total	21.97	22.63	21.93	21.80	21.58

a. Rates per 100,000 and age-adjusted to the 2000 United States standard population.

Fig. 5. Annual Age-Adjusted Incidence Rates[a] of Primary Brain and CNS Tumors by Year and Behavior, CBTRUS Statistical Report: NPCR and SEER, 2008-2012.

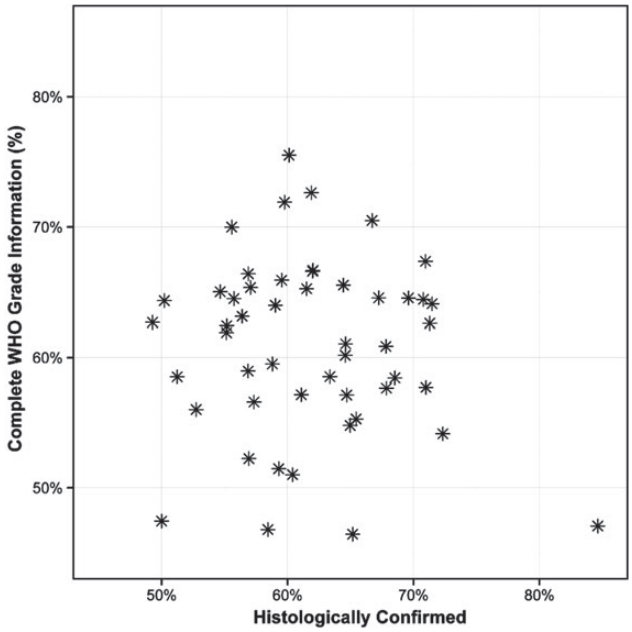


Fig. 6. Percentage of All Primary Brain and CNS Tumors Histologically Confirmed and with Complete WHO Grade by Central Cancer Registry, CBTRUS Statistical Report: NPCR and SEER, 2011-2012.

The overall average annual age-adjusted incidence rates by age, behavior and CCR, are presented in Table 5, Figures 7a–c.

- There is less variation by region for malignant tumor incidence rates as compared to incidence rates for non-malignant tumors. CCR and regional variations likely reflect differences in reporting and case ascertainment practices.
- A slight majority of non-malignant brain and CNS tumors are histologically confirmed (50.4%) (Table 6).
- The overall average annual age-adjusted incidence rates of all tumors (malignant and non-malignant) for each individual CCR ranged from 16.30 to 28.06 per 100,000 population.
- Average annual age-adjusted incidence rates of all primary malignant tumors ranged from 4.79 to 8.48 per 100,000 population, and average annual age-adjusted incidence rates of all primary non-malignant tumors ranged from 9.41 to 20.04 per 100,000 population.
- Among adults 20 years of age and older, CCR-specific incidence rates ranged from 5.63 to 10.27 per 100,000 population for malignant tumors and from 13.02 to 27.30 per 100,000 population for non-malignant tumors.
- In those less than 20 years of age, incidence rates listed ranged from 2.27 to 4.81 per 100,000 population for malignant tumors and from 1.02 to 3.65 per 100,000 population for non-malignant tumors.

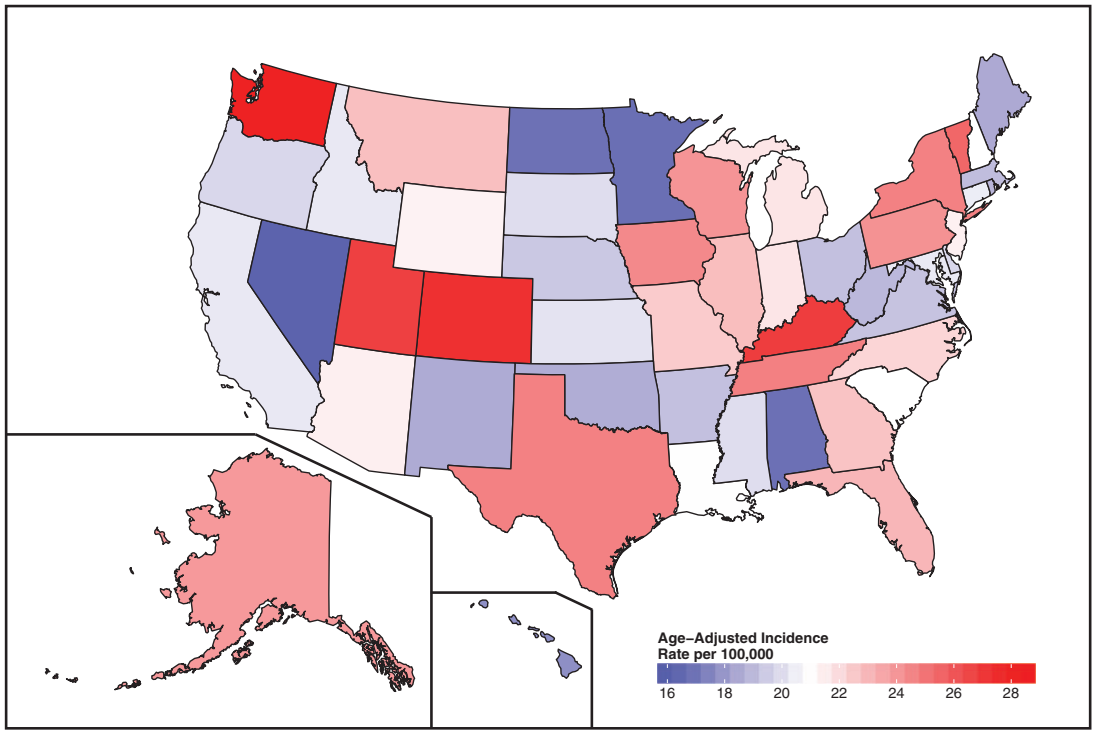
Primary Brain and CNS Tumors: Incidence by Site, Histology, WHO Grade, Gender, Race, Hispanic Ethnicity and Age

Distribution of Tumors by Site and Histology

The distribution of brain and CNS tumors by site is shown in Figures 8a–c.

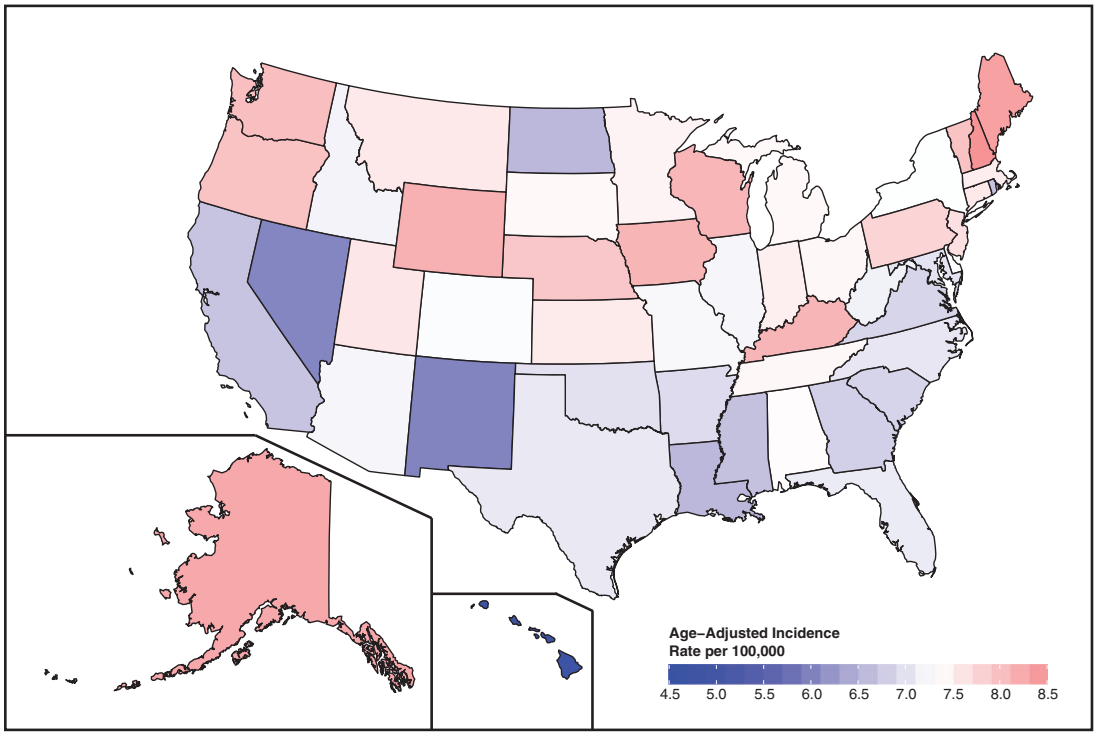
- Overall, frontal (8.5%), temporal (6.3%), parietal (3.9%), and occipital lobes (1.1%) account for 19.8% of all tumors.
- Overall, the most common tumor site is the meninges, representing 36.4% of all tumors.
- Cerebrum, ventricle, cerebellum, and brain stem tumors account for 7.0% of all tumors.
- Brain stem tumors account for 1.5% of all tumors and 3.6% of all **malignant** brain tumors.
- The cranial nerves and the spinal cord/cauda equina account for 9.8% of all tumors.
- The pituitary and craniopharyngeal duct and pineal glands account for 16.6% of all tumors.
- For **malignant** tumors, frontal (23.3%), temporal (17.2%), parietal (10.8%), and occipital (2.8%) account for 54.1% of tumors.
- For **non-malignant** tumors, 53.3% of all tumors occur in the meninges.

The distribution by brain and CNS histology is shown in Figure 9a.



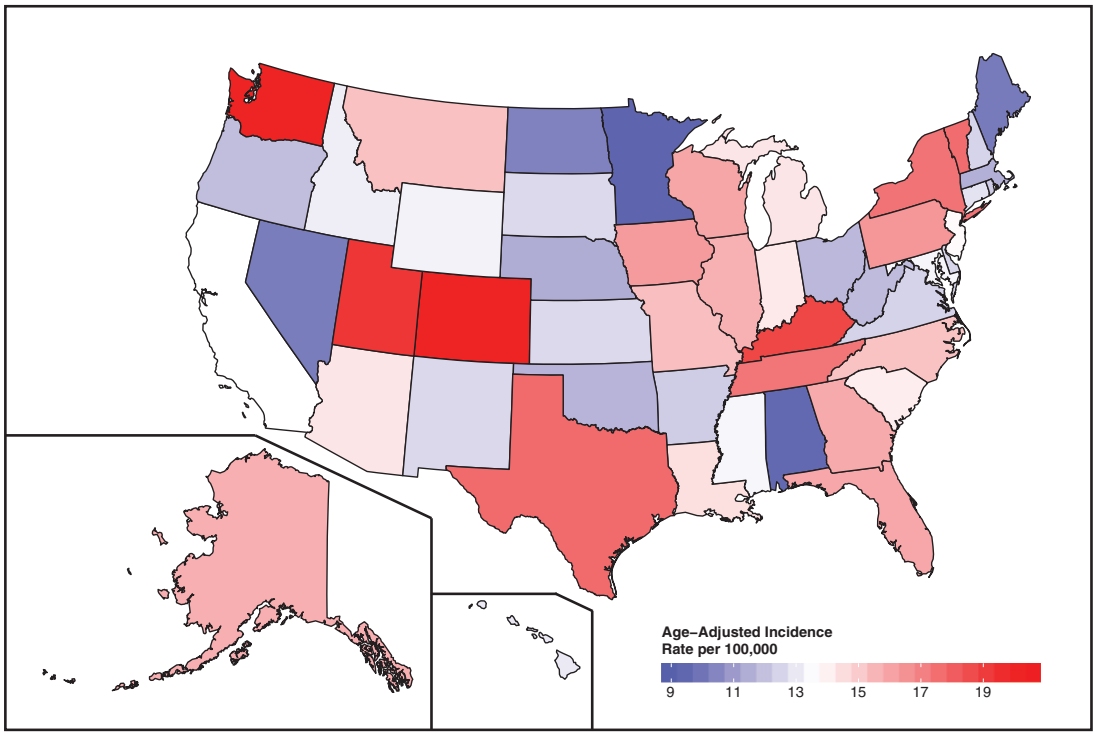
a. Rates per 100,000 and age-adjusted to the 2000 United States standard population. b. Data only available from 2008-2010 for Nevada.

Fig. 7a. Average Annual Age-Adjusted Incidence Rates[a] of All Primary Brain and CNS Tumors by Central Cancer Registry, CBTRUS Statistical Report: NPCR and SEER, 2008-2012[b].



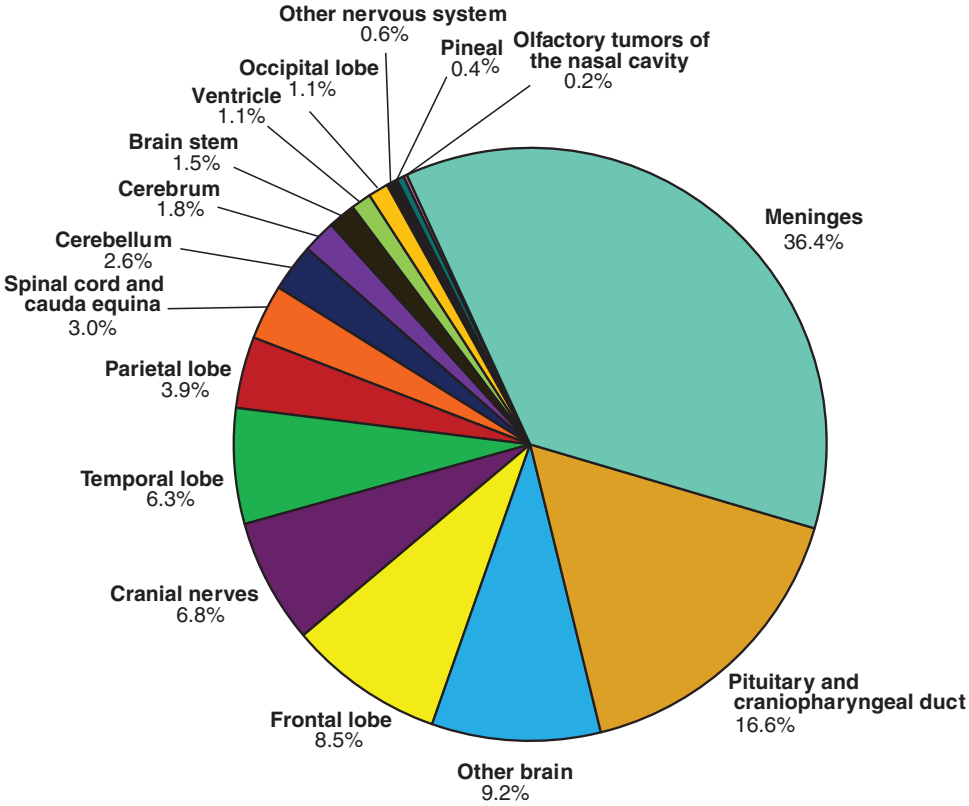
a. Rates per 100,000 and age-adjusted to the 2000 United States standard population. b. Data only available from 2008-2010 for Nevada.

Fig. 7b. Average Annual Age-Adjusted Incidence Rates[a] of Malignant Primary Brain and CNS Tumors by Central Cancer Registry, CBTRUS Statistical Report: NPCR and SEER, 2008-2012[b].



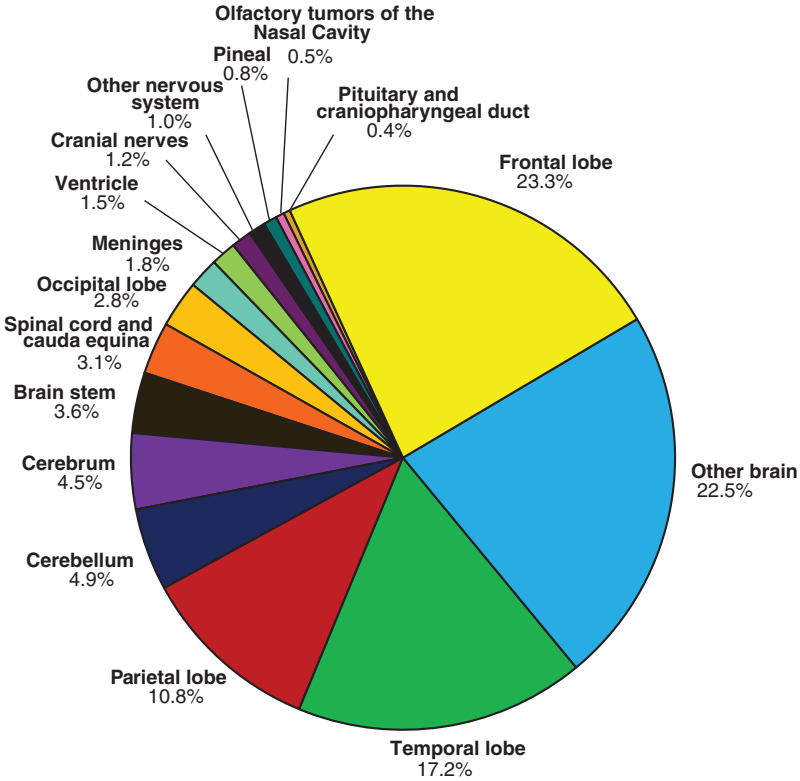
a. Rates per 100,000 and age-adjusted to the 2000 United States standard population. b. Data only available from 2008-2010 for Nevada.

Fig. 7c. Average Annual Age-Adjusted Incidence Rates[a] of Non-Malignant Primary Brain and CNS Tumors by Central Cancer Registry, CBTRUS Statistical Report: NPCR and SEER, 2008-2012[b].



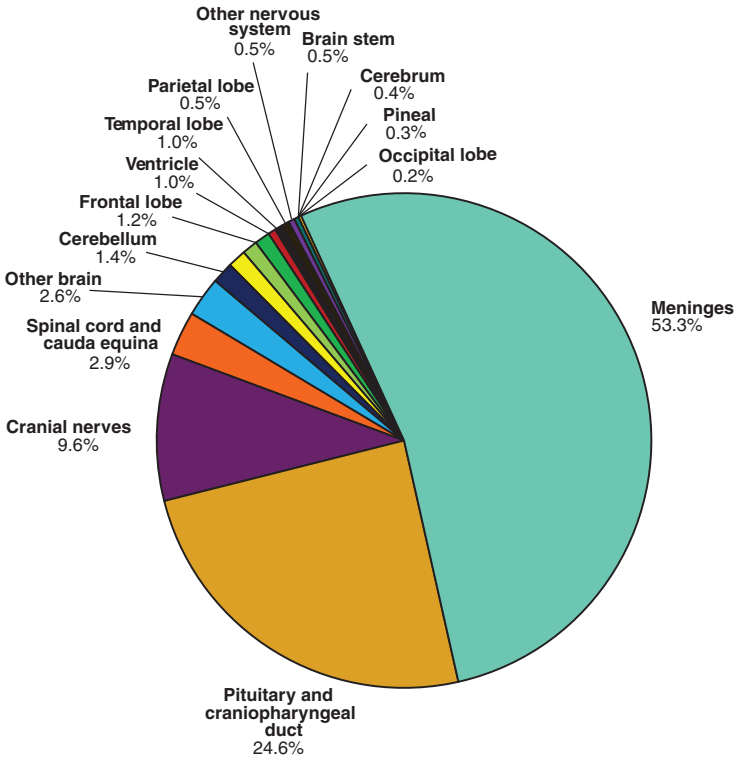
a. Percentages may not add up to 100% due to rounding.

Fig. 8a. Distribution[a] of All Primary Brain and CNS Tumors by Site (N = 356,858), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



a. Percentages may not add up to 100% due to rounding.

Fig. 8b. Distribution[a] of Malignant Primary Brain and CNS Tumors by Site (N = 117,023), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



a. Percentages may not add up to 100% due to rounding.

Fig. 8c. Distribution[a] of Non-Malignant Primary Brain and CNS Tumors by Site (N = 239,835), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.

- **The most frequently reported histology overall is meningioma (36.4%),** followed by tumors of the pituitary (15.5%) and glioblastoma (15.1%).
- Tumors of the pituitary and nerve sheath tumors combined account for slightly less than one-fourth of all tumors (23.6%), the vast majority of which are non-malignant.

The distribution of malignant and non-malignant brain and CNS tumors by histology are shown in Figures 9b and 9c, respectively, as well as in Table 7.

- The most common of all **malignant** brain and CNS tumors is glioblastoma (46.1%).
- The most common of all **non-malignant** brain and CNS tumors is meningioma (53.4%).
- The most common non-malignant nerve sheath tumor (based on multiple sites in the brain and CNS) is vestibular schwannomas (defined by histology code 9560, also formerly called acoustic neuromas) (94.4%).

The broad category glioma represents approximately 27% of all tumors (Figure 9a) and 80% of malignant tumors (Figure 9b). The distribution of gliomas by site and histology are shown in Figures 10 and 11, respectively.

- The majority of gliomas occur in the frontal, temporal, parietal, and occipital lobes combined (60.8%). Only a very small proportion of gliomas occur outside the brain.
- Glioblastoma accounts for the majority of gliomas (55.1%).
- Other astrocytomas and glioblastoma combined account for about 75% of all gliomas.

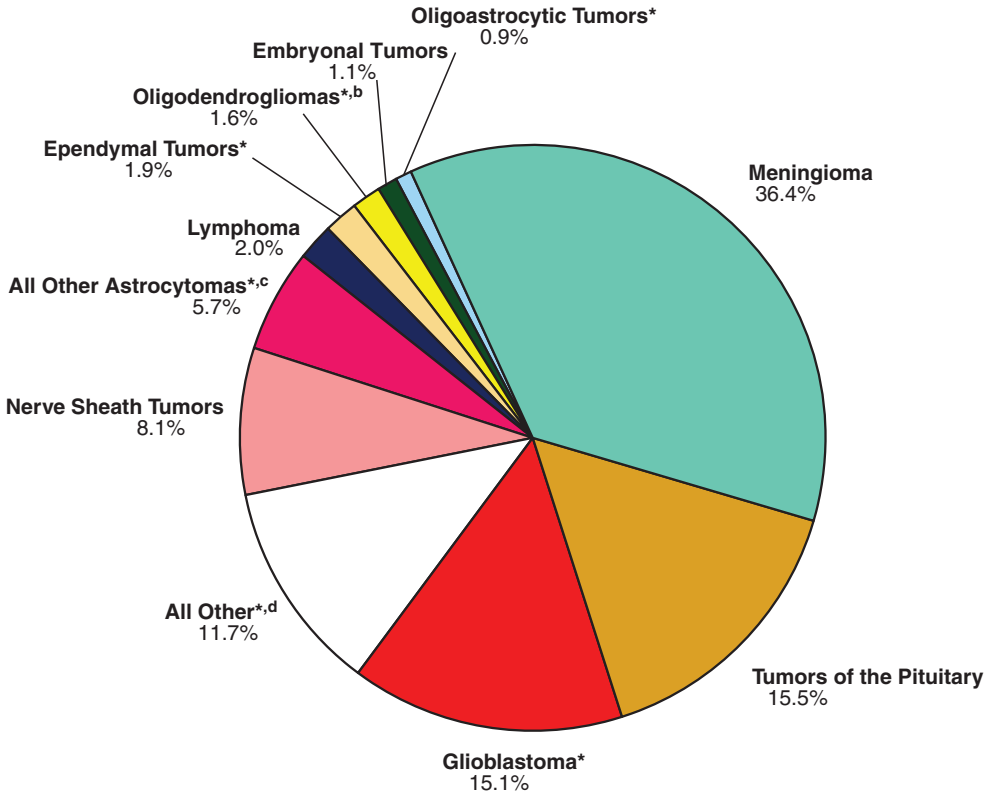
The distribution of reported tumors with histologically confirmed diagnosis from 2011 to 2012 is listed by histology and reported WHO grade in Table 8.

- Overall, 60.5% of tumors had complete WHO grade information, but there was substantial variation by histology.
- The histologic types with the highest WHO grade completeness were anaplastic oligodendroglioma (95.0%) and oligoastrocytic tumors, (94.6%).

Incidence of Spinal Cord Tumors

Although spinal cord tumors account for a relatively small percentage of all brain and CNS tumors, they result in significant morbidity. The most common histologies found in the spinal cord, spinal meninges and cauda equina are presented in Figures 12a and 12b for both children (age 0-19 years) and adults (age 20+ years), respectively.

- The predominant histology for those age 0-19 years is ependymal tumors (21.6%) followed by other astrocytomas (20.5%), including glioblastoma.
- Tumors of meninges (37.6%) account for the largest proportion of spinal cord tumors among those age 20 years and older.



* All or some of this histology is included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460 (Table 2a). a. Percentages may not add up to 100% due to rounding. b. Includes oligodendroglioma and anaplastic oligodendroglioma (Table 2a). c. Includes pilocytic astrocytoma, diffuse astrocytoma, anaplastic astrocytoma, and unique astrocytoma variants (Table 2a). d. Includes glioma malignant, NOS, choroid plexus tumors, other neuroepithelial tumors, neuronal and mixed neuronal-glial tumors, tumors of the pineal region, other tumors of cranial and spinal nerves, mesenchymal tumors, primary melanocytic lesions, other neoplasms related to the meninges, other hematopoietic neoplasms, hemangioma, neoplasm, unspecified, and all other (Table 2a). e. ICD-O-3 histology codes: 9380- 9384, 9391-9460,9480.

Fig. 9a. Distribution[a] of All Primary Brain and CNS Tumors by CBTRUS Histology Groupings and Histology (N = 356,858), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.

Incidence Rates by Site and Gender

Incidence counts and average annual age-adjusted rates for brain and CNS tumors by site and gender are provided in Table 9.

- Incidence rates were highest for tumors located in the meninges (7.86 per 100,000 population).
- Incidence rates were lowest for olfactory tumors of the nasal cavity (0.04 per 100,000 population).
- Incidence rates were higher in females than in males for tumors located in the meninges, pituitary and craniopharyngeal duct, and cranial nerves.
- Males had higher incidence rates of tumors located in the four lobes of the brain, cerebrum, ventricle, cerebellum, brain stem, other brain, spinal cord and cauda equina, other nervous system, pineal, and olfactory tumors of the nasal cavity compared to females.

Incidence Rates by Major Histology Groupings and Specific Histologies

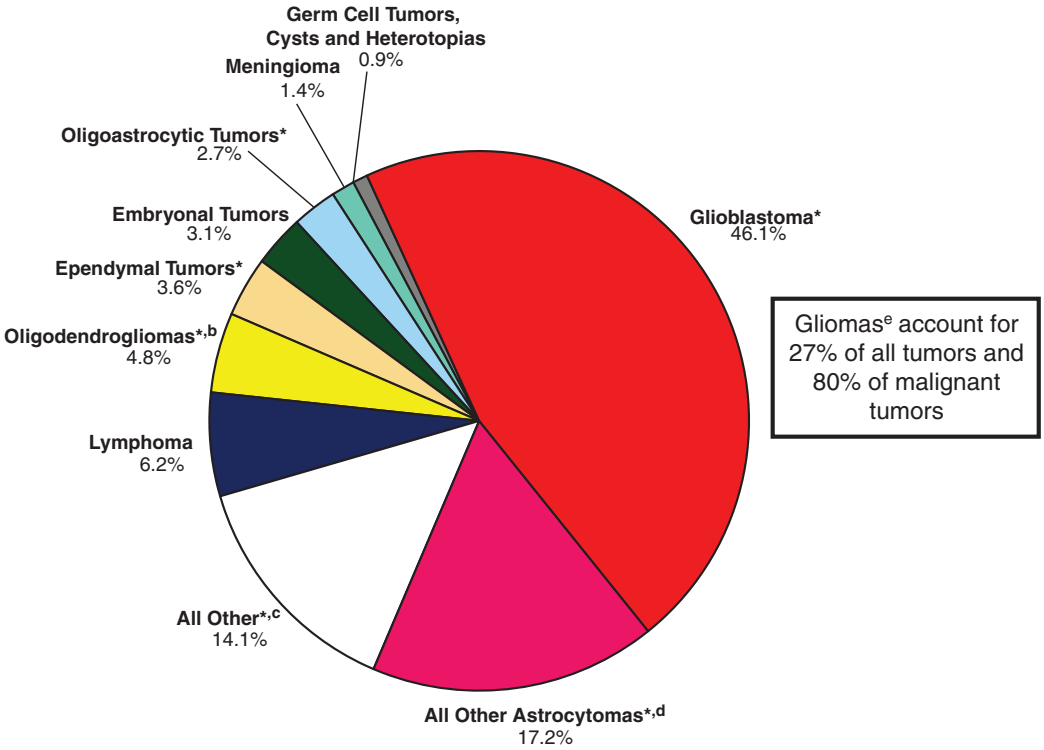
Incidence rates overall by major histology groupings and specific histologies are provided in Table 3.

- Among CBTRUS major histology groupings, incidence rates were highest for tumors of the meninges (8.13 per 100,000 population), followed by tumors of the neuroepithelial tissue (6.62 per 100,000 population), tumors of the sellar region (3.68 per 100,000 population), and tumors of the cranial and spinal nerves (1.76 per 100,000 population).
- Incidence rates were highest for meningiomas (7.86 per 100,000 population), tumors of the pituitary (3.49 per 100,000 population), glioblastomas (3.20 per 100,000 population), and nerve sheath tumors (1.76 per 100,000 population).

Incidence Rates by Behavior and Histology

Brain and CNS tumor incidence rates by behavior (malignant and non-malignant) and by major histologies are presented in Table 7.

- For **malignant** tumors, the incidence rate was highest for glioblastoma (3.20 per 100,000 population), followed by diffuse astrocytoma (0.53 per 100,000 population) and lymphoma (0.44 per 100,000 population).
- For **non-malignant** tumors, the incidence rate was highest for meningioma (7.75 per 100,000 population), followed by



* All or some of this histology is included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460 (Table 2b). a. Percentages may not add up to 100% due to rounding. b. Includes oligodendroglioma and anaplastic oligodendroglioma (Table 2b). c. Includes glioma malignant, NOS, choroid plexus tumors, other neuroepithelial tumors, neuronal and mixed neuronal-glial tumors, tumors of the pineal region, nerve sheath tumors, other tumors of cranial and spinal nerves, mesenchymal tumors, primary melanocytic lesions, other neoplasms related to the meninges, other hematopoietic neoplasms, hemangioma, neoplasm, unspecified, and all other (Table 2b). d. Includes pilocytic astrocytoma, diffuse astrocytoma, anaplastic astrocytoma, and unique astrocytoma variants (Table 2b).

Fig. 9b. Distribution[a] of Malignant Primary Brain and CNS Tumors by CBTRUS Histology Groupings and Histology (N = 117,023), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.

tumors of the pituitary (3.49 per 100,000 population), and nerve sheath (1.75 per 100,000 population).

Incidence Rates by Gender and Histology

Incidence rates by gender and histology are presented in Table 3. Incidence rates for **all** primary brain and CNS tumors combined are higher among females (23.95 per 100,000 population) than males (19.82 per 100,000 population).

- The incidence rate of tumors of neuroepithelial tissue is higher in males (7.79 per 100,000 population) than in females (5.60 per 100,000 population).
- The incidence rate of tumors of meninges is higher in females (10.87 per 100,000 population) than in males (4.98 per 100,000 population).

Incidence rate ratios (male:female) for selected histologies and histology groupings are shown in Figure 13.

- Incidence was higher in males for many histologies, such as germ cell tumors ($p < 0.001$), most glial tumors, lymphomas ($p < 0.001$), and embryonal tumors ($p < 0.001$).
- In addition to non-malignant ($p < 0.001$) and malignant ($p = 0.003$) meningiomas, tumors of the pituitary ($p < 0.001$) were also more common in females than in males.

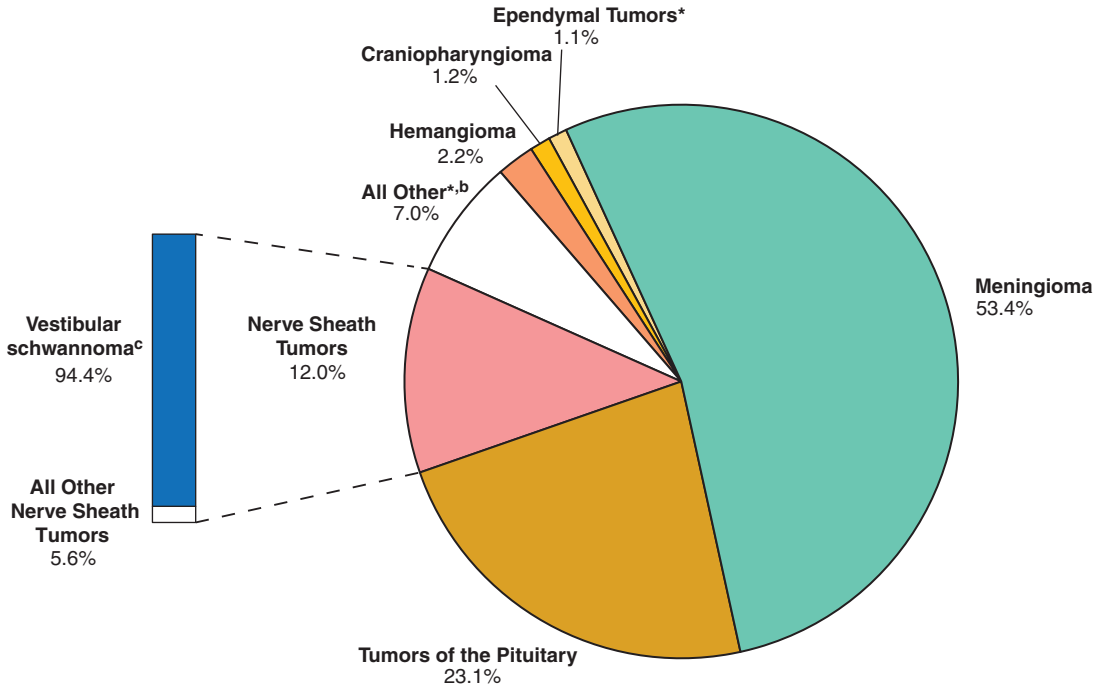
Incidence Rates by Race and Histology

Incidence rates by race and histology are shown in Table 10.

- Incidence rates for **all** primary brain and CNS tumors combined are lower for race groups AIAN (14.28 per 100,000 population) as compared to whites (22.09 per 100,000 population), blacks (22.04 per 100,000 population), and API (20.14 per 100,000 population).
- Incidence rates of meningioma, tumors of the pituitary, and craniopharyngioma for blacks exceed those observed for white, AIAN, and API.
- The average annual incidence rate for tumors of the cranial and spinal nerves in the API group is highest for all racial groups.

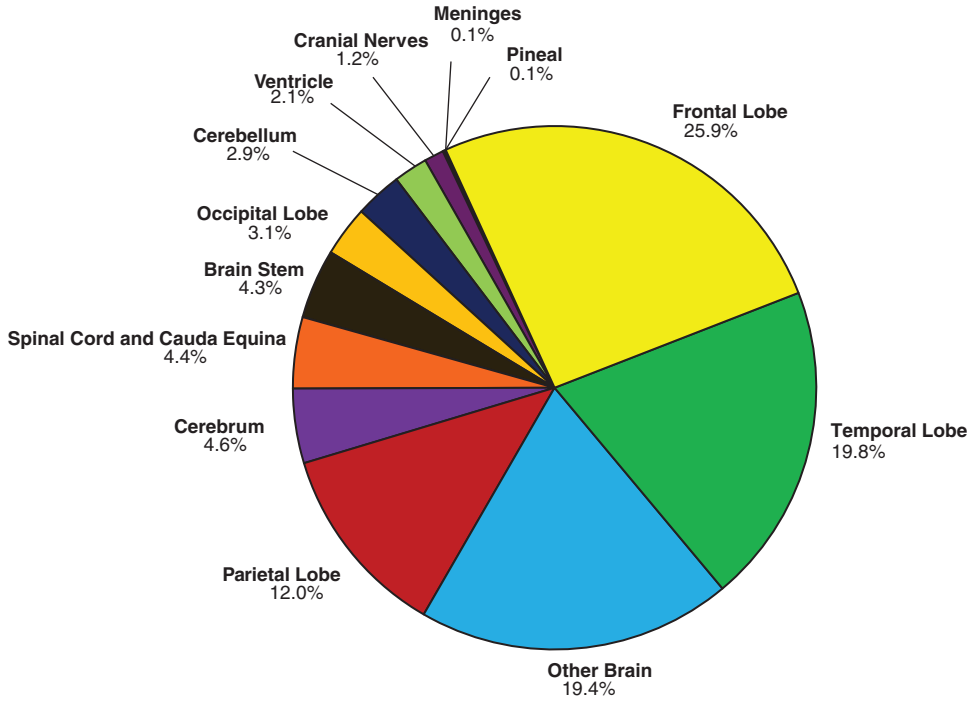
Incidence rate ratios (white:black) for selected histologies are shown in Figure 14.

- Incidence rates for glioblastoma ($p < 0.001$), all other astrocytoma ($p < 0.001$), oligoastrocytic tumors ($p < 0.001$), and nerve sheath tumors ($p < 0.001$) are approximately 2 times greater in whites than in blacks.
- Incidence of oligodendroglioma is approximately 3 times greater in whites than in blacks ($p < 0.001$).
- Incidence rates for pilocytic astrocytoma ($p < 0.001$), ependymal tumors ($p < 0.001$), embryonal tumors ($p < 0.001$),



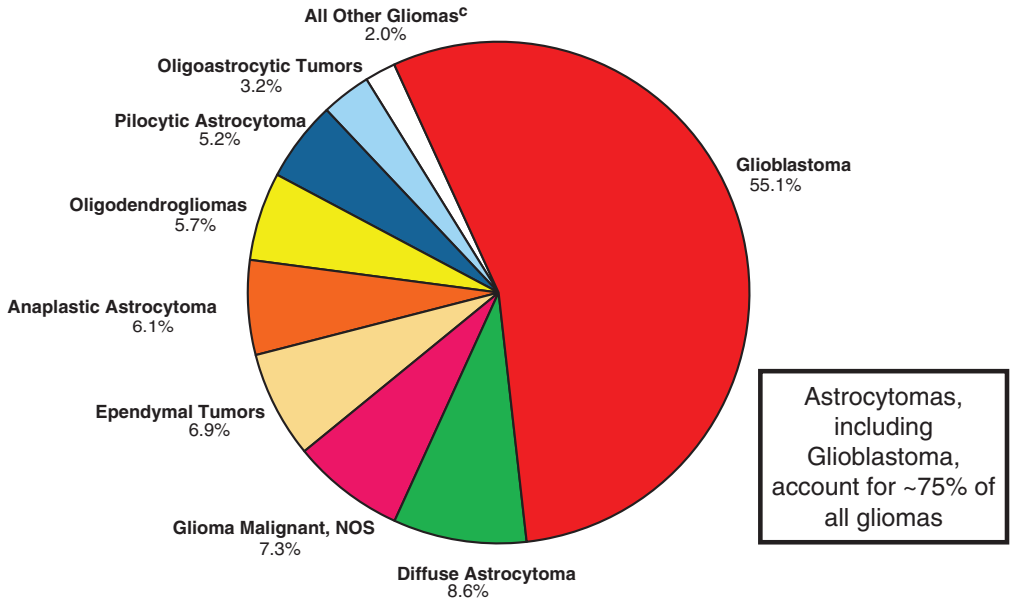
* All or some of this histology is included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460 (Table 2c). a. Percentages may not add up to 100% due to rounding. b. Includes pilocytic astrocytoma, diffuse astrocytoma, anaplastic astrocytoma, unique astrocytoma variants, glioblastoma, oligodendroglioma, anaplastic oligodendroglioma, oligoastrocytic tumors, glioma malignant, NOS, choroid plexus tumors, other neuroepithelial tumors, neuronal and mixed neuronal-glial tumors, tumors of the pineal region, embryonal tumors, other tumors of cranial and spinal nerves, mesenchymal tumors, primary melanocytic lesions, other neoplasms related to the meninges, other hematopoietic neoplasms, germ cell tumors, neoplasm, unspecified, and all other (Table 2c). c. ICD-O-3 histology code 9560.

Fig. 9c. Distribution[a] of Non-Malignant Primary Brain and CNS Tumors by CBTRUS Histology Groupings and Histology (N = 239,835), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



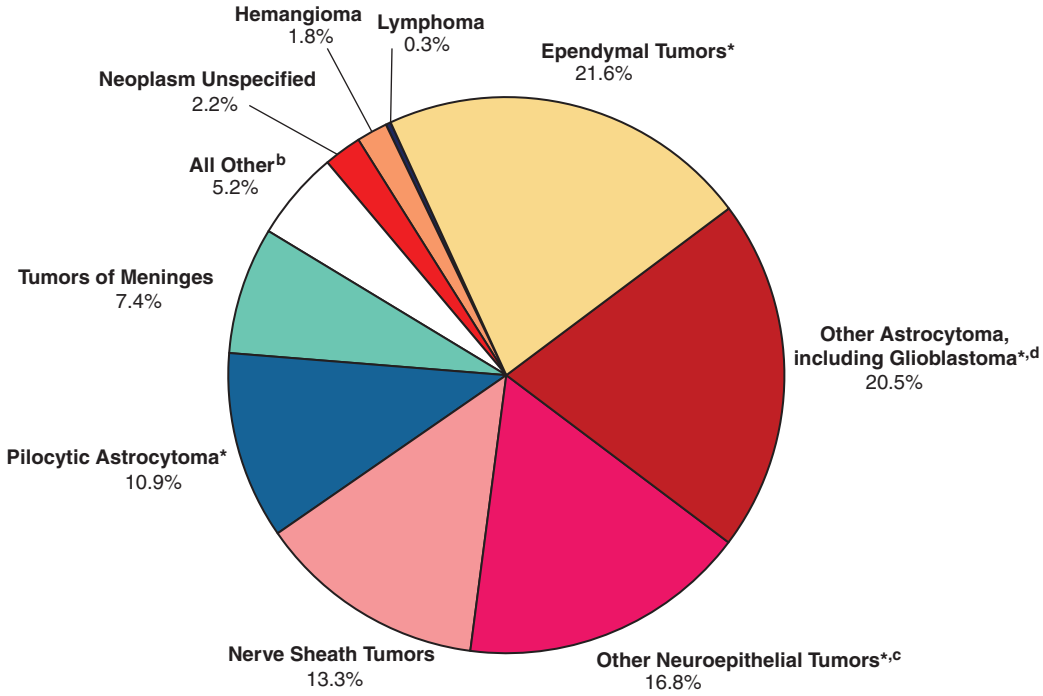
a. Percentages may not add up to 100% due to rounding. b. ICD-O-3 codes = 9380-9384,9391-9460.(Table 2a).

Fig. 10. Distribution of Primary Brain and CNS Gliomas[a] by Site (N = 97,910), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



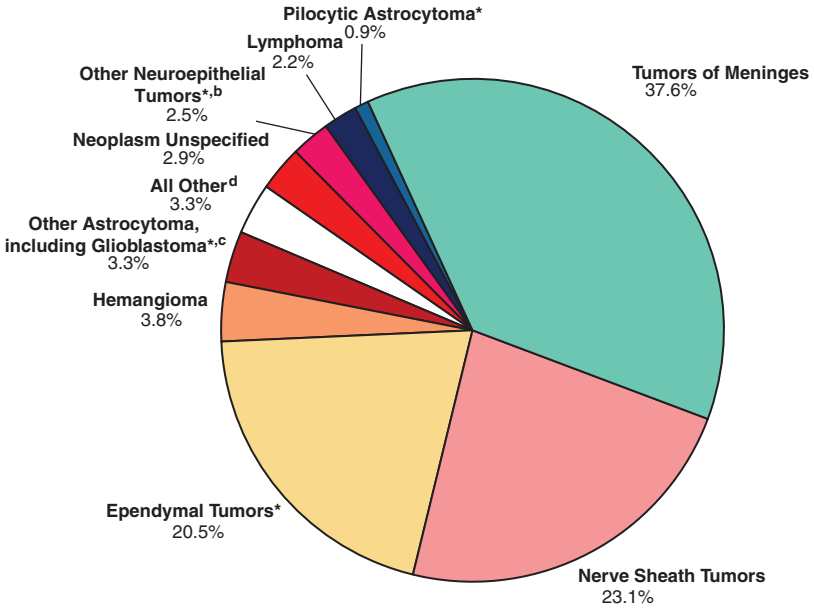
a. Percentages may not add up to 100% due to rounding. b. ICD-O-3 codes = 9380-9384,9391-9460.(Table 2a). c. Includes histologies from unique astrocytoma variants, other neuroepithelial tumors, and neuronal and mixed neuronal-glial tumors (Table 2a).

Fig. 11. Distribution[a] of Primary Brain and CNS Gliomas[b] by Histology Subtypes (N = 97,910), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



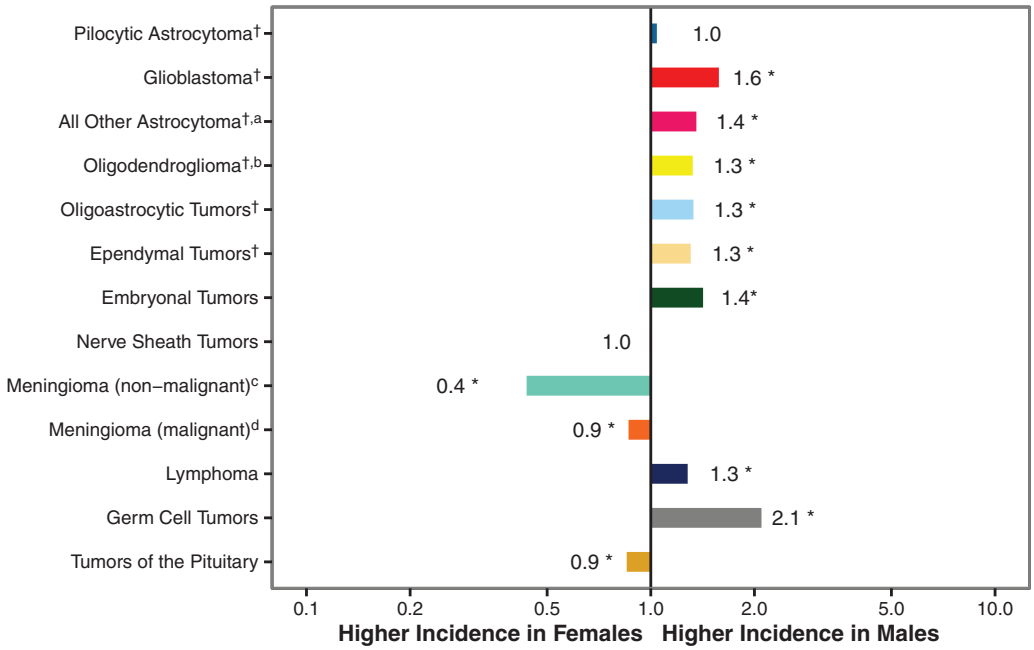
* All or some of this histology are included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460 (Table 2a). a. Percentages may not add up to 100% due to rounding. b. Includes embryonal tumors, other tumors of cranial and spinal nerves, other hematopoietic neoplasms, germ cell tumors, neoplasm unspecified, and all other (Table 2a). c. Includes oligodendroglioma, anaplastic oligodendroglioma, oligoastrocytic tumors, glioma malignant, NOS, choroid plexus tumors, other neuroepithelial tumors, and neuronal and mixed neuronal-glial tumors (Table 2a). d. Includes diffuse astrocytoma, anaplastic astrocytoma, unique astrocytoma variants (Table 2a).

Fig. 12a. Distribution[a] of Spinal Cord, Spinal Meninges and Cauda Equina Tumors in Children and Adolescents (Age 0-19 years), CBTRUS Histology Groupings and Histology (N = 1,256), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



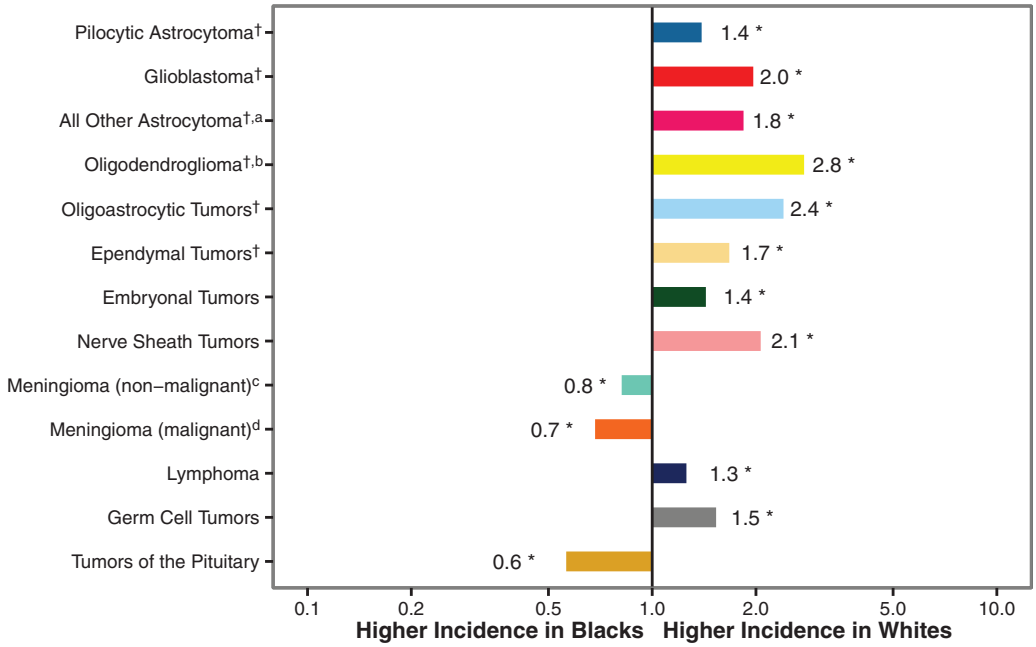
*All or some of this histology are included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460 (Table 2a). a. Percentages may not add up to 100% due to rounding. b. Includes oligodendroglioma, anaplastic oligodendroglioma, oligoastrocytic tumors, glioma malignant, NOS, choroid plexus tumors, other neuroepithelial tumors, and neuronal and mixed neuronal-glial tumors (Table 2a). c. Includes diffuse astrocytoma, anaplastic astrocytoma, unique astrocytoma variants (Table 2a). d. Includes embryonal tumors, other tumors of cranial and spinal nerves, other hematopoietic neoplasms, germ cell tumors, neoplasm unspecified, and all other (Table 2a).

Fig. 12b. Distribution[a] of Spinal Cord, Spinal Meninges and Cauda Equina Tumors in Adults (Age 20+ years), CBTRUS Histology Groupings and Histology (N = 15,473), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



* Incidence Rate is significantly different in males and females.
† All or some of this histology are included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460, (Table 2a). a. ICD-O-3 Histology Codes: 9381, 9384, 9424, 9400, 9401, 9410, 9411, 9420. b. ICD-O-3 Histology Codes: 9450, 9451, 9460. c. ICD-O-3 Histology Codes: 9530/0,9530/1, 9531/0, 9532/0, 9533/0, 9534/0, 9537/0, 9538/1, 9539/1. d. ICD-O-3 Histology Codes: 9530/3, 9538/3, 9539/3.

Fig. 13. Incidence Rate Ratios by Gender (Males:Females) for Selected CBTRUS Histology Groupings and Histology, CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



* Incidence Rate is significantly different in whites and blacks.
† All or some of this histology are included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384,9391-9460, (Table 2a). a. ICD-O-3 Histology Codes: 9381, 9384, 9424, 9400, 9401, 9410, 9411, 9420. b. ICD-O-3 Histology Codes: 9450, 9451, 9460. c. ICD-O-3 Histology Codes: 9530/0,9530/1, 9531/0, 9532/0, 9533/0, 9534/0, 9537/0, 9538/1, 9539/1. d. ICD-O-3 Histology Codes: 9530/3, 9538/3, 9539/3.

Fig. 14. Incidence Rate Ratios by Race (Whites:Blacks) for Selected CBTRUS Histology Groupings and Histologies, CBTRUS Statistical Report: NPCR and SEER, 2008-2012.

lymphoma ($p < 0.001$), and germ cell tumors ($p < 0.001$) are also higher among whites than blacks.
- Incidence rates for non-malignant ($p < 0.001$) and malignant ($p < 0.001$) meningioma and tumors of the pituitary ($p < 0.001$) are higher among blacks than whites.

Incidence Rates by Hispanic Ethnicity and Histology

Incidence rates by Hispanic ethnicity and histology are shown in Table 11.

- The overall incidence rate for primary brain and CNS tumors is 20.45 per 100,000 population among Hispanics and 22.31 per 100,000 population among non-Hispanics.
- Tumors of the pituitary, neoplasm unspecified and other hematopoietic neoplasms are the only histologies that are higher in Hispanics than in non-Hispanics.

Incidence Rates by Age and Histology

The age-adjusted incidence rates by age and histology at diagnosis are presented in Table 12, Figure 15 (age 20+ years) and Figure 16 (age 0-19 years).

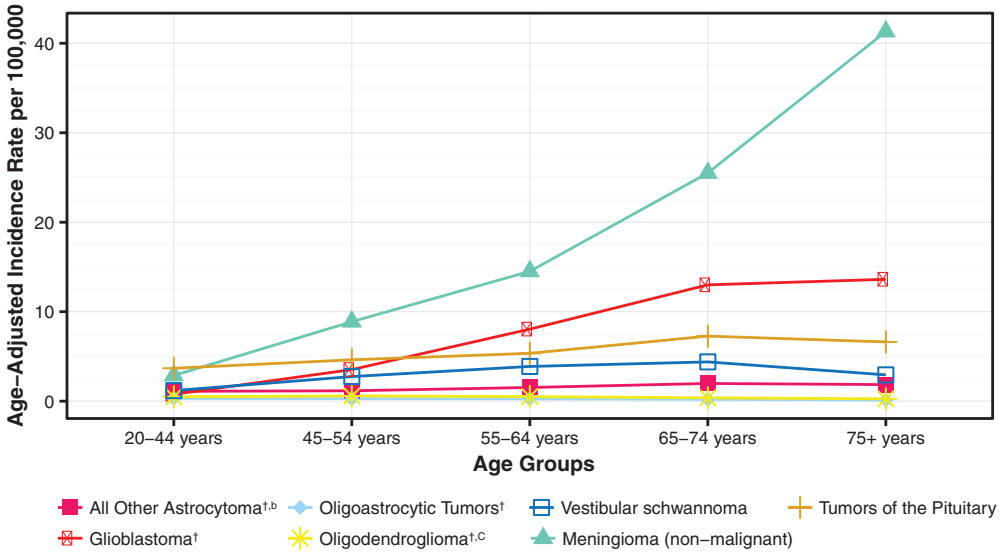
- The incidence rate for **all** brain and CNS tumors is highest among the age 85+ years (83.14 per 100,000 population) and lowest among children and adolescents age 0-19 years (5.57 per 100,000 population).
- Incidence rates of pilocytic astrocytoma, germ cell tumors, and embryonal tumors are higher in the younger age groups and decrease with advancing age.
- Incidence rate of meningioma increases with age.
- Incidence rates decline with increasing age for those age 0-19 years, particularly for the gliomas and embryonal tumors (primitive neuroectodermal tumor (PNET) and medulloblastoma).
- After peaking in the 0-9 year age-groups, incidence rates of pilocytic astrocytoma decreases in the 10-14, and 15-19 years age groups.
- The incidence of tumors of the pituitary increase substantially between the 10-14 years age-group and 15-19 years age-group.
- The incidence rate of PNET peaks in the 0-4 age group.
- The incidence of medulloblastoma peaks in those 9 years old and younger.

The distribution patterns of histologies within age groups differ substantially as is apparent in Table 13, which shows the four most common brain and CNS tumor histologies by age-group at diagnosis.

Median Age at Diagnosis

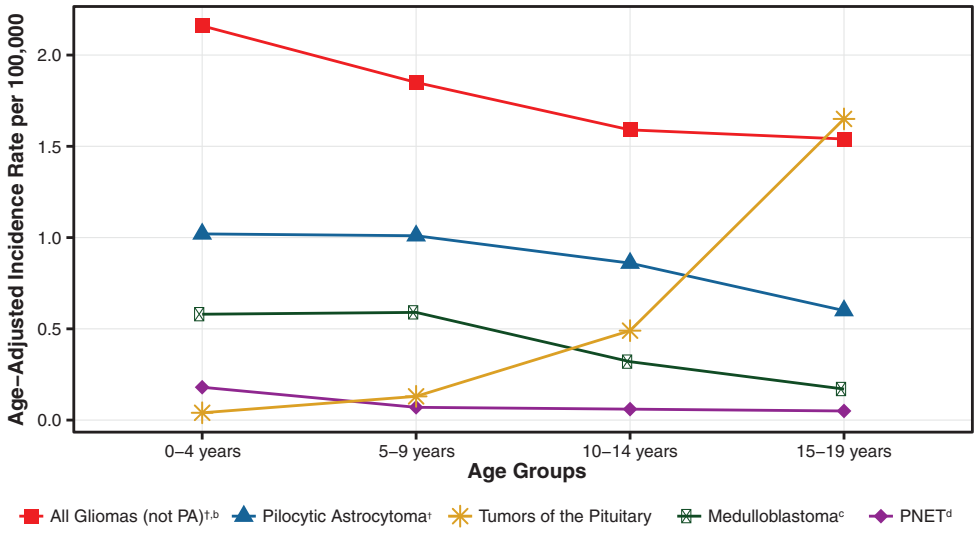
The median age at diagnosis for **all** primary brain and CNS tumors is 59 years (Table 7).

- The histology-specific median ages range from age 9 (embryonal tumors) to 70 (neoplasm, unspecified) years.
- Pilocytic astrocytoma, choroid plexus tumors, neuronal and mixed neuronal-glial tumors, tumors of the pineal region, embryonal tumors, and germ cell tumors and cysts are histologies with younger median ages at diagnosis.
- Meningioma and glioblastoma are primarily diagnosed at older ages (median age of 65 and 64 years, respectively).



† All or some of this histology are included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460 (Table 2a). a. Rates per 100,000 and age-adjusted to the 2000 United States standard population. b. ICD-O-3 Histology Codes: 9381, 9384, 9424, 9400, 9401, 9410, 9411, 9420. c. ICD-O-3 Histology Codes: 945, 9451, 9460. d. ICD-O-3 Code: 9560. e. ICD-O-3 Histology Codes: 9530/0,9530/1, 9531/0, 9532/0, 9533/0, 9534/0, 9537/0, 9538/1, 9539/1.

Fig. 15. Age-Adjusted Incidence Rates[a] of Brain and CNS Tumors by Selected Histologies and Age Groups (Age 20+ years), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



† All or some of this histology are included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460 (Table 2a). a. Rates per 100,000 and age-adjusted to the 2000 United States standard population. b. ICD-O-3 Histology Codes: 9380-9384, 9391-9420, 9422-9460, 9480. c. ICD-O-3 histology codes: 9470/3, 9471/3, 9472/3,9474/3. d. ICD-O-3 Histology Code: 9473/3.

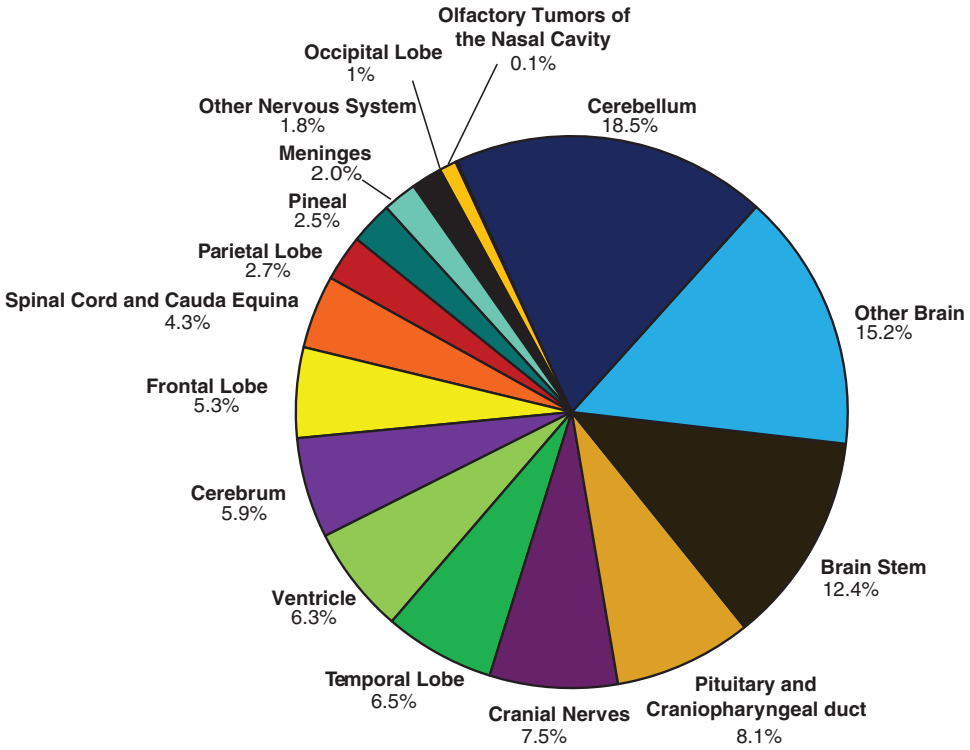
Fig. 16. Age-Adjusted Incidence Rates[a] in Children and Adolescents of Brain and CNS Tumors by Selected Histologies and Age Groups (Age 0-19 years), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.

Childhood and Adolescence: Incidence and Distribution of Primary Brain and CNS Tumors by Site, Histology, Gender and Age

Distribution of Tumors by Site and Histology in Children and Adolescents (Age 0-19 years)

Brain and CNS tumors are the most common form of solid tumors in children,[32,33] accounting for the majority of cancer mortality in this age group.[34] About 7% of the reported brain and CNS tumors during 2008-2012 occurred in children and adolescents age 0-19 years, and approximately 5% of all these reported tumors occurred in children age 0-14 years. The distribution of brain and CNS tumors for children and adolescents age 0-19 years by site is shown in Figure 17a.

- The largest percentages of tumors in childhood and adolescence are located in the pituitary and pineal glands (17.2%).



a. Percentages may not add up to 100% due to rounding.

Fig. 17a. Distribution[a] in Children and Adolescents (Age 0-19 years) of Primary Brain and CNS Tumors by Site (N = 23,113), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.

- A similar proportion of tumors are located within the frontal, temporal, parietal, and occipital lobes of the brain combined (17.0%).
- Cerebrum, ventricle, brain stem and cerebellum tumors account for 5.2%, 5.6%, 10.3%, and 15.6% of all brain and CNS tumors in childhood and adolescence, respectively.
- Tumors of the meninges represent 2.9% of all tumors in childhood and adolescence.
- The cranial nerves and the spinal cord and cauda equina account for 6.7% and 4.5% of all brain and CNS tumors in childhood and adolescence, respectively.

Figure 17b presents the most common brain and CNS histologies in children and adolescents age 0-19 years.

- For children and adolescents age 0-19 years, pilocytic astrocytomas, glioma malignant, NOS and embryonal tumors account for 15.5%, 11.7%, and 11.4%, respectively.
- Gliomas account for approximately 47.0% of tumors in children and adolescents age 0-19 years.
- Medulloblastoma accounts for 63.7% of all embryonal tumors in this age group.

Distribution of Tumors by Site and Histology in Children (Age 0-14 years)

The distribution of brain and CNS tumors for children age 0-14 years by site is shown in Figure 18a.

- Tumors of the cerebellum comprise the largest proportion of tumors (18.5%), followed by other brain (15.2%) and brain stem (12.4%).

Figure 18b presents the most common brain and CNS histologies in children age 0-14 years.

- For children age 0-14 years, pilocytic astrocytomas, embryonal tumors, and glioma malignant, NOS account for 18.0%, 14.6%, and 14.4%, respectively.
- Gliomas account for approximately 53.0% of tumors in children age 0-14 years.
- Of embryonal tumors, medulloblastoma, atypical teratoid/rhabdoid tumor and primitive neuroectodermal tumor account for 62.9%, 15.5%, and 13.3%, respectively.

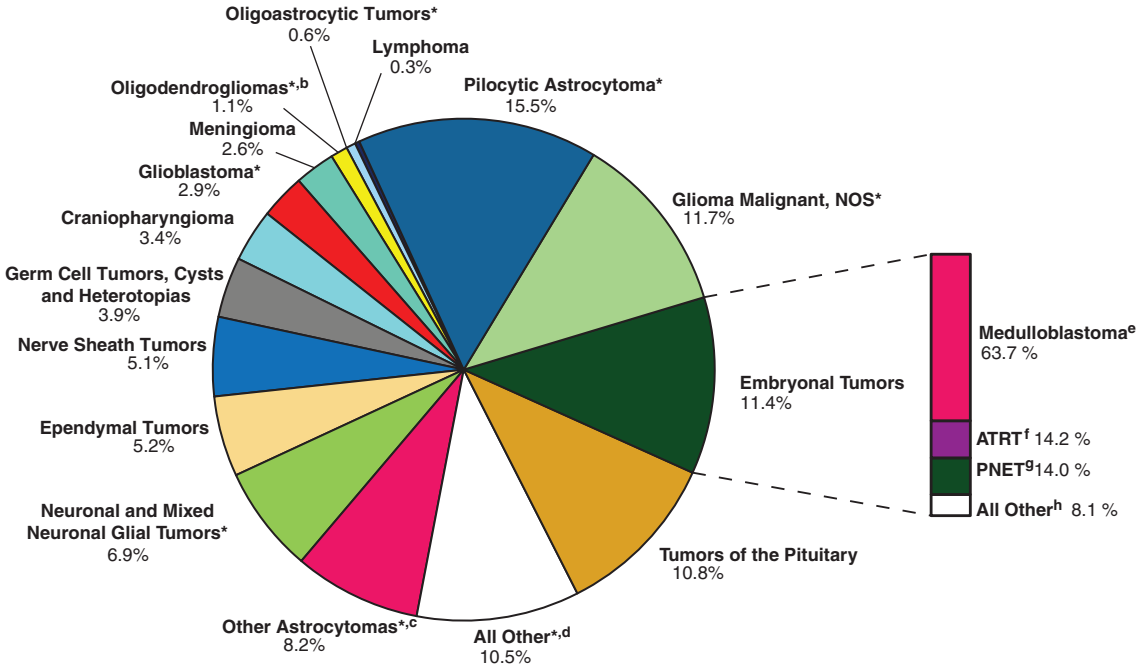
Distribution of Tumors by Site and Histology in Adolescents (Age 15-19 years)

About 1.9% of all brain and CNS tumors occurred in adolescents age 15-19 years for a total of 6,747 tumors diagnosed between 2008 and 2012 (Table 4). The distribution of these tumors by site is presented in Figure 19a.

- Approximately 29.8% of these tumors were diagnosed in the pituitary and craniopharyngeal duct.
- The frontal lobe, temporal lobe, occipital lobe, and parietal lobe accounted for 20.8% of tumors in adolescents age 15-19 years.

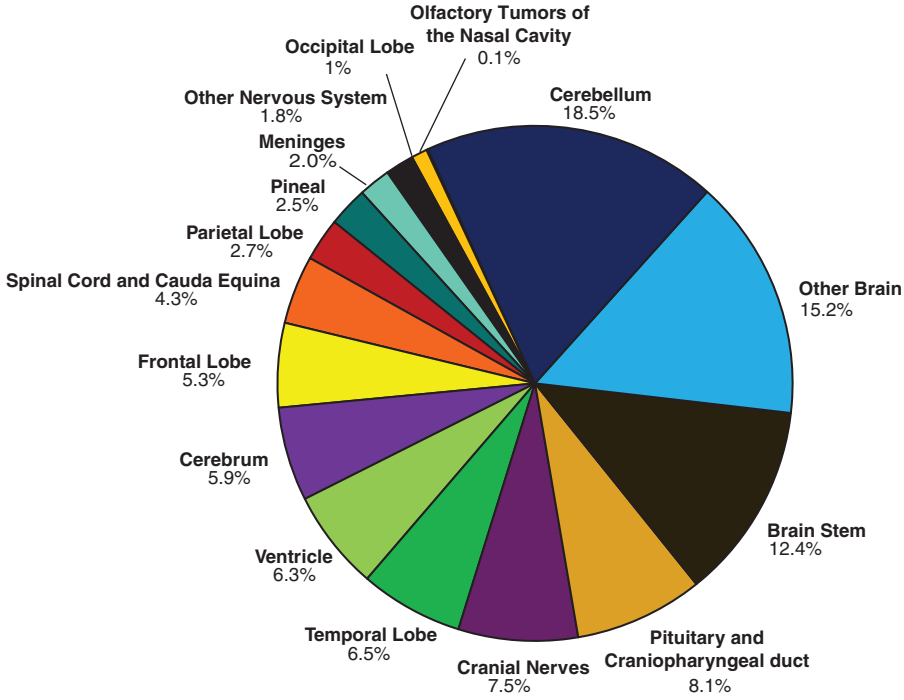
The distribution of brain and CNS tumors in those age 15-19 years by histology is presented in Figure 19b.

- The most common histology in adolescents age 15-19 years is tumors of the pituitary (26.8%).



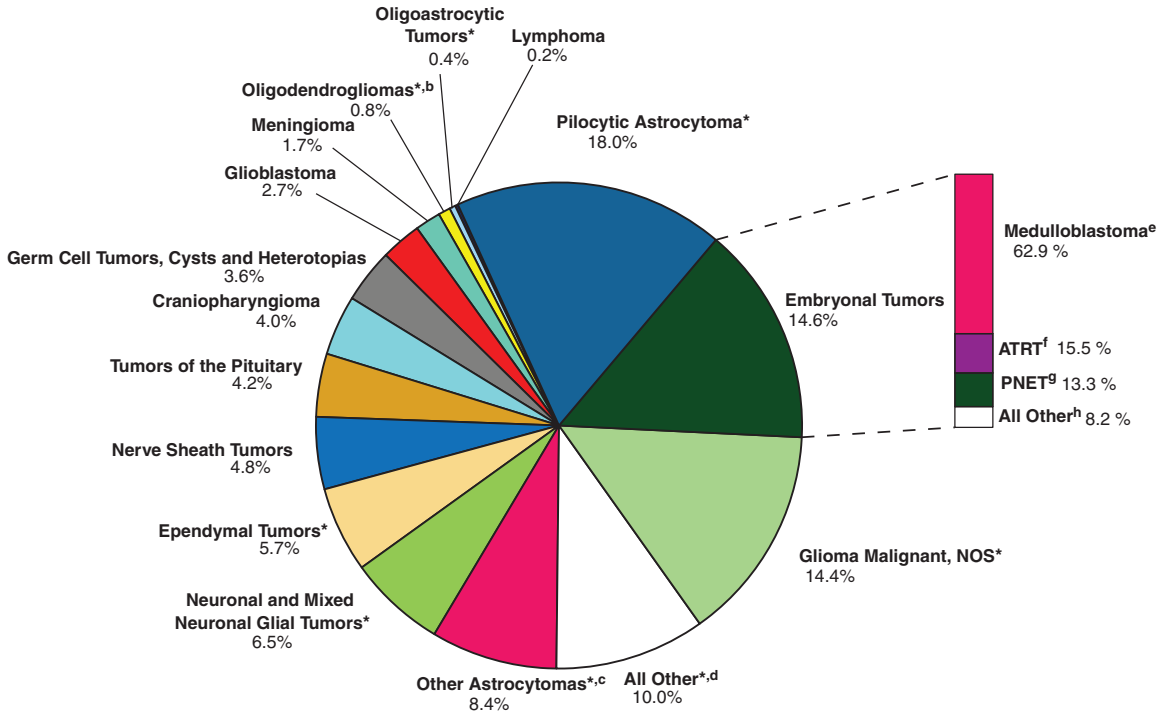
*All or some of this histology are included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460 (Table 2a).
a. Percentages may not add up to 100% due to rounding. b. ncludes oligodendrogliomas and anaplastic oligodendrogliomas (Table 2a).
c. Includes diffuse astrocytoma, anaplastic astrocytoma, unique astrocytoma variants (Table 2a). d. Includes choroid plexus tumors, other neuroepithelial tumors, tumors of the pineal region, other tumors of cranial and spinal nerves, mesenchymal tumors, primary melanocytic lesions, other neoplasms related to the meninges, other hematopoietic neoplasms, hemangioma, neoplasm unspecified, all other (Table 2a). e. ICD-O-3 histology codes: 9470/3, 9471/3, 9472/3,9474/3. f. ICD-O-3 histology code: 9508/3. g. ICD-O-3 histology code: 9473/3. h. ICD-O-3 histology codes: 8963/3, 9364/3, 9480/0, 9480/3, 9490/0 , 9490/3, 9500/3, 9501/3, 9502/3.

Fig. 17b. Distribution[a] in Children and Adolescents (Age 0-19 years) of Primary Brain and CNS Tumors by CBTRUS Histology Groupings and Histology (N = 23,113), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



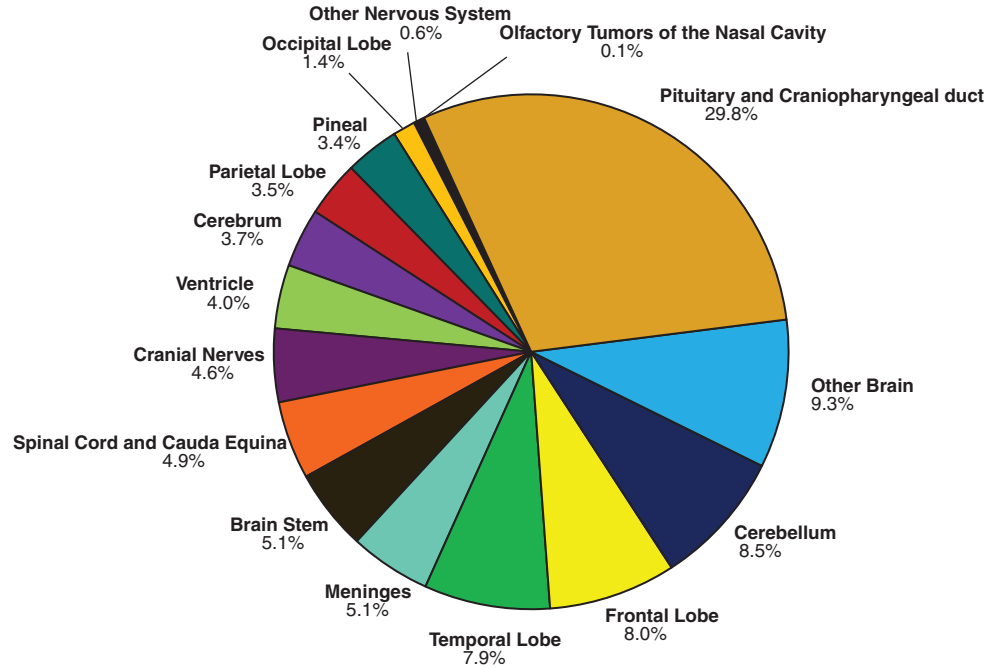
a. Percentages may not add up to 100% due to rounding.

Fig. 18a. Distribution[a] in Children (Age 0-14 years) of Primary Brain and CNS Tumors by Site (N = 16,366), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



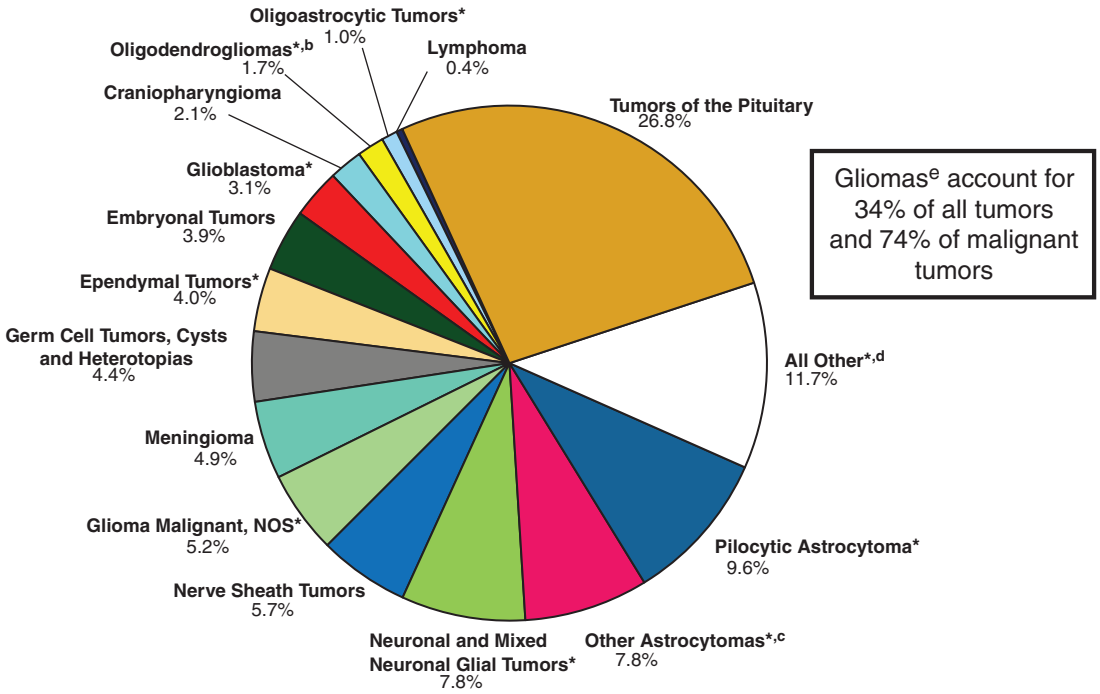
* All or some of this histology are included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460 (Table 2a).
a. Percentages may not add up to 100% due to rounding. b. Includes oligodendrogliomas and anaplastic oligodendrogliomas (Table 2a). c. Includes diffuse astrocytoma, anaplastic astrocytoma, unique astrocytoma variants (Table 2a). d. Includes choroid plexus tumors, other neuroepithelial tumors, tumors of the pineal region, other tumors of cranial and spinal nerves, mesenchymal tumors, primary melanocytic lesions, other neoplasms related to the meninges, other hematopoietic neoplasms, hemangioma, neoplasm unspecified, all other (Table 2a). e. ICD-O-3 histology codes: 9470/3, 9471/3, 9472/3,9474/3. f. ICD-O-3 histology code: 9508/3. g. ICD-O-3 histology code: 9473/3. h. ICD-O-3 histology codes: 8963/3, 9364/3, 9480/0, 9480/3, 9490/0 , 9490/3, 9500/3, 9501/3, 9502/3.

Fig. 18b. Distribution[a] in Children (Age 0-14 years) of Primary Brain and CNS Tumors by CBTRUS Histology Groupings and Histology (N = 16,366), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



a. Percentages may not add up to 100% due to rounding.

Fig. 19a. Distribution[a] in Adolescents[b] (Age 15-19 years) of Primary Brain and CNS Tumors by Site (N = 6,747), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



* All or some of this histology are included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460 (Table 2a). a. Percentages may not add up to 100% due to rounding. b. Includes oligodendrogliomas and anaplastic oligodendrogliomas (Table 2a). c. Includes diffuse astrocytoma, anaplastic astrocytoma, unique astrocytoma variants (Table 2a). d. Includes choroid plexus tumors, other neuroepithelial tumors, tumors of the pineal region, other tumors of cranial and spinal nerves, mesenchymal tumors, primary melanocytic lesions, other neoplasms related to the meninges, other hematopoietic neoplasms, hemangioma, neoplasm unspecified, all other (Table 2a). e. ICD-O-3 histology codes: 9380- 9384, 9391-9460,9480.

Fig. 19b. Distribution[a] in Adolescents (Age 15-19 years) of Primary Brain and CNS Tumors by Histology (N = 6,747), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.

- Gliomas account for approximately 34% of tumors in adolescents age 15-19 years. Of these gliomas, the histology pilocytic astrocytoma account for 9.6% of all tumors in this age group.

Incidence Rates by Histology, Histology Groupings and Gender in Children and Adolescents (Age 0-19 years)

The incidence rates of the most common tumors in children and adolescents by major histology groupings, histology and gender are shown in Table 14.

- Average annual incidence rates are highest for tumors of neuroepithelial tissue (3.71 per 100,000 population). Among these tumors, the most common histologies are pilocytic astrocytoma (0.87 per 100,000 population), glioma malignant, NOS (0.66 per 100,000 population), and embryonal tumors (0.64 per 100,000 population).
- There are notable differences in incidence rates between males and females for ependymal tumors, embryonal tumors, germ cell tumors, and tumors of the pituitary.

Incidence Rates by Histology and Race in Children and Adolescents (Age 0-19 years)

Table 15 shows incidence rates by histology and race for children and adolescents age 0-19 years.

- Incidence rates are highest among API (6.03 per 100,000 population) as compared to white (5.79 per 100,000 population), black (4.43 per 100,000 population), and AIAN (3.29 per 100,000 population).

Incidence Rates by Histology and Hispanic Ethnicity in Children and Adolescents (Age 0-19 years)

Incidence rates for children and adolescents age 0-19 years by Hispanic ethnicity are shown in Table 16.

- Incidence rates for non-Hispanics (5.86 per 100,000 population, 18,782 total tumors) are higher than those for Hispanics (4.62 per 100,000 population, 4,331 total tumors).
- The largest differences between non-Hispanics and Hispanics are in incidence rates of tumors of neuroepithelial tissue and tumors of cranial and spinal nerves.

Incidence Rates by Age and Histology in Children and Adolescents (Age 0-19 years)

The detailed age-adjusted incidence rates by histology for childhood age groups 0-14 years overall, childhood and adolescence age 0-19 years overall, and age groups 0-4 years, 5-9 years, 10-14 years, and 15-19 years are shown in Table 4.

- Overall, incidence rates for age groups 0-4 years (5.93 per 100,000 population) and 15-19 years (6.19 per 100,000 population) significantly exceed those observed in age groups 5-9 years (5.06 per 100,000 population) and 10-14 years (5.14 per 100,000 population).

- Individual histology distributions vary substantially within these age groups.
- Incidence rates of pilocytic astrocytoma, glioma malignant, NOS, ependymal tumors, choroid plexus tumors and embryonal tumors decrease with increasing age.

Incidence Rates by Histology Defined by ICCC in Children and Adolescents (Age 0-19 years)

Table 17 presents the CBTRUS brain and CNS tumor data for children and adolescents used for this report according to the International Classification of Childhood Cancer (ICCC) grouping system for pediatric cancers (See the CBTRUS website for additional information on this classification scheme: http://www.cbtrus.org).[18]

Primary Brain and CNS Tumors: Estimated Numbers of Expected Cases, Mortality Rates and Relative Survival

Estimated Numbers of Expected Cases of All Primary Brain and CNS Tumors by State

The estimated number of cases of all primary brain and CNS tumors for 2015 and 2016 by state and behavior are shown in Table 18. The estimated number of cases of malignant and non-malignant tumors projected using age-adjusted annual brain tumor incidence rates were generated for 2000-2012 for malignant tumors, and 2006-2012 for non-malignant tumors.

- The total number of new cases of primary brain and CNS tumors for all 50 states and the District of Columbia in 2015 is estimated to be 76,520 with 24,560 malignant and 51,960 non-malignant.
- For 2016, the estimate is 77,670 new cases of primary brain and CNS tumors of which 24,790 and 52,880 are expected to be malignant and non-malignant, respectively.

Estimated Number of Expected Cases of All Primary Brain and CNS Tumors by Histology, Histology Grouping and Age

The estimated number of cases of all primary brain and CNS tumors for 2015 and 2016 by histology are shown in Table 19.

- **Meningioma has the highest number of all estimated new cases, with 25,110 cases in 2015 and 24,880 in 2016**. Tumors of the pituitary have the second highest number of all estimated cases, with 11,610 cases in 2015 and 11,700 in 2016.
- **Glioblastoma has the highest number of cases of all malignant tumors, with 11,890 cases predicted in 2015 and 12,120 in 2016.**

The estimated numbers of cases for 2015 and 2016 by age are presented in Table 20.

- For 2015, the highest number of new cases is predicted in those age 40-64 years, with 29,260 cases. For 2016, the highest number of new cases is estimated to be in those age 65+ years, with 29,610 cases.
- For 2015 and 2016, children age 0-14 years are estimated to have 4,630 new cases of primary brain and CNS tumors each year.

Estimated Mortality Rates for Malignant Brain and CNS Tumors by State and Gender

Table 21 and Figure 20 show average annual age-adjusted mortality rates for primary malignant brain and CNS tumors in the US during 2008-2012 by state and gender.

- The aggregate total number of observed deaths is 71,831, for an average annual age-adjusted mortality rate of 4.31 per 100,000 population.
- There is considerable variation by individual state, which range from a low of 2.42 deaths per 100,000 population to a high of 5.52 deaths per 100,000 population.
- Males have higher mortality rates for brain and CNS tumors than females in the US population, with 5.28 per 100,000 population as compared to 3.48 per 100,000 population.

Relative Survival Rates for Malignant Brain and CNS Tumors by Site

Relative survival estimates by site are presented in Table 22.

- The highest ten-year survival is for tumors occurring in the cranial nerves (91.2%).
- The lowest ten-year survival is for tumors of the parietal lobe (14.3%).

Survival Rates for Malignant Brain and CNS Tumors by Histology and Age

Survival estimates for malignant brain tumors by histology and age at diagnosis are presented in Tables 23 and 24. The one- through ten-year relative survival rates by histology and age-group are shown in Table 24.

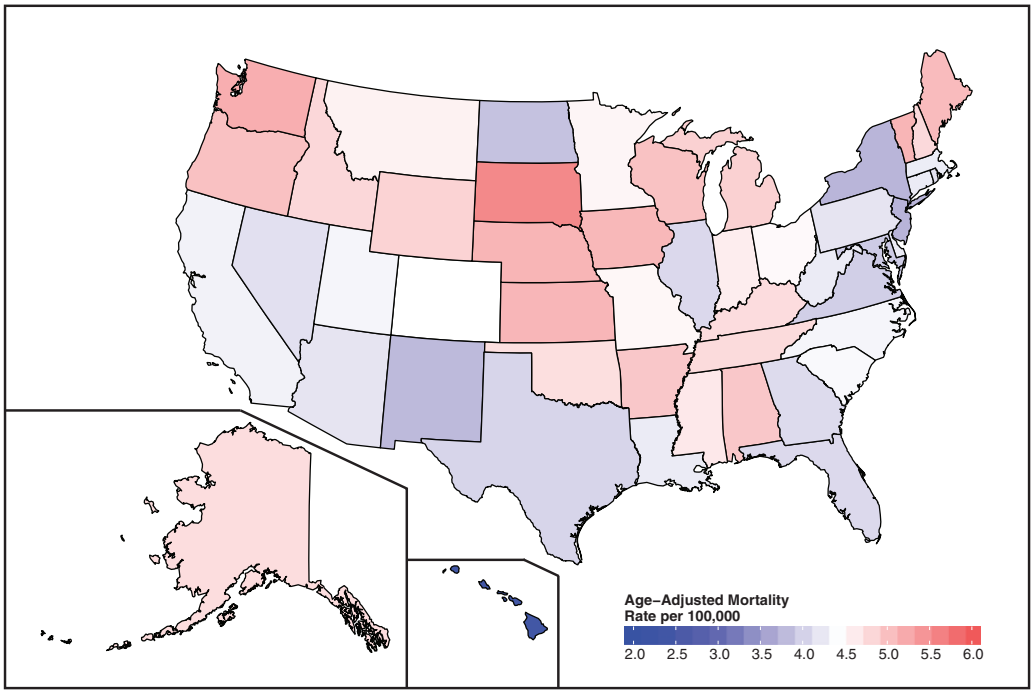
- The estimated five- and ten-year relative survival rates for all malignant brain and CNS tumors are 34.4% and 28.8%, respectively.
- There is large variation in survival estimates depending upon tumor histology; five-year survival rates are 94.2% for pilocytic astrocytoma but are 5.1% for glioblastoma.
- Survival generally decreases with older age at diagnosis; children and young adults generally have better survival outcomes for most histologies.

Descriptive Summary of Meningioma, Glioblastoma and Embryonal Tumors

The data in the CBTRUS Statistical Report 2008-2012 are synthesized to describe the three most common histologic types for adults: meningioma and glioblastoma, and for children and adolescents: embryonal tumors.

Meningioma

- **Meningiomas are the most frequently reported tumors, accounting for 36.4% of tumors overall** (Figure 9a).
- Non-malignant meningiomas with behavior codes /0 (benign) or /1 (uncertain) account for 98.7% of meningiomas reported to CBTRUS (Table 7).
- Meningiomas are most common in adults age 65 years and older (Table 13), and one of the least common in children age 0-14 years (Table 4).



a. Rates per 100,000 and age-adjusted to the 2000 United States standard population.

Fig. 20. Average Annual Age-Adjusted Mortality Rates[a] for Malignant Primary Brain and CNS Tumors by Central Cancer Registry, CBTRUS Statistical Report: NCHS, 2008-2012.

- Incidence of meningiomas increases with age, with a dramatic increase after age 65 years. Even among the population aged 85 years and older, these rates continue to be high (Table 12).
- Non-malignant meningiomas are 2.5 times more common in females as compared to males (Figure 13).
- Incidence of meningioma is significantly higher in blacks than in whites (Figure 14).
- Ten-year relative survival for malignant meningioma is 57.5% (Table 23).
- Age had a large effect on relative survival after diagnosis with malignant meningioma: 10-year survival was 82.2% for age 20-44 years, and 36.3% for age 75+ years (Table 24).

Glioblastoma

- **Glioblastoma is the third most frequently reported histology overall and the most common malignant histology** (Tables 3 and 7).
- Glioblastoma accounts for 15.1% of all primary brain tumors (Figure 9a) and 46.1% of primary malignant brain tumors (Figure 9b).
- Glioblastoma is more common in older adults (Table 12) and is less common in children; these tumors comprise approximately 2.9% of all brain and CNS tumors reported among age 0-19 years (Figure 17b).
- Incidence of glioblastoma increases with age, with rates highest in the 75 to 84 years (Table 12).
- Glioblastoma is 1.6 times more common in males (Figure 13).
- Glioblastoma is about 2 times higher among whites as compared to blacks (Figure 14).
- Relative survival estimates for glioblastoma are quite low; 5.1% of patients survived five years post diagnosis (Table 23). These survival estimates are somewhat higher for the small number of patients who are diagnosed under age 20 years (Table 24).

Embryonal Tumors

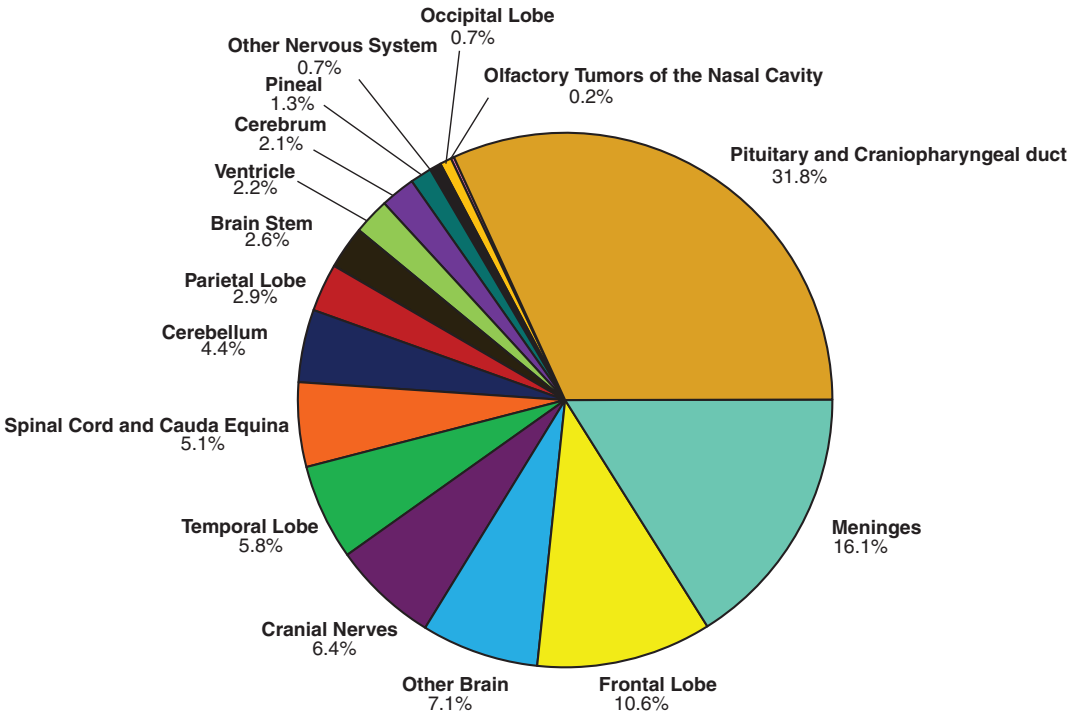
- **Embryonal tumors are the most frequently reported tumor type in children age 0-4 years, and the second most common tumor type overall in children and adolescents age 0-19 years** (Tables 12 and 13).
- Embryonal tumors account for 14.6% of all primary brain tumors in children age 0-14 years (Figure 18b), 11.4% of all primary brain tumors in children and adolescents age 0-19 years (Figure 17b, and 1.1% of tumors diagnosed overall (Figure 9a).
- Embryonal tumors within the CBTRUS histologic grouping scheme includes multiple different histologies: primitive neuroectodermal tumor (PNET; ICD-O-3 histology code 9473), medulloblastoma (ICD-O-3 histology codes 9470-9472), atypical teratoid/rhabdoid tumor (ATRT; ICD-O-3 histology code 9508), and several other histologies (Table 2a).
- Incidence of medulloblastoma decreases with age. Incidence was 0.58 per 100,000 population, 0.59 per 100,000 population, 0.32 per 100,000 population, and 0.17 per 100,000 population in children age 0-4, 5-9, 10-14, and adolescents 15-19 years, respectively (Table 4).
- Incidence of PNET was 0.18 per 100,000 population, 0.07 per 100,000 population, 0.06 per 100,000 population, and 0.05

per 100,000 population in children age 0-4, 5-9, 10-14, and adolescents 15-19 years, respectively (Table 4).
- Incidence of ATRT was 0.34 per 100,000 population and 0.02 per 100,000 population in children age 0-4 and 5-9 years, respectively. There are too few of these cases in older age groups to report (Table 4).
- Relative survival estimates for embryonal tumors are low but vary significantly by histology. 10-year survival is 63.3% for medulloblastoma, 42.1% for PNET, and 26.5% for ATRT (Table 23).

Descriptive Summary of Adolescent and Young Adult Primary Brain and CNS Tumors (Age 15-39 years)

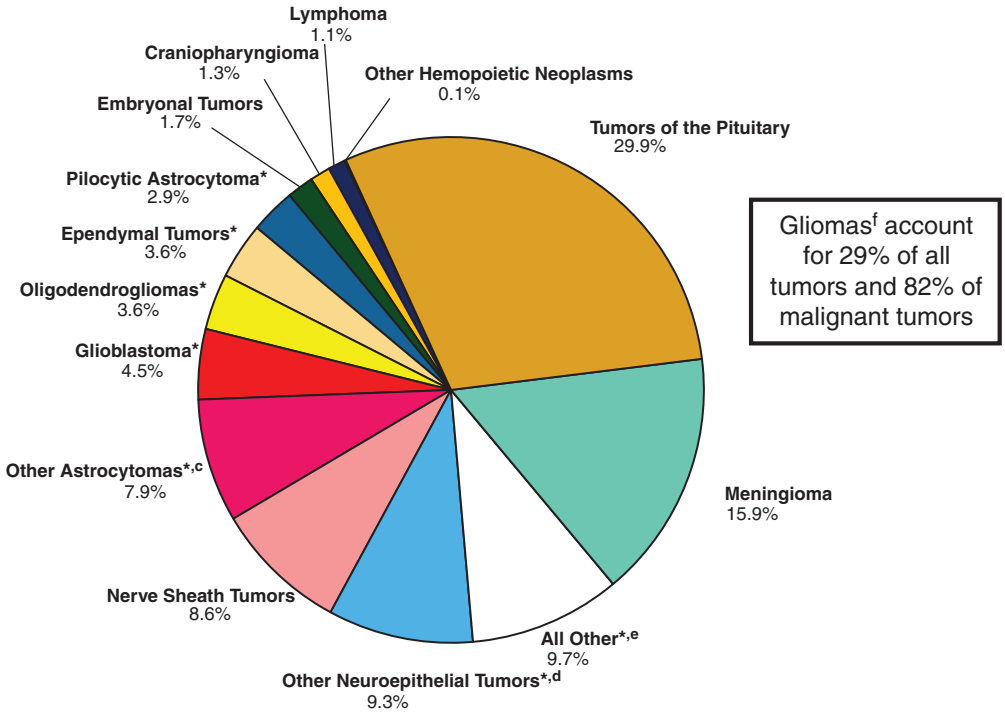
Brain and CNS tumors are less common in adolescents and young adults (AYA; age 15-39 years)[35] as compared to older adults (Table 25). While brain tumors have a higher incidence rate in AYA as opposed to children (Table 25), they are not as common in comparison to other types of cancer.

- There were 53,083 primary brain and CNS tumors diagnosed in AYA between 2008 and 2012, which is 14.9% of all brain and CNS.
- 53,083 total tumors were diagnosed in persons age 15-39 years between 2008 and 2012 (Figure 21a–b).
- The overall incidence rate in this age group was 10.47 per 100,000 population (Table 25).
- Tumors of neuroepithelial tissue had the highest incidence (3.45 per 100,000 population), followed by tumors of the sellar region (3.24 per 100,000 population) (Table 25).
- The most common histology in AYA was Tumors of the pituitary (3.11 per 100,000 population), followed by meningioma (1.74 per 100,000 population) and nerve sheath tumors (0.91 per 100,000 population) (Table 25).
- The majority of AYA brain and CNS tumors occurred in the pituitary and craniopharyngeal duct (31.8%), followed by the meninges (16.1%) (Figure 21a).
- Approximately 20% of tumors diagnosed in AYA are located within the frontal, temporal, parietal, and occipital lobes of the brain combined (Figure 21a).
- Cerebrum, ventricle, cerebellum, and brain stem tumors combined account for about 11.3% of all AYA tumors (Figure 21a).
- The predominately non-malignant tumors of the pituitary (29.9%), meningioma (15.9%), and nerve sheath (8.6%) represent over half of tumors diagnosed in those age 15-39 years. (Figure 21b).
- Glioma accounts for approximately 29% of all brain and CNS tumors in AYA, and about 82% of malignant tumors. (Figure 21b).
- AYA are estimated to have 10,390 new primary brain and CNS tumors in both 2015 and 2016 (Table 20).
- AYA have higher rates of relative survival than adults greater than 40 years old for all histologic types. Though 1-year relative survival for most tumor types is higher for AYA than children, 5 and 10-year survival is usually higher for children as compared to AYA (Table 26).



a. Percentages may not add up to 100% due to rounding. b. Adolescents and Young Adults (AYA), as defined by the National Cancer Institute, see: http://www.cancer.gov/researchandfunding/snapshots/adolescent-young-adult.

Fig. 21a. Distribution[a] in Adolescents and Young Adults[b] (Age 15-39 years) of Primary Brain and CNS Tumors by Site (N = 53,083), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.



* All or some of this histology are included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460 (Table 2a). a. Percentages may not add up to 100% due to rounding. b. Adolescents and Young Adults (AYA), as defined by the National Cancer Institute, see: http://www.cancer.gov/researchandfunding/snapshots/adolescent-young-adult. c. Includes diffuse astrocytoma, anaplastic astrocytoma, unique astrocytoma variants (Table 2a). d. Includes other tumors of cranial and spinal nerves, mesenchymal tumors, primary melanocytic lesions, other neoplasms related to the meninges, hemangioma, neoplasm unspecified, all other (Table 2a). e. Includes oligoastrocytic tumors, glioma malignant, NOS, choroid plexus tumors, other neuroepithelial tumors, neuronal and mixed neuronal-glial tumors, tumors of the pineal region (Table 2a). f. ICD-O-3 histology codes: 9380- 9384, 9391-9460,9480.

Fig. 21b. Distribution[a] in Adolescents and Young Adults[b] (Age 15-39 years) of Primary Brain and CNS Tumors by Histology (N = 53,083), CBTRUS Statistical Report: NPCR and SEER, 2008-2012.

Descriptive Summary of Time Trends in Primary Brain and CNS Tumors

Time trends in cancer incidence rates are an important measure of the changing burden of cancer in a population over time. Incidence rates of cancer overall, and many specific cancer histologies, have decreased over time.[36] Overall, there have been some changes in incidence rates of brain and CNS tumors between 2000 and 2010, but the scale of these changes has been small.[37]

- In children (0-14 years old), there have been significant increases in incidence of primary malignant brain and CNS tumors between 2000-2010, with an annual percentage change (APC) of 0.6%.[37]
- In adolescents (15-19 years old), there was a significant increase in incidence of primary malignant brain and CNS tumors between 2000-2008, with an APC of 1.0%.[37]
- Adolescents also experienced an increase in non-malignant brain and CNS tumors from 2004-2010, with an APC of 3.9%.[37]
- Between 2008 and 2010, adults (age 20+years) experienced a decrease in incidence of primary malignant brain and CNS tumors, with an APC of −3.1%.[37]

Concluding Comment

The *CBTRUS Statistical Report: Primary Brain and Central Nervous System Tumors Diagnosed in the United States in 2008-2012* comprehensively describes the current population-based incidence, mortality and relative survival of primary malignant and non-malignant brain and other CNS tumors collected and reported by central cancer registries covering approximately 99.9% of the US population (for 2011-2012 only, data was available for 50 out of 51 registries). This report aims to serve as a useful resource for researchers, clinicians, patients and families. In keeping with its mission, CBTRUS continually revises its reports to reflect the current collection and reporting practices of the broader surveillance community in which it works, while integrating the input it receives from the clinical and research community, especially from neuropathologists, when possible. In this way, the CBTRUS facilitates communication between the cancer surveillance and the brain tumor research and clinical communities and contributes meaningful insight into the descriptive epidemiology of all primary brain and CNS tumors in the United States.

Abbreviations

AIAN – American Indian/Alaskan Native
AJCC – American Joint Commission on Cancer
API – Asian/Pacific Islander
AYA – Adolescents and Young Adults
ATRT – Atypical Teratoid Rhabdoid Tumor
CBTRUS – Central Brain Tumor Registry of the United States
CCR – Central Cancer Registry
CDC – Centers for Disease Control and Prevention
CS – Collaborative Staging
CSS – Cancer Surveillance System
CI – Confidence interval
CNS – Central nervous system
ICD-O-3 – International Classification of Diseases for Oncology, Third Edition
ICCC – International Classification of Childhood Cancer
NAACCR – North American Association of Central Cancer Registries
NCDB – National Cancer Data Base
NCHS – National Center for Health Statistics
NCI – National Cancer Institute
NOS – Not otherwise specified
NPCR – National Program of Cancer Registries
PNET – Primitive Neuroectodermal Tumor
SEER – Surveillance, Epidemiology and End Results
US – United States
USCS – United States Cancer Statistics
VHA – Veteran's Health Administration
WHO – World Health Organization

References

1. Centers for Disease Control and Prevention (CDC). National Program of Cancer Registries Cancer Surveillance System Rationale and Approach. 1999; http://www.cdc.gov/cancer/npcr/pdf/npcr_css.pdf.
2. Cancer Registries Amendment Act, 102nd Cong. § 515 (1992). http://www.gpo.gov/fdsys/pkg/STATUTE-106/pdf/STATUTE-106-Pg3372.pdf.
3. Benign Brain Tumor Cancer Registries Amendment Act, 107th Cong. § 260 (2002). http://www.gpo.gov/fdsys/pkg/PLAW-107publ260/pdf/PLAW-107publ260.pdf.
4. National Cancer Institute. Overview of the SEER Program. http://seer.cancer.gov/about/overview.html.
5. Centers for Disease Control and Prevention National Center for Health Statistics. United States Cancer Statistics: 1999–2012 Incidence, WONDER Online Database. United States Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; 2015. Accessed at http://wonder.cdc.gov/cancer-v2012.html. http://wonder.cdc.gov/ucd-icd10.html.
6. Louis DN, OH, Wiestler OD, Cavanee WK, ed *WHO Classification of Tumours of the Central Nervous System*. Lyon, France: International Agency for Research on Cancer; 2007.
7. Ostrom QT, Gittleman H, Liao P, et al. CBTRUS Statistical Report: Primary Brain and Central Nervous System Tumors Diagnosed in the United States in 2007-2011. *Neuro Oncol*. 2014;16(s4):iv1–iv63.
8. Fritz A, PC, Jack A, Shanmugaratnam K, Sobin L, Perkin DM, Whelan S ed *International Classification of Diseases for Oncology*, Third edition. World Health Organization; 2000.
9. Centers for Disease Control and Prevention National Center for Health Statistics. United States Cancer Statistics: 1999–2011 Incidence, WONDER Online Database. United States Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; 2015. Accessed at http://wonder.cdc.gov/cancer-v2012.html. http://wonder.cdc.gov/ucd-icd10.html.
10. Surveillance Research Program - National Cancer Institute. SEER … as a Research Resource. 2010; http://seer.cancer.gov/about/factsheets/SEER_Research_Brochure.pdf.
11. Surveillance E, and End Results (SEER) Program. SEER*Stat Database: Mortality - All COD, Aggregated With State, Total U.S. (1990-2012) < Katrina/Rita Population Adjustment>, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2015. Underlying mortality data provided by NCHS (www.cdc.gov/nchs).
12. Centers for Disease Control and Prevention National Center for Health Statistics. Underlying Cause of Death 1999-2013 on CDC WONDER Online Database, released 2015. Data are from the Multiple Cause of Death Files, 1999-2013, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. http://wonder.cdc.gov/ucd-icd10.html.
13. McCarthy BJ, Surawicz T, Bruner JM, et al. Consensus Conference on Brain Tumor Definition for registration. November 10, 2000. *Neuro Oncol*. 2002;4(2):134–145. http://www.ncbi.nlm.nih.gov/pubmed/11916506.
14. Kleihues P, Cavenee W. *Tumours of the nervous system: World Health Organization classification of tumours*. Lyon, France: IARC Press; 2000.
15. American Joint Committee on Cancer. Collaborative Stage Data Collection System. 2015; http://www.cancerstaging.org/cstage/.
16. Lym RL, Ostrom QT, Kruchko C, et al. Completeness and concordancy of WHO grade assignment for brain and central nervous system tumors in the United States, 2004-2011. *Journal of neuro-oncology*. Apr 12 2015.
17. Surveillance Research Program - National Cancer Institute. ICCC Recode ICD-O-3/WHO 2008. http://seer.cancer.gov/iccc/iccc-who2008.html.
18. Steliarova-Foucher E, Stiller C, Lacour B, Kaatsch P. International Classification of Childhood Cancer, third edition. *Cancer*. Apr 1 2005;103(7):1457–1467.
19. Surveillance Research Program - National Cancer Institute. ICD-0-3 SEER Site/Histology Validation List. 2012; http://seer.cancer.gov/icd-o-3/sitetype.icdo3.d20121205.pdf.
20. R Core Team. R: A language and environment for statistical computing. 2014; http://www.R-project.org/.
21. Surveillance Epidemiology and End Results (SEER) Program. SEER*Stat software version 8.1.5. 2014; www.seer.cancer.gov/seerstat.
22. Surveillance Epidemiology and End Results (SEER) Program. SEER*Stat Database: Populations - Total U.S. (1990-2013) - Linked To County Attributes - Total U.S., 1969-2013 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released December 2014. http://seer.cancer.gov/popdata/.

23. Tiwari RC, Clegg LX, Zou Z. Efficient interval estimation for age-adjusted cancer rates. *Statistical methods in medical research.* 2006;15(6): 547–569. http://www.ncbi.nlm.nih.gov/pubmed/17260923.
24. NAACCR Race and Ethnicity Work Group. NAACCR Guideline for Enhancing Hispanic/Latino Identification: Revised NAACCR Hispanic/Latino Identification Algorithm [NHIA v2.2.1]. September 2012.
25. Joinpoint Regression Program, Version 4.2.0 - April 2015; Statistical Methodology and Applications Branch, Surveillance Research Program, National Cancer Institute.
26. Kim HJ, Fay MP, Feuer EJ, Midthune DN. Permutation tests for joinpoint regression with applications to cancer rates. *Statistics in medicine*. Feb 15 2000;19(3):335–351.
27. Zhu L, Pickle LW, Ghosh K, et al. Predicting US- and state-level cancer counts for the current calendar year: Part II: evaluation of spatiotemporal projection methods for incidence. *Cancer*. Feb 15 2012;118(4):1100–1109.
28. Centers for Disease Control and Prevention National Center for Health Statistics. Underlying Cause of Death 1999-2011 on CDC WONDER Online Database, released 2015. Data are from the Multiple Cause of Death Files, 1999-2012, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. http://wonder.cdc.gov/ucd-icd10.html.
29. Surveillance Epidemiology and End Results (SEER) Program. SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2013 Sub (1973-2012 varying) - Linked To County Attributes - Total U.S., 1969-2013 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2015, based on the November 2014 submission.
30. Edwards BK, Noone AM, Mariotto AB, et al. Annual Report to the Nation on the status of cancer, 1975-2010, featuring prevalence of comorbidity and impact on survival among persons with lung, colorectal, breast, or prostate cancer. *Cancer*. May 1 2014;120(9): 1290–1314.
31. Clegg LX, Feuer EJ, Midthune DN, et al. Impact of reporting delay and reporting error on cancer incidence rates and trends. *J Natl Cancer Inst*. 2002;94(20):1537–1545. http://www.ncbi.nlm.nih.gov/pubmed/12381706.
32. Ostrom QT, de Blank PM, Kruchko C, et al. Alex's Lemonade Stand Foundation Infant and Childhood Primary Brain and Central Nervous System Tumors Diagnosed in the United States in 2007-2011. *Neuro Oncol*. Jan 2015;16 Suppl 10:x1–x36.
33. Gurney JG, SM, Bunin GR. Chapter III: CNS and miscellaneous intracranial and intraspinal neoplasms. In: Ries LAG SM, Gurney JG, Linet M, Tamra T, Young JL, Bunin GR ed. *Cancer Incidence and Survival among Children and Adolescents: United States SEER Program 1975-1995, National Cancer Institute, SEER Program. NIH Pub. No. 99-4649*. Bethesda, MD 1999.
34. de Blank PM, Ostrom QT, Rouse C, et al. Years of life lived with disease and years of potential life lost in children who die of cancer in the United States, 2009. *Cancer Med*. Jan 27 2015.
35. National Cancer Institute at the National Institutes of Health. Adolescents and Young Adults with Cancer. http://www.cancer.gov/cancertopics/aya.
36. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2015. *CA: a cancer journal for clinicians*. Jan-Feb 2015;65(1):5–29.
37. Gittleman HR, Ostrom QT, Rouse CD, et al. Trends in central nervous system tumor incidence relative to other common cancers in adults, adolescents, and children in the United States, 2000 to 2010. Cancer. Aug 25 2014.

Table 1. Central Brain Tumor Registry of the United States (CBTRUS), Brain and Central Nervous System Tumor Site Groupings

Site	ICD-O-3[a] Site Code
Cerebrum	C71.0
Frontal lobe of brain	C71.1
Temporal lobe of brain	C71.2
Parietal lobe of brain	C71.3
Occipital lobe of brain	C71.4
Ventricle	C71.5
Cerebellum	C71.6
Brain stem	C71.7
Other brain	C71.8-C71.9
Overlapping lesion of brain	C71.8
Brain, NOS	C71.9
Spinal cord and cauda equina	C72.0-C72.1
Spinal cord	C72.0
Cauda equina	C72.1
Cranial nerves	C72.2-C72.5
Olfactory nerve	C72.2
Optic nerve	C72.3
Acoustic nerve	C72.4
Cranial nerve, NOS	C72.5
Other nervous system	C72.8-C72.9
Overlapping lesion of brain and central nervous system	C72.8
Nervous system, NOS	C72.9
Meninges (cerebral & spinal)	C70.0-C70.1, C70.9
Cerebral meninges	C70.0
Spinal meninges	C70.1
Meninges, NOS	C70.9
Pituitary and craniopharyngeal duct	C75.1-C75.2
Pituitary gland	C75.1
Craniopharyngeal duct	C75.2
Pineal gland	C75.3
Olfactory tumors of the nasal cavity[b]	C30.0

[a]International Classification of Diseases for Oncology, 3rd Edition, 2000. World Health Organization, Geneva, Switzerland.
[b]ICD-O-3 histology codes 9522-9523 only.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NOS, not otherwise specified.

Table 2a. Central Brain Tumor Registry of the United States (CBTRUS), Brain and Central Nervous System Tumor Histology Groupings

Histology	ICD-O-3[a] Histology Code[b]
Tumors of Neuroepithelial Tissue	
Pilocytic astrocytoma*	9421, *9425*[c]
Diffuse astrocytoma*	9400, 9410, 9411, 9420
Anaplastic astrocytoma*	9401
Unique astrocytoma variants*	9381, 9384, 9424
Glioblastoma*	9440, 9441, 9442/3[d]
Oligodendroglioma*	9450
Anaplastic oligodendroglioma*	9451, 9460
Oligoastrocytic tumors*	9382
Ependymal tumors*	9383, 9391, 9392, 9393, 9394
Glioma malignant, NOS*	9380, *9431*[c], *9432*[c]
Choroid plexus tumors	9390
Other neuroepithelial tumors*	9363, 9423, 9430, 9444
Neuronal and mixed neuronal-glial tumors*	8680, 8681, 8690, 8693, 9412, 9413, 9442/1[e], 9492 (excluding site C75.1), 9493, 9505, 9506, 9522, 9523
Tumors of the pineal region	9360, 9361, 9362, *9395*[c]
Embryonal tumors	8963, 9364, 9470, 9471, 9472, 9473, 9474, 9480, 9490, 9500, 9501, 9502, 9508
Tumors of Cranial and Spinal Nerves	
Nerve sheath tumors	9540, 9541, 9550, 9560, 9561, 9570, 9571
Other tumors of cranial and spinal nerves	9562
Tumors of Meninges	
Meningioma	9530, 9531, 9532, 9533, 9534, 9537, 9538, 9539
Mesenchymal tumors	8324, 8800, 8801, 8802, 8803, 8804, 8805, 8806, 8810, 8815, 8824, 8830, 8831, 8835, 8836, 8850, 8851, 8852, 8853, 8854, 8857, 8861, 8870 , 8880, 8890, 8897, 8900, 8901, 8902, 8910, 8912, 8920, 8921, 8935, 8990, 9040, 9136, 9150, 9170, 9180, 9210, 9241, 9260, 9373
Primary melanocytic lesions	8720, 8728, 8770, 8771
Other neoplasms related to the meninges	9161, 9220, 9231, 9240, 9243, 9370, 9371, 9372, 9535
Lymphomas and Hemopoietic Neoplasms	
Lymphoma	9590, 9591, 9596, 9650, 9651, 9652, 9653, 9654, 9655, 9659, 9661, 9662, 9663, 9664, 9665, 9667, 9670, 9671, 9673, 9675, 9680, 9684, 9687, 9690, 9691, 9695, 9698, 9699, 9701, 9702, 9705, 9714, 9719, 9728, 9729
Other hemopoietic neoplasms	9727, 9731, 9733, 9734, 9740, 9741, 9750, 9751, 9752, 9753, 9754, 9755, 9756, 9757, 9758, 9760, 9766, 9823, 9826, 9827, 9832, 9837, 9860, 9861, 9866, 9930, 9970
Germ Cell Tumors and Cysts	
Germ cell tumors, cysts and heterotopias	8020, 8440, 9060, 9061, 9064, 9065, 9070, 9071, 9072, 9080, 9081, 9082, 9083, 9084, 9085, 9100, 9101
Tumors of Sellar Region	
Tumors of the pituitary	8040, 8140, 8146, 8246, 8260, 8270, 8271, 8272, 8280, 8281, 8290, 8300, 8310, 8323, 9492 (Site C75.1 only), 9582
Craniopharyngioma	9350, 9351, 9352
Unclassified Tumors	
Hemangioma	9120, 9121, 9122, 9123, 9125, 9130, 9131, 9133, 9140
Neoplasm, unspecified	8000, 8001, 8002, 8003, 8004, 8005, 8010, 8021
All other	8320, 8452, 8710, 8711, 8713, 8811, 8840, 8896, 8980, 9173, 9503, 9580

[a]International Classification of Diseases for Oncology, 3rd Edition, 2000. World Health Organization, Geneva, Switzerland.
[b]See the CBTRUS website for additional information about the specific histology codes included in each group: http://www.cbtrus.org.
[c]Histology not currently used to US cancer registration, will be included starting with diagnosis year 2015. See NAACCR website: http://www.naaccr.org/LinkClick.aspx?fileticket=4Hx-2XJJqFo%3d&tabid=161&mid=523
[d]Morphology 9442/3 only.
[e]Morphology 9442/1 only.
*All or some of this histology is included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NOS, not otherwise specified.

Table 2b. Central Brain Tumor Registry of the United States (CBTRUS), Brain and Central Nervous System Tumor Malignant Histologies[a]

Histology	ICD-O-3[b] Histology Code[c]
Tumors of Neuroepithelial Tissue	
Pilocytic astrocytoma*	9421/1 [Included with malignant tumors], *9425/3*[c]
Diffuse astrocytoma*	9400/3, 9410/3, 9411/3, 9420/3
Anaplastic astrocytoma*	9401/3
Unique astrocytoma variants*	9381/3, 9424/3
Glioblastoma*	9440/3, 9441/3, 9442/3
Oligodendroglioma*	9450/3
Anaplastic oligodendroglioma*	9451/3, 9460/3
Oligoastrocytic tumors*	9382/3
Ependymal tumors*	9391/3, 9392/3, 9393/3
Glioma malignant, NOS*	9380/3, 9431/1, 9432/1 [Included with malignant tumors]
Choroid plexus tumors	9390/3
Other neuroepithelial tumors*	9423/3, 9430/3
Neuronal and mixed neuronal-glial tumors*	8680/3, 8693/3, 9505/3, 9522/3, 9523/3
Tumors of the pineal region	9362/3, *9395/3*[c]
Embryonal tumors	8963/3, 9364/3, 9470/3, 9471/3, 9472/3,9473/3, 9474/3, 9480/3, 9490/3, 9500/3, 9501/3, 9502/3, 9508/3
Tumors of Cranial and Spinal Nerves	
Nerve sheath tumors	9540/3, 9560/3, 9561/3, 9571/3
Tumors of Meninges	
Meningioma	9530/3, 9538/3, 9539/3
Mesenchymal tumors	8800/3, 8801/3, 8802/3, 8803/3, 8804/3, 8805/3, 8806/3, 8810/3, 8815/3, 8830/3, 8850/3, 8851/3, 8852/3, 8853/3, 8854/3, 8857/3, 8890/3, 8900/3, 8901/3, 8902/3, 8910/3, 8912/3, 8920/3, 8921/3, 8990/3, 9040/3, 9150/3, 9170/3, 9180/3, 9260/3
Primary melanocytic lesions	8720/3, 8728/3, 8770/3, 8771/3
Other neoplasms related to the meninges	9220/3, 9231/3, 9240/3, 9243/3, 9370/3, 9371/3, 9372/3
Lymphomas and Hemopoietic Neoplasms	
Lymphoma	9590/3, 9591/3, 9596/3, 9650/3, 9651/3, 9652/3, 9653/3, 9654/3, 9655/3, 9659/3, 9661/3, 9662/3, 9663/3, 9664/3, 9665/3, 9667/3, 9670/3, 9671/3, 9673/3, 9675/3, 9680/3, 9684/3, 9687/3, 9690/3, 9691/3, 9695/3, 9698/3, 9699/3, 9701/3, 9702/3, 9705/3, 9714/3, 9719/3, 9728/3, 9729/3
Other hemopoietic neoplasms	9727/3, 9731/3, 9733/3, 9734/3, 9740/3, 9741/3, 9750/3, 9754/3, 9755/3, 9756/3, 9757/3, 9758/3, 9760/3, 9823/3, 9826/3, 9827/3, 9832/3, 9837/3, 9860/3, 9861/3, 9866/3, 9930/3
Germ Cell Tumors and Cysts	
Germ cell tumors, cysts and heterotopias	8020/3, 8440/3, 9060/3, 9061/3, 9064/3, 9065/3, 9070/3, 9071/3, 9072/3, 9080/3, 9081/3, 9082/3, 9083/3, 9084/3, 9085/3, 9100/3, 9101/3
Tumors of Sellar Region	
Tumors of the pituitary	8140/3, 8246/3, 8260/3, 8270/3, 8272/3, 8280/3, 8281/3, 8290/3, 8300/3, 8310/3, 8323/3
Unclassified Tumors	
Hemangioma	9120/3, 9130/3, 9133/3, 9140/3
Neoplasm, unspecified	8000/3, 8001/3, 8002/3, 8003/3, 8004/3, 8005/3, 8010/3, 8021/3
All other	8320/3, 8710/3, 8711/3, 8811/3, 8840/3, 8896/3, 8980/3, 9503/3, 9580/3

[a]Includes all the histologies listed in the standard definition of reportable brain tumors from the Consensus Conference on Brain Tumor Definitions.
[b]International Classification of Diseases for Oncology, 3rd Edition, 2000. World Health Organization, Geneva, Switzerland.
[c]See the CBTRUS website for additional information about the specific histology codes included in each group: http://www.cbtrus.org.
*All or some of this histology is included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NOS, not otherwise specified.

Table 2c. Central Brain Tumor Registry of the United States (CBTRUS), Brain and Central Nervous System Tumor Non-Malignant Histologies[a]

Histology	ICD-O-3[b] Histology Code[c]
Tumors of Neuroepithelial Tissue	
Unique astrocytoma variants*	9384/1
Ependymal tumors*	9383/1, 9394/1
Choroid plexus	9390/0,1
Other neuroepithelial tumors	9363/0, 9444/1
Neuronal and mixed neuronal-glial tumors*	8680/0,1, 8681/1, 8690/1, 8693/1, 9412/1, 9413/0, 9442/1, 9492/0 (excluding site C75.1), 9493/0, 9505/1, 9506/1, 9509/1
Tumors of the pineal region	9360/1, 9361/1
Embryonal tumors	9490/0
Tumors of Cranial and Spinal Nerves	
Nerve sheath tumors	9540/0,1, 9541/0, 9550/0, 9560/0,1, 9570/0, 9571/0
Other tumors of cranial and spinal nerves	9562/0
Tumors of Meninges	
Meningioma	9530/0,1, 9531/0, 9532/0, 9533/0, 9534/0, 9537/0, 9538/1, 9539/1
Mesenchymal tumors	8324/0, 8800/0, 8810/0, 8815/0, 8824/0,1, 8830/0,1, 8831/0, 8835/1, 8836/1, 8850/0,1, 8851/0, 8852/0, 8854/0, 8857/0, 8861/0, 8870/0, 8880/0, 8890/0,1, 8897/1, 8900/0, 8920/1, 8935/0,1, 8990/0,1, 9040/0, 9136/1, 9150/0,1, 9170/0, 9180/0, 9210/0, 9241/0, 9373/0
Primary melanocytic lesions	8728/0,1, 8770/0, 8771/0
Other neoplasms related to the meninges	9161/1, 9220/0,1, 9535/0
Lymphomas and Hemopoietic Neoplasms	
Other hemopoietic neoplasms	9740/1, 9751/1, 9752/1, 9753/1, 9766/1, 9970/1
Germ Cell Tumors and Cysts	
Germ cell tumors, cysts and heterotopias	8440/0, 9080/0,1, 9084/0
Tumors of Sellar Region	
Tumors of the pituitary	8040/0,1, 8140/0,1, 8146/0, 8260/0, 8270/0, 8271/0, 8272/0, 8280/0, 8281/0, 8290/0, 8300/0, 8310/0, 8323/0, 9492/0 (site C75.1 only), 9582/0
Craniopharyngioma	9350/1, 9351/1, 9352/1
Unclassified Tumors	
Hemangioma	9120/0, 9121/0, 9122/0, 9123/0, 9125/0, 9130/0,1, 9131/0, 9133/1
Neoplasm, unspecified	8000/0,1, 8001/0,1, 8005/0, 8010/0
All other	8452/1, 8711/0, 8713/0, 8811/0, 8840/0, 9173/0, 9580/0

[a]Includes all the histologies listed in the standard definition of reportable brain tumors from the Consensus Conference on Brain Tumor Definition.
[b]International Classification of Diseases for Oncology, 3rd Edition, 2000. World Health Organization, Geneva, Switzerland.
[c]See the CBTRUS website for additional information about the specific histology codes included in each group: http://www.cbtrus.org.
*All or some of this histology is included in the CBTRUS definition of gliomas, including ICD-O-3 histology codes 9380-9384, 9391-9460.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NOS, not otherwise specified.

Table 3. Five Year Total, Annual Average Total[a] and Average Annual Age-Adjusted Incidence Rates[b] for Brain and Central Nervous System Tumors by Major Histology Groupings, Histology. Behavior and Gender, CBTRUS Statistical Report: NPCR and SEER, 2008-2012

Histology	Total				Male						Female					
	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Percent Malignant	Percent Non-Malignant	Rate	95% CI	5 year total	Annual average	Percent Malignant	Percent Non-Malignant	Rate	95% CI
Tumors of Neuroepithelial Tissue	**106,621**	**21,324**	**6.62**	**(6.58-6.66)**	**59,625**	**11,925**	**93.2%**	**6.8%**	**7.79**	**(7.73-7.85)**	**46,996**	**9,399**	**92.7%**	**7.3%**	**5.60**	**(5.55-5.65)**
Pilocytic astrocytoma	5,048	1,010	0.34	(0.33-0.35)	2,614	523	100.0%	0.0%	0.35	(0.34-0.36)	2,434	487	100.0%	0.0%	0.34	(0.32-0.35)
Diffuse astrocytoma	8,382	1,676	0.53	(0.52-0.54)	4,679	936	100.0%	–	0.62	(0.60-0.63)	3,703	741	100.0%	0.0%	0.46	(0.44-0.47)
Anaplastic astrocytoma	6,005	1,201	0.38	(0.37-0.39)	3,365	673	100.0%	0.0%	0.44	(0.43-0.46)	2,640	528	100.0%	0.0%	0.32	(0.30-0.33)
Unique astrocytoma variants	1,019	204	0.07	(0.06-0.07)	559	112	65.5%	34.5%	0.07	(0.07-0.08)	460	92	67.2%	32.8%	0.06	(0.05-0.07)
Glioblastoma	53,934	10,787	3.20	(3.17-3.22)	30,955	6,191	100.0%	0.0%	3.99	(3.94-4.03)	22,979	4,596	100.0%	0.0%	2.53	(2.50-2.56)
Oligodendroglioma	3,896	779	0.25	(0.25-0.26)	2,196	439	100.0%	0.0%	0.29	(0.28-0.30)	1,700	340	100.0%	0.0%	0.22	(0.21-0.23)
Anaplastic oligodendroglioma	1,670	334	0.10	(0.10-0.11)	916	183	100.0%	0.0%	0.12	(0.11-0.13)	754	151	99.9%	–	0.09	(0.09-0.10)
Oligoastrocytic tumors	3,154	631	0.20	(0.20-0.21)	1,778	356	100.0%	0.0%	0.23	(0.22-0.25)	1,376	275	99.9%	–	0.18	(0.17-0.19)
Ependymal tumors	6,709	1,342	0.43	(0.42-0.44)	3,755	751	57.7%	42.3%	0.49	(0.47-0.50)	2,954	591	67.5%	32.5%	0.37	(0.36-0.39)
Glioma malignant, NOS	7,165	1,433	0.47	(0.46-0.48)	3,615	723	100.0%	0.0%	0.49	(0.48-0.51)	3,550	710	100.0%	0.0%	0.45	(0.43-0.46)
Choroid plexus tumors	800	160	0.05	(0.05-0.06)	385	77	15.8%	84.2%	0.05	(0.05-0.06)	415	83	14.5%	85.5%	0.05	(0.05-0.06)
Other neuroepithelial tumors	100	20	0.01	(0.01-0.01)	37	–	59.5%	–	0.00	(0.00-0.01)	63	–	73.0%	27.0%	0.01	(0.01-0.01)
Neuronal and mixed neuronal-glial tumors	4,324	865	0.28	(0.28-0.29)	2,283	457	20.7%	79.3%	0.30	(0.29-0.31)	2,041	408	17.4%	82.6%	0.27	(0.26-0.28)
Tumors of the pineal region	665	133	0.04	(0.04-0.05)	270	54	64.1%	35.9%	0.04	(0.03-0.04)	395	79	47.3%	52.7%	0.05	(0.05-0.06)
Embryonal tumors	3,750	750	0.26	(0.25-0.26)	2,218	444	97.9%	2.1%	0.30	(0.29-0.31)	1,532	306	96.0%	4.0%	0.21	(0.20-0.22)
Tumors of Cranial and Spinal Nerves	**28,980**	**5,796**	**1.76**	**(1.74-1.78)**	**13,830**	**2,766**	**0.9%**	**99.1%**	**1.76**	**(1.73-1.79)**	**15,150**	**3,030**	**0.8%**	**99.2%**	**1.77**	**(1.74-1.80)**
Nerve sheath tumors	28,958	5,792	1.76	(1.74-1.78)	13,819	2,764	0.9%	99.1%	1.76	(1.73-1.79)	15,139	3,028	0.8%	99.2%	1.77	(1.74-1.80)
Other tumors of cranial and spinal nerves	22	–	0.00	(0.00-0.00)	–	–	–	–	–	–	–	–	–	–	–	–
Tumors of Meninges	**134,224**	**26,845**	**8.13**	**(8.09-8.18)**	**36,769**	**7,354**	**3.1%**	**96.9%**	**4.98**	**(4.93-5.03)**	**97,455**	**19,491**	**1.4%**	**98.6%**	**10.87**	**(10.8-10.94)**
Meningioma	129,841	25,968	7.86	(7.81-7.90)	34,440	6,888	2.0%	98.0%	4.68	(4.62-4.73)	95,401	19,080	1.0%	99.0%	10.62	(10.55-10.68)
Mesenchymal tumors	1,314	263	0.08	(0.08-0.09)	639	128	33.5%	66.5%	0.08	(0.08-0.09)	675	135	28.9%	71.1%	0.08	(0.08-0.09)
Primary melanocytic lesions	141	28	0.01	(0.01-0.01)	86	17	73.3%	26.7%	0.01	(0.01-0.01)	55	–	61.8%	38.2%	0.01	(0.00-0.01)
Other neoplasms related to the meninges	2,928	586	0.18	(0.18-0.19)	1,604	321	9.4%	90.6%	0.21	(0.20-0.22)	1,324	265	8.6%	91.4%	0.16	(0.15-0.17)
Lymphomas and Hematopoietic Neoplasms	**7,476**	**1,495**	**0.46**	**(0.45-0.47)**	**3,898**	**780**	**99.6%**	**0.4%**	**0.52**	**(0.50-0.53)**	**3,578**	**716**	**99.7%**	–	**0.40**	**(0.39-0.42)**
Lymphoma	7,244	1,449	0.44	(0.43-0.45)	3,774	755	100.0%	0.0%	0.50	(0.48-0.52)	3,470	694	100.0%	0.0%	0.39	(0.38-0.40)
Other hematopoietic neoplasms	232	46	0.01	(0.01-0.02)	124	25	87.1%	12.9%	0.02	(0.01-0.02)	108	22	88.9%	–	0.01	(0.01-0.02)
Germ Cell Tumors and Cysts	**1,471**	**294**	**0.10**	**(0.09-0.10)**	**1,004**	**201**	**77.0%**	**23.0%**	**0.13**	**(0.13-0.14)**	**467**	**93**	**48.0%**	**52.0%**	**0.06**	**(0.06-0.07)**
Germ cell tumors, cysts and heterotopias	1,471	294	0.10	(0.09-0.10)	1,004	201	77.0%	23.0%	0.13	(0.13-0.14)	467	93	48.0%	52.0%	0.06	(0.06-0.07)
Tumors of Sellar Region	**58,248**	**11,650**	**3.68**	**(3.65-3.71)**	**26,301**	**5,260**	**0.2%**	**99.8%**	**3.43**	**(3.38-3.47)**	**31,947**	**6,389**	**0.2%**	**99.8%**	**4.00**	**(3.96-4.05)**
Tumors of the pituitary	55,396	11,079	3.49	(3.46-3.52)	24,934	4,987	0.2%	99.8%	3.25	(3.21-3.29)	30,462	6,092	0.2%	99.8%	3.81	(3.77-3.86)
Craniopharyngioma	2,852	570	0.18	(0.18-0.19)	1,367	273	–	99.8%	0.18	(0.17-0.19)	1,485	297	–	99.7%	0.19	(0.18-0.20)
Unclassified Tumors	**19,838**	**3,968**	**1.23**	**(1.21-1.24)**	**8,855**	**1,771**	**35.6%**	**64.4%**	**1.22**	**(1.19-1.24)**	**10,983**	**2,197**	**32.0%**	**68.0%**	**1.25**	**(1.22-1.27)**
Hemangioma	5,406	1,081	0.34	(0.33-0.35)	2,318	464	**–**	**99.5%**	**0.30**	**(0.29-0.32)**	**3,088**	**618**	**–**	**99.6%**	0.38	(0.37-0.39)
Neoplasm, unspecified	14,341	2,868	0.88	(0.87-0.90)	6,492	1,298	48.2%	51.8%	0.91	(0.89-0.93)	7,849	1,570	44.5%	55.5%	0.86	(0.84-0.88)
All other	91	18	0.01	(0.00-0.01)	45	–	–	75.6%	0.01	(0.00-0.01)	46	–	–	71.7%	0.01	(0.00-0.01)
TOTAL[c]	**356,858**	**71,372**	**21.97**	**(21.9-22.05)**	**150,271[d]**	**30,054[d]**	**43.0%**	**57.0%**	**19.82[d]**	**(19.72-19.92)**	**206,565[d]**	**41,313[d]**	**25.3%**	**74.7%**	**23.95[d]**	**(23.85-24.06)**

[a]Annual average cases are calculated by dividing the five year total by five.
[b]Rates are per 100,000 and are age-adjusted to the 2000 US standard population.
[c]Refers to all brain tumors including histologies not presented in this table.
[d]Rates and counts do not include histologies for which cases were suppressed
- Counts are not presented when fewer than 16 cases were reported for the specific histology category.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified.

Table 4: Five Year Total, Annual Average Total[a] and Average Annual Age-Adjusted Incidence Rates[b] for Children and Adolescents, Brain and Central Nervous System Tumors by Major Histology Groupings, Histology and Age at Diagnosis, CBTRUS Statistical Report: NPCR and SEER, 2008-2012

Histology	Age At Diagnosis (years)																							
	0-14‡				0-19‡				0-4				5-9				10-14				15-19			
	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI
Tumors of Neuroepithelial Tissue	**12,220**	**2,444**	**4.00**	**(3.93-4.07)**	**15,297**	**3,059**	**3.71**	**(3.65-3.77)**	**4,938**	**988**	**4.91**	**(4.78-5.05)**	**3,911**	**782**	**3.87**	**(3.75-3.99)**	**3,371**	**674**	**3.27**	**(3.16-3.39)**	**3,077**	**615**	**2.83**	**(2.73-2.93)**
Pilocytic astrocytoma	2,944	589	0.97	(0.93-1.00)	3,594	719	0.87	(0.84-0.9)	1031	206	1.03	(0.96-1.09)	1022	204	1.01	(0.95-1.07)	891	178	0.86	(0.81-0.92)	650	130	0.60	(0.55-0.65)
Diffuse astrocytoma	809	162	0.27	(0.25-0.28)	1,106	221	0.27	(0.25-0.28)	329	66	0.33	(0.29-0.36)	218	44	0.22	(0.19-0.25)	262	52	0.25	(0.22-0.29)	297	59	0.27	(0.24-0.31)
Anaplastic astrocytoma	250	50	0.08	(0.07-0.09)	355	71	0.09	(0.08-0.10)	66	–	0.07	(0.05-0.08)	90	18	0.09	(0.07-0.11)	94	19	0.09	(0.07-0.11)	105	21	0.10	(0.08-0.12)
Unique astrocytoma variants	311	62	0.10	(0.09-0.11)	432	86	0.10	(0.10-0.12)	78	16	0.08	(0.06-0.10)	113	23	0.11	(0.09-0.14)	120	24	0.12	(0.10-0.14)	121	24	0.11	(0.09-0.13)
Glioblastoma	447	89	0.15	(0.13-0.16)	659	132	0.16	(0.15-0.17)	118	24	0.12	(0.10-0.14)	154	31	0.15	(0.13-0.18)	175	35	0.17	(0.15-0.20)	212	42	0.19	(0.17-0.22)
Oligodendroglioma	118	24	0.04	(0.03-0.05)	217	43	0.05	(0.05-0.06)	23	–	0.02	(0.01-0.03)	42	–	0.04	(0.03-0.06)	53	–	0.05	(0.04-0.07)	99	20	0.09	(0.07-0.11)
Anaplastic oligodendroglioma	–	–	–	–	30	–	0.01	(0.00-0.01)	–	–	–	–	–	–	–	–	–	–	–	–	17	–	0.02	(0.01-0.02)
Oligoastrocytic tumors	73	15	0.02	(0.02-0.03)	138	28	0.03	(0.03-0.04)	21	–	0.02	(0.01-0.03)	24	–	0.02	(0.02-0.04)	28	6	0.03	(0.02-0.04)	65	–	0.06	(0.05-0.08)
Ependymal tumors	925	185	0.30	(0.28-0.32)	1,194	239	0.29	(0.27-0.30)	488	98	0.48	(0.44-0.53)	220	44	0.22	(0.19-0.25)	217	43	0.21	(0.18-0.24)	269	54	0.25	(0.22-0.28)
Glioma malignant, NOS	2,350	470	0.77	(0.74-0.80)	2,698	540	0.66	(0.63-0.68)	933	187	0.93	(0.87-0.99)	891	178	0.88	(0.82-0.94)	526	105	0.51	(0.47-0.56)	348	70	0.32	(0.29-0.36)
Choroid plexus tumors	357	71	0.12	(0.10-0.13)	409	82	0.10	(0.09-0.11)	263	53	0.26	(0.23-0.30)	50	10	0.05	(0.04-0.06)	44	9	0.04	(0.03-0.06)	52	–	0.05	(0.04-0.06)
Other neuroepithelial tumors	31	–	0.01	(0.01-0.01)	35	–	0.01	(0.01-0.01)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Neuronal and mixed neuronal-glial tumors	1069	214	0.35	(0.33-0.37)	1,595	319	0.38	(0.37-0.40)	277	55	0.28	(0.24-0.31)	309	62	0.31	(0.27-0.34)	483	97	0.47	(0.43-0.51)	526	105	0.48	(0.44-0.53)
Tumors of the pineal region	139	28	0.05	(0.04-0.05)	190	38	0.05	(0.04-0.05)	58	–	0.06	(0.04-0.07)	41	–	0.04	(0.03-0.05)	40	8	0.04	(0.03-0.05)	51	–	0.05	(0.03-0.06)
Embryonal tumors	2,384	477	0.78	(0.75-0.81)	2,645	529	0.64	(0.62-0.67)	1,243	249	1.24	(1.17-1.31)	727	145	0.72	(0.67-0.77)	414	83	0.40	(0.37-0.44)	261	52	0.24	(0.21-0.27)
Medulloblastoma[c]	*1,505*	*301*	*0.49*	*(0.47-0.52)*	*1,690*	*338*	*0.41*	*(0.39-0.43)*	*584*	*117*	*0.58*	*(0.53-0.63)*	*597*	*119*	*0.59*	*(0.54-0.64)*	*324*	*65*	*0.32*	*(0.28-0.35)*	*185*	*37*	*0.17*	*(0.15-0.20)*
Primitive neuroectodermal tumor[d]	*317*	*63*	*0.10*	*(0.09-0.12)*	*369*	*74*	*0.09*	*(0.08-0.10)*	*185*	*37*	*0.18*	*(0.16-0.21)*	*73*	–	*0.07*	*(0.06-0.09)*	*60*	–	*0.06*	*(0.04-0.07)*	*52*	–	*0.05*	*(0.04-0.06)*
Atypical teratoid/rhabdoid tumor[e]	*370*	*74*	*0.12*	*(0.11-0.13)*	*376*	*75*	*0.09*	*(0.08-0.10)*	*338*	*68*	*0.34*	*(0.30-0.37)*	*24*	–	*0.02*	*(0.02-0.03)*	–	–	–	–	–	–	–	–
Other embryonal histologies[f]	*191*	*38*	*0.06*	*(0.05-0.07)*	*209*	*42*	*0.05*	*(0.04-0.06)*	*136*	*27*	*0.14*	*(0.11-0.16)*	*33*	–	*0.03*	*(0.02-0.05)*	*22*	–	*0.02*	*(0.01-0.03)*	*18*	–	*0.02*	*(0.01-0.03)*
Tumors of Cranial and Spinal Nerves	**789**	**158**	**0.26**	**(0.24-0.28)**	**1,176**	**235**	**0.28**	**(0.27-0.30)**	**279**	**56**	**0.28**	**(0.25-0.31)**	**242**	**48**	**0.24**	**(0.21-0.27)**	**268**	**54**	**0.26**	**(0.23-0.29)**	**387**	**77**	**0.36**	**(0.32-0.39)**
Nerve sheath tumors	789	158	0.26	(0.24-0.28)	1,175	235	0.28	(0.27-0.30)	279	56	0.28	(0.25-0.31)	242	48	0.24	(0.21-0.27)	268	54	0.26	(0.23-0.29)	386	77	0.35	(0.32-0.39)
Other tumors of cranial and spinal nerves	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tumors of Meninges	**486**	**97**	**0.16**	**(0.15-0.17)**	**980**	**196**	**0.23**	**(0.22-0.25)**	**138**	**28**	**0.14**	**(0.12-0.16)**	**114**	**23**	**0.11**	**(0.09-0.14)**	**234**	**47**	**0.23**	**(0.20-0.26)**	**494**	**99**	**0.45**	**(0.41-0.49)**
Meningioma	277	55	0.09	(0.08-0.10)	606	121	0.14	(0.13-0.16)	60	–	0.06	(0.05-0.08)	60	–	0.06	(0.05-0.08)	157	31	0.15	(0.13-0.18)	329	66	0.30	(0.27-0.34)
Mesenchymal tumors	147	29	0.05	(0.04-0.06)	197	39	0.05	(0.04-0.05)	67	–	0.07	(0.05-0.08)	43	–	0.04	(0.03-0.06)	37	–	0.04	(0.03-0.05)	50	–	0.05	(0.03-0.06)
Primary melanocytic lesions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Other neoplasms related to the meninges	53	–	0.02	(0.01-0.02)	165	33	0.04	(0.03-0.05)	–	–	–	–	–	–	–	–	39	–	0.04	(0.03-0.05)	112	22	0.10	(0.08-0.12)
Lymphomas and Hematopoietic Neoplasms	**84**	**17**	**0.03**	**(0.02-0.03)**	**123**	**25**	**0.03**	**(0.02-0.04)**	**23**	**–**	**0.02**	**(0.01-0.03)**	**36**	**–**	**0.04**	**(0.03-0.05)**	**25**	**–**	**0.02**	**(0.02-0.04)**	**39**	**–**	**0.04**	**(0.03-0.05)**
Lymphoma	32	–	0.01	(0.01-0.01)	59	–	0.01	(0.01-0.02)	–	–	–	–	–	–	–	–	–	–	–	–	27	–	0.02	(0.02-0.04)
Other hematopoietic neoplasms	52	–	0.02	(0.01-0.02)	64	–	0.02	(0.01-0.02)	19	–	0.02	(0.01-0.03)	22	–	0.02	(0.01-0.03)	–	–	–	–	–	–	–	–
Germ Cell Tumors and Cysts	**596**	**119**	**0.20**	**(0.18-0.21)**	**892**	**178**	**0.22**	**(0.20-0.23)**	**133**	**27**	**0.13**	**(0.11-0.16)**	**171**	**34**	**0.17**	**(0.15-0.20)**	**292**	**58**	**0.28**	**(0.25-0.32)**	**296**	**59**	**0.27**	**(0.24-0.31)**
Germ cell tumors, cysts and heterotopias	596	119	0.20	(0.18-0.21)	892	178	0.22	(0.20-0.23)	133	27	0.13	(0.11-0.16)	171	34	0.17	(0.15-0.20)	292	58	0.28	(0.25-0.32)	296	59	0.27	(0.24-0.31)
Tumors of Sellar Region	**1,337**	**267**	**0.44**	**(0.42-0.46)**	**3,287**	**657**	**0.78**	**(0.75-0.81)**	**161**	**32**	**0.16**	**(0.14-0.19)**	**429**	**86**	**0.43**	**(0.39-0.47)**	**747**	**149**	**0.72**	**(0.67-0.77)**	**1950**	**390**	**1.79**	**(1.71-1.87)**
Tumors of the pituitary	684	137	0.22	(0.21-0.24)	2,493	499	0.58	(0.56-0.61)	37	–	0.04	(0.03-0.05)	135	27	0.13	(0.11-0.16)	512	102	0.49	(0.45-0.54)	1,809	362	1.66	(1.58-1.73)
Craniopharyngioma	653	131	0.22	(0.20-0.23)	794	159	0.19	(0.18-0.21)	124	25	0.12	(0.10-0.15)	294	59	0.29	(0.26-0.33)	235	47	0.23	(0.20-0.26)	141	28	0.13	(0.11-0.15)
Unclassified Tumors	**854**	**171**	**0.28**	**(0.26-0.30)**	**1,358**	**272**	**0.33**	**(0.31-0.34)**	**282**	**56**	**0.28**	**(0.25-0.32)**	**210**	**42**	**0.21**	**(0.18-0.24)**	**362**	**72**	**0.35**	**(0.32-0.39)**	**504**	**101**	**0.46**	**(0.42-0.50)**
Hemangioma	279	56	0.09	(0.08-0.10)	494	99	0.12	(0.11-0.13)	93	19	0.09	(0.07-0.11)	67	–	0.07	(0.05-0.08)	119	24	0.12	(0.10-0.14)	215	43	0.20	(0.17-0.23)
Neoplasm, unspecified	559	112	0.18	(0.17-0.20)	844	169	0.20	(0.19-0.22)	182	36	0.18	(0.16-0.21)	140	28	0.14	(0.12-0.16)	237	47	0.23	(0.20-0.26)	285	57	0.26	(0.23-0.29)
All other	16	–	0.01	(0.00-0.01)	20	–	0.00	(0.00-0.01)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TOTAL[g]	**16,366**	**3,273**	**5.37**	**(5.28-5.45)**	**23,113**	**4,623**	**5.57**	**(5.50-5.65)**	**5,954**	**1,191**	**5.93**	**(5.78-6.08)**	**5,113**	**1,023**	**5.06**	**(4.93-5.20)**	**5,299**	**1,060**	**5.14**	**(5.00-5.28)**	**6,747**	**1,349**	**6.19**	**(6.04-6.34)**

[a]Annual average cases are calculated by dividing the five year total by five.
[b]Rates are per 100,000 and are age-adjusted to the 2000 US standard population.
[c]ICD-O-3 histology codes: 9470/3, 9471/3, 9472/3, 9474/3.
[d]ICD-O-3 histology code: 9473/3.
[e]ICD-O-3 histology code: 9508/3.
[f]ICD-O-3 histology codes: 8963/3, 9364/3, 9480/3, 9490/0, 9490/3, 9500/3, 9501/3, 9502/3.
[g]Refers to all brain tumors including histologies not presented in this table.
- Counts and rates are not presented when fewer than 16 cases were reported for the specific histology category. The suppressed cases are included in the counts and rates for totals.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified.

Table 5. Brain and Central Nervous System Tumor Average Annual Age-Adjusted Incidence Rates[a] by Age, Behavior and Central Cancer Registry, CBTRUS Statistical Report: NPCR and SEER, 2008-2012

State	0-19 Years						20+ Years						All Ages					
	Malignant		Non-Malignant		All Tumors		Malignant		Non-Malignant		All Tumors		Malignant		Non-Malignant		All Tumors	
	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI
Alabama	2.97	(2.56-3.43)	1.02	(0.79-1.30)	3.99	(3.51-4.51)	9.11	(8.68-9.56)	13.02	(12.50-13.56)	22.13	(21.45-22.83)	7.35	(7.02-7.69)	9.58	(9.20-9.97)	16.93	(16.42-17.45)
Alaska	3.22	(2.23-4.51)	3.49	(2.46-4.81)	6.71	(5.24-8.47)	10.27	(8.88-11.82)	20.59	(18.61-22.72)	30.87	(28.42-33.46)	8.25	(7.21-9.40)	15.69	(14.24-17.24)	23.94	(22.14-25.84)
Arizona	3.10	(2.75-3.49)	2.17	(1.88-2.50)	5.28	(4.82-5.77)	8.87	(8.49-9.25)	19.12	(18.56-19.69)	27.99	(27.31-28.67)	7.21	(6.93-7.51)	14.26	(13.85-14.67)	21.47	(20.97-21.98)
Arkansas	3.18	(2.65-3.79)	2.81	(2.31-3.39)	6.00	(5.26-6.81)	8.45	(7.91-9.01)	16.10	(15.35-16.87)	24.54	(23.62-25.49)	6.94	(6.53-7.37)	12.29	(11.73-12.86	19.22	(18.53-19.93)
California	2.93	(2.78-3.08)	1.74	(1.63-1.85)	4.66	(4.48-4.85)	8.22	(8.06-8.37)	18.39	(18.16-18.62)	26.61	(26.32-26.89)	6.70	(6.58-6.82)	13.61	(13.44-13.78)	20.31	(20.10-20.52)
Colorado	3.18	(2.77-3.63)	1.80	(1.49-2.15)	4.98	(4.46-5.54)	8.92	(8.48-9.37)	27.30	(26.52-28.10)	36.22	(35.32-37.13)	7.27	(6.94-7.62)	19.99	(19.42-20.56)	27.26	(26.60-27.93)
Connecticut	3.60	(3.07-4.21)	1.87	(1.50-2.30)	5.47	(4.81-6.19)	9.16	(8.66-9.68)	17.29	(16.60-18.01)	26.45	(25.60-27.33)	7.57	(7.18-7.97)	12.87	(12.36-13.39)	20.43	(19.79-21.09)
Delaware	4.28	(3.17-5.64)	3.56	(2.55-4.83)	7.84	(6.31-9.62)	8.54	(7.59-9.58)	16.12	(14.80-17.52)	24.66	(23.02-26.38)	7.32	(6.56-8.14)	12.51	(11.53-13.57)	19.83	(18.58-21.15)
District of Columbia	4.32	(2.80-6.37)	3.65	(2.27-5.56)	7.97	(5.85-10.62)	7.91	(6.74-9.22)	20.38	(18.48-22.42)	28.29	(26.04-30.67)	6.88	(5.92-7.95)	15.58	(14.16-17.11)	22.46	(20.73-24.29)
Florida	3.51	(3.27-3.77)	2.36	(2.16-2.57)	5.87	(5.56-6.2)	8.56	(8.36-8.77)	21.38	(21.05-21.71)	29.94	(29.55-30.33)	7.11	(6.95-7.28)	15.92	(15.68-16.16)	23.03	(22.74-23.33)
Georgia	3.32	(3.02-3.64)	1.88	(1.66-2.12)	5.20	(4.83-5.59)	8.21	(7.90-8.53)	21.46	(20.96-21.97)	29.68	(29.08-30.28)	6.81	(6.57-7.05)	15.85	(15.48-16.22)	22.65	(22.22-23.10)
Hawaii	2.70	(1.98-3.61)	1.36	(0.86-2.04)	4.06	(3.16-5.14)	5.63	(5.01-6.32)	17.72	(16.59-18.92)	23.36	(22.05-24.72)	4.79	(4.29-5.33)	13.03	(12.20-13.90)	17.82	(16.85-18.83)
Idaho	2.82	(2.19-3.58)	1.64	(1.16-2.25)	4.46	(3.65-5.4)	8.94	(8.16-9.77)	17.76	(16.65-18.92)	26.70	(25.34-28.11)	7.18	(6.60-7.81)	13.13	(12.33-13.98)	20.32	(19.32-21.36)
Illinois	3.03	(2.77-3.30)	2.39	(2.16-2.63)	5.41	(5.08-5.77)	8.89	(8.62-9.17)	20.97	(20.55-21.39)	29.86	(29.36-30.36)	7.21	(7.00-7.42)	15.64	(15.33-15.94)	22.85	(22.48-23.22)
Indiana	3.93	(3.53-4.36)	2.32	(2.02-2.66)	6.25	(5.75-6.79)	8.94	(8.56-9.33)	18.99	(18.43-19.55)	27.93	(27.26-28.61)	7.50	(7.21-7.80)	14.21	(13.80-14.62)	21.71	(21.21-22.22)
Iowa	3.69	(3.13-4.33)	2.93	(2.43-3.50)	6.62	(5.86-7.46)	9.88	(9.32-10.47)	21.62	(20.78-22.49)	31.50	(30.49-32.55)	8.11	(7.67-8.56)	16.26	(15.64-16.90)	24.37	(23.61-25.15)
Kansas	3.16	(2.63-3.75)	1.78	(1.40-2.25)	4.94	(4.28-5.68)	9.31	(8.73-9.91)	16.99	(16.20-17.81)	26.30	(25.32-27.31)	7.54	(7.10-8.00)	12.63	(12.05-13.22)	20.17	(19.44-20.92)
Kentucky	4.19	(3.68-4.76)	2.80	(2.38-3.27)	6.99	(6.32-7.71)	9.68	(9.21-10.16)	25.10	(24.33-25.88)	34.77	(33.87-35.69)	8.10	(7.73-8.48)	18.70	(18.14-19.28)	26.80	(26.13-27.49)
Louisiana	3.68	(3.22-4.19)	2.04	(1.70-2.43)	5.72	(5.15-6.35)	7.74	(7.32-8.18)	19.42	(18.74-20.11)	27.16	(26.36-27.98)	6.58	(6.25-6.92)	14.43	(13.94-14.94)	21.01	(20.42-21.62)
Maine	4.34	(3.35-5.52)	1.52	(0.98-2.25)	5.86	(4.71-7.2)	9.95	(9.12-10.83)	13.70	(12.71-14.74)	23.65	(22.35-24.99)	8.34	(7.68-9.04)	10.20	(9.48-10.97)	18.54	(17.56-19.57)
Maryland	3.42	(3.01-3.86)	1.86	(1.57-2.20)	5.28	(4.77-5.82)	8.47	(8.08-8.87)	17.93	(17.36-18.52)	26.40	(25.71-27.10)	7.02	(6.72-7.33)	13.32	(12.91-13.75)	20.34	(19.83-20.87)
Massachusetts	3.80	(3.38-4.25)	2.07	(1.77-2.40)	5.87	(5.35-6.42)	9.02	(8.65-9.39)	15.40	(14.93-15.90)	24.42	(23.82-25.04)	7.52	(7.23-7.82)	11.58	(11.23-11.94)	19.10	(18.64-19.56)
Michigan	3.71	(3.38-4.05)	1.90	(1.68-2.15)	5.61	(5.21-6.03)	8.91	(8.61-9.21)	19.29	(18.84-19.74)	28.19	(27.66-28.74)	7.41	(7.18-7.65)	14.30	(13.98-14.63)	21.72	(21.32-22.12)
Minnesota	3.52	(3.10-3.99)	1.56	(1.28-1.87)	5.08	(4.57-5.63)	9.03	(8.61-9.46)	12.57	(12.08-13.08)	21.60	(20.95-22.26)	7.45	(7.12-7.78)	9.41	(9.05-9.79)	16.86	(16.37-17.36)
Mississippi	3.11	(2.60-3.69)	2.25	(1.83-2.75)	5.36	(4.69-6.11)	8.10	(7.57-8.66)	17.81	(17.01-18.63)	25.91	(24.95-26.90)	6.67	(6.26-7.09)	13.35	(12.76-13.95)	20.01	(19.30-20.75)
Missouri	3.44	(3.04-3.87)	1.42	(1.17-1.70)	4.86	(4.39-5.37)	8.77	(8.39-9.16)	20.81	(20.22-21.42)	29.58	(28.87-30.30)	7.24	(6.94-7.54)	15.25	(14.82-15.69)	22.49	(21.96-23.02)
Montana	3.08	(2.18-4.23)	1.62	(1.00-2.49)	4.71	(3.58-6.08)	9.36	(8.42-10.38)	20.69	(19.26-22.19)	30.05	(28.33-31.85)	7.56	(6.83-8.35)	15.22	(14.18-16.31)	22.78	(21.51-24.11)
Nebraska	4.42	(3.65-5.31)	3.48	(2.79-4.28)	7.90	(6.85-9.06)	9.32	(8.60-10.08)	14.73	(13.83-15.68)	24.05	(22.89-25.26)	7.91	(7.35-8.51)	11.50	(10.83-12.21)	19.42	(18.53-20.33)
Nevada[b]	2.37	(1.77-3.11)	–	–	2.87	(2.20-3.67)	7.53	(6.83-8.28)	14.18	(13.20-15.21)	21.71	(20.50-22.97)	6.05	(5.52-6.62)	10.25	(9.55-11.00)	16.30	(15.42-17.23)

Continued

Table 5. *Continued*

State	0-19 Years						20+ Years						All Ages					
	Malignant		Non-Malignant		All Tumors		Malignant		Non-Malignant		All Tumors		Malignant		Non-Malignant		All Tumors	
	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI
New Hampshire	4.81	(3.77-6.04)	2.67	(1.95-3.57)	7.48	(6.19-8.95)	9.95	(9.09-10.87)	16.44	(15.34-17.60)	26.39	(24.99-27.85)	8.48	(7.79-9.21)	12.49	(11.67-13.35)	20.97	(19.89-22.08)
New Jersey	3.97	(3.61-4.35)	2.31	(2.04-2.60)	6.28	(5.83-6.75)	9.14	(8.82-9.47)	18.38	(17.92-18.84)	27.51	(26.95-28.08)	7.65	(7.40-7.91)	13.77	(13.43-14.11)	21.42	(21.00-21.85)
New Mexico	2.50	(1.96-3.16)	1.85	(1.38-2.42)	4.35	(3.62-5.19)	7.44	(6.83-8.08)	16.91	(15.98-17.87)	24.35	(23.23-25.50)	6.02	(5.56-6.51)	12.59	(11.91-13.29)	18.61	(17.79-19.46)
New York	3.56	(3.33-3.81)	2.84	(2.63-3.06)	6.40	(6.09-6.73)	8.81	(8.60-9.03)	23.17	(22.83-23.53)	31.99	(31.58-32.40)	7.31	(7.14-7.48)	17.34	(17.09-17.60)	24.65	(24.34-24.95)
North Carolina	3.28	(2.98-3.61)	2.00	(1.77-2.27)	5.29	(4.90-5.70)	8.56	(8.26-8.87)	20.42	(19.95-20.90)	28.98	(28.42-29.55)	7.05	(6.81-7.29)	15.14	(14.79-15.48)	22.18	(21.77-22.60)
North Dakota	2.38	(1.45-3.67)	1.31	(0.65-2.35)	3.69	(2.50-5.24)	8.26	(7.20-9.43)	14.02	(12.58-15.58)	22.29	(20.48-24.21)	6.57	(5.76-7.47)	10.38	(9.33-11.52)	16.95	(15.61-18.37)
Ohio	3.46	(3.17-3.77)	2.28	(2.05-2.53)	5.74	(5.37-6.14)	9.02	(8.74-9.30)	15.60	(15.23-15.98)	24.62	(24.16-25.09)	7.42	(7.21-7.64)	11.78	(11.51-12.06)	19.20	(18.86-19.56)
Oklahoma	2.71	(2.28-3.20)	1.98	(1.61-2.40)	4.69	(4.11-5.31)	8.73	(8.24-9.23)	15.57	(14.91-16.24)	24.30	(23.48-25.13)	7.00	(6.63-7.39)	11.67	(11.19-12.16)	18.67	(18.06-19.29)
Oregon	3.76	(3.23-4.35)	2.07	(1.69-2.52)	5.83	(5.17-6.56)	9.65	(9.16-10.17)	15.84	(15.19-16.50)	25.49	(24.67-26.33)	7.96	(7.57-8.36)	11.89	(11.41-12.38)	19.85	(19.24-20.48)
Pennsylvania	3.88	(3.57-4.20)	2.15	(1.93-2.39)	6.03	(5.65-6.43)	9.34	(9.08-9.61)	22.07	(21.66-22.49)	31.41	(30.92-31.91)	7.77	(7.56-7.99)	16.36	(16.06-16.66)	24.13	(23.77-24.50)
Rhode Island	2.85	(1.98-3.96)	2.04	(1.34-2.98)	4.88	(3.74-6.27)	8.23	(7.37-9.16)	16.32	(15.10-17.61)	24.55	(23.05-26.12)	6.69	(6.02-7.41)	12.22	(11.32-13.17)	18.91	(17.78-20.09)
South Carolina	2.93	(2.51-3.39)	1.61	(1.31-1.96)	4.54	(4.02-5.11)	8.45	(8.02-8.89)	19.14	(18.49-19.81)	27.59	(26.81-28.39)	6.86	(6.54-7.20)	14.11	(13.64-14.60)	20.98	(20.40-21.57)
South Dakota	3.07	(2.13-4.27)	1.50	(0.87-2.40)	4.56	(3.41-5.98)	9.15	(8.10-10.29)	17.08	(15.62-18.63)	26.23	(24.42-28.13)	7.40	(6.60-8.27)	12.61	(11.55-13.73)	20.01	(18.68-21.42)
Tennessee	3.71	(3.31-4.15)	2.57	(2.24-2.93)	6.28	(5.75-6.84)	8.91	(8.54-9.30)	23.16	(22.55-23.79)	32.07	(31.36-32.80)	7.42	(7.13-7.72)	17.25	(16.81-17.71)	24.67	(24.14-25.22)
Texas	3.64	(3.45-3.83)	2.50	(2.34-2.67)	6.14	(5.89-6.39)	8.45	(8.25-8.65)	23.64	(23.30-23.97)	32.09	(31.70-32.48)	7.07	(6.92-7.22)	17.57	(17.33-17.82)	24.64	(24.36-24.93)
Utah	3.67	(3.16-4.25)	2.55	(2.10-3.05)	6.22	(5.53-6.97)	9.15	(8.49-9.84)	25.79	(24.68-26.93)	34.93	(33.64-36.26)	7.58	(7.09-8.09)	19.12	(18.32-19.94)	26.70	(25.75-27.66)
Vermont	2.27	(1.31-3.66)	3.21	(2.09-4.75)	5.49	(3.95-7.43)	10.24	(9.02-11.59)	23.26	(21.35-25.29)	33.50	(31.22-35.90)	7.96	(7.03-8.97)	17.51	(16.10-19.00)	25.46	(23.77-27.25)
Virginia	3.38	(3.04-3.76)	1.60	(1.37-1.86)	4.98	(4.56-5.43)	8.27	(7.94-8.60)	16.81	(16.34-17.28)	25.07	(24.50-25.66)	6.87	(6.61-7.13)	12.44	(12.10-12.79)	19.31	(18.88-19.74)
Washington	3.66	(3.28-4.09)	3.02	(2.67-3.41)	6.69	(6.16-7.25)	9.76	(9.38-10.16)	26.89	(26.24-27.55)	36.66	(35.90-37.42)	8.01	(7.72-8.32)	20.04	(19.57-20.53)	28.06	(27.50-28.63)
West Virginia	3.56	(2.81-4.45)	2.28	(1.70-3.00)	5.84	(4.87-6.94)	8.59	(7.95-9.28)	15.70	(14.82-16.63)	24.30	(23.19-25.44)	7.15	(6.63-7.69)	11.85	(11.20-12.54)	19.00	(18.16-19.87)
Wisconsin	3.77	(3.34-4.24)	2.35	(2.02-2.72)	6.12	(5.58-6.71)	9.82	(9.41-10.25)	21.43	(20.81-22.06)	31.25	(30.51-32.01)	8.09	(7.77-8.42)	15.96	(15.50-16.42)	24.04	(23.49-24.61)
Wyoming	3.25	(2.10-4.80)	1.86	(1.02-3.13)	5.11	(3.63-6.99)	10.10	(8.76-11.60)	17.79	(15.99-19.73)	27.89	(25.63-30.30)	8.14	(7.11-9.27)	13.22	(11.91-14.64)	21.36	(19.68-23.14)
TOTAL	**3.42**	**(3.37-3.48)**	**2.15**	**(2.11-2.20)**	**5.57**	**(5.50-5.65)**	**8.76**	**(8.70-8.81)**	**19.82**	**(19.73-19.90)**	**28.57**	**(28.47-28.67)**	**7.23**	**(7.18-7.27)**	**14.75**	**(14.69-14.81)**	**21.97**	**(21.90-22.05)**

[a]Rates are *per* 100,000 and are age-adjusted to the 2000 United States standard population.
[b]For Nevada *only*, rates are calculated using data from 2008-2010.
Abbreviations: CB*T*RUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval.

Table 6. Characteristics of Brain and Central Nervous System Tumors by Central Cancer Registry, CBTRUS Statistical Report: NPCR and SEER, 2008-2012

State	No. of Newly Diagnosed Tumors	Percent Non-Malignant Tumors	Total		Malignant		Non-Malignant		Average Annual 2008-2012 Population[a]
			Histologically Confirmed	Radio-graphically Confirmed	Histologically Confirmed	Radio-graphically Confirmed	Histologically Confirmed	Radio-graphically Confirmed	
Alabama	4,396	56.8%	3,147	1,064	1,638	121	1,509	943	4,776,174
Alaska	766	65.8%	430	313	221	33	209	280	710,780
Arizona	7,242	66.3%	4,321	2,475	2,020	204	2,301	2,271	6,410,450
Arkansas	3,016	63.6%	1,847	1,036	883	145	964	891	2,916,402
California	37,685	66.9%	24,469	11,844	10,813	1,123	13,656	10,721	37,313,545
Colorado	6,818	73.1%	3,513	3,090	1,538	197	1,975	2,893	5,043,596
Connecticut	4,033	63.3%	2,750	1,199	1,264	174	1,486	1,025	3,573,462
Delaware	972	63.4%	647	295	297	40	350	255	900,071
District of Columbia	663	70.3%	412	217	168	–	244	207	606,128
Florida	25,702	69.8%	14,938	10,000	6,727	739	8,211	9,261	18,886,047
Georgia	10,666	70.0%	6,031	4,239	2,686	400	3,345	3,839	9,712,953
Hawaii	1,327	73.3%	778	473	307	33	471	440	1,361,930
Idaho	1,600	64.2%	1,055	486	482	64	573	422	1,567,799
Illinois	15,216	68.6%	8,985	5,903	4,199	430	4,786	5,473	12,821,535
Indiana	7,382	65.5%	4,124	3,074	2,190	284	1,934	2,790	6,485,643
Iowa	4,084	66.8%	2,404	1,598	1,137	187	1,267	1,411	3,047,812
Kansas	3,013	62.6%	1,838	1,083	952	121	886	962	2,850,927
Kentucky	6,212	69.6%	3,159	2,766	1,523	242	1,636	2,524	4,340,250
Louisiana	4,884	68.7%	3,125	1,611	1,325	152	1,800	1,459	4,529,991
Maine	1,435	55.1%	1,010	383	558	60	452	323	1,328,762
Maryland	6,138	65.8%	4,092	1,722	1,804	154	2,288	1,568	5,785,531
Massachusetts	6,897	61.2%	4,987	1,718	2,386	189	2,601	1,529	6,560,286
Michigan	11,693	66.0%	7,277	4,020	3,414	352	3,863	3,668	9,896,347
Minnesota	4,693	56.1%	4,292	229	1,977	25	2,315	204	5,313,062
Mississippi	3,064	66.2%	1,925	1,037	878	119	1,047	918	2,968,193
Missouri	7,287	67.7%	4,143	2,834	2,024	197	2,119	2,637	5,983,131
Montana	1,278	67.1%	734	505	368	40	366	465	990,804
Nebraska	1,873	59.6%	1,184	620	630	84	554	536	1,827,200
Nevada[b]	1,317	62.5%	932	314	435	23	497	291	2,680,508[b]
New Hampshire	1,516	60.6%	1,099	373	520	51	579	322	1,317,663
New Jersey	10,173	64.8%	6,543	3,142	3,083	370	3,460	2,772	8,794,757
New Mexico	2,006	67.4%	1,363	547	568	52	795	495	2,054,781
New York	25,684	70.8%	14,821	10,187	6,465	893	8,356	9,294	19,399,317
North Carolina	11,145	68.3%	7,120	3,625	3,066	353	4,054	3,272	9,543,658

Continued

Table 6. *Continued*

State	No. of Newly Diagnosed Tumors	Percent Non-Malignant Tumors	Total		Malignant		Non-Malignant		Average Annual 2008-2012 Population[a]
			Histologically Confirmed	Radio-graphically Confirmed	Histologically Confirmed	Radio-graphically Confirmed	Histologically Confirmed	Radio-graphically Confirmed	
North Dakota	628	60.5%	376	225	209	25	167	200	676,619
Ohio	12,065	61.3%	7,824	3,513	3,659	408	4,165	3,105	11,538,505
Oklahoma	3,690	62.3%	2,068	1,475	1,094	179	974	1,296	3,749,425
Oregon	4,150	59.9%	2,934	1,106	1,435	151	1,499	955	3,836,459
Pennsylvania	17,496	68.2%	10,179	6,529	4,660	562	5,519	5,967	12,699,080
Rhode Island	1,108	65.2%	775	312	355	–	420	297	1,052,394
South Carolina	5,220	67.1%	3,027	1,865	1,448	149	1,579	1,716	4,630,431
South Dakota	879	62.9%	519	320	270	33	249	287	816,044
Tennessee	8,376	69.9%	4,646	3,506	2,160	246	2,486	3,260	6,352,678
Texas	29,252	70.8%	15,542	11,891	6,987	1,076	8,555	10,815	25,211,537
Utah	3,179	70.6%	2,046	1,099	814	108	1,232	991	2,766,106
Vermont	903	68.1%	540	352	261	23	279	329	625,407
Virginia	8,064	64.7%	5,353	2,423	2,426	197	2,927	2,226	8,015,266
Washington	9,897	71.3%	5,409	4,202	2,405	314	3,004	3,888	6,737,742
West Virginia	2,060	62.7%	1,291	709	674	57	617	652	1,850,819
Wisconsin	7,384	66.1%	4,236	2,903	2,113	257	2,123	2,646	5,686,532
Wyoming	631	62.0%	428	198	202	35	226	163	562,814
TOTAL	**356,858**	**67.2%**	**216,688**	**126,650**	**99,718**	**11,496**	**116,970**	**115,154**	**309,129,608**

[a]Population estimates were obtained from the United States Bureau of the Census available on the SEER program website.
[b]Cases and estimated population is for 2008-2010 only.
- Counts are not presented when fewer than 16 cases were reported for the specific category. The suppressed cases are included in the counts and rates for totals.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; CNS, central nervous system; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program.

Table 7. Distribution and Five Year Total, Annual Average Total[a] and Average Annual Age-Adjusted Incidence Rates[b] of Brain and Central Nervous System Tumors by Major Histology Groupings, Histology and Behavior, CBTRUS Statistical Report: NPCR and SEER, 2008-2012

Histology	Total						Malignant				Non-Malignant			
	5 year total	Annual average	% of All Tumors	Median Age	Rate	(95% CI)	5 year total	Annual average	Rate	(95% CI)	5 year total	Annual average	Rate	(95% CI)
Tumors of Neuroepithelial Tissue	**106,621**	**21,324**	**29.9%**	**56.0**	**6.62**	**(6.58-6.66)**	**99,104**	**19,821**	**6.13**	**(6.09-6.17)**	**7,517**	**1,503**	**0.49**	**(0.48-0.50)**
Pilocytic astrocytoma	5,048	1,010	1.4%	12.0	0.34	(0.33-0.35)	5,048	1,010	0.34	(0.33-0.35)	–	–	–	–
Diffuse astrocytoma	8,381	1,676	2.3%	48.0	0.53	(0.52-0.54)	8,381	1,676	0.53	(0.52-0.54)	–	–	–	–
Anaplastic astrocytoma	6,005	1,201	1.7%	53.0	0.38	(0.37-0.39)	6,005	1,201	0.38	(0.37-0.39)	–	–	–	–
Unique astrocytoma variants	1,019	204	0.3%	23.0	0.07	(0.06-0.07)	675	135	0.04	(0.04-0.05)	344	69	0.02	(0.02-0.03)
Glioblastoma	53,934	10,787	15.1%	64.0	3.20	(3.17-3.22)	53,934	10,787	3.20	(3.17-3.22)	–	–	–	–
Oligodendroglioma	3,896	779	1.1%	43.0	0.25	(0.25-0.26)	3,896	779	0.25	(0.25-0.26)	–	–	–	–
Anaplastic oligodendroglioma	1,669	334	0.5%	50.0	0.10	(0.10-0.11)	1,669	334	0.10	(0.10-0.11)	–	–	–	–
Oligoastrocytic tumors	3,153	631	0.9%	42.0	0.20	(0.20-0.21)	3,153	631	0.20	(0.20-0.21)	–	–	–	–
Ependymal tumors	6,709	1,342	1.9%	45.0	0.43	(0.42-0.44)	4,161	832	0.27	(0.26-0.28)	2,548	510	0.16	(0.16-0.17)
Glioma malignant, NOS	7,165	1,433	2.0%	37.0	0.47	(0.46-0.48)	7,165	1,433	0.47	(0.46-0.48)	–	–	–	–
Choroid plexus tumors	800	160	0.2%	18.5	0.05	(0.05-0.06)	121	24	0.01	(0.01-0.01)	679	136	0.04	(0.04-0.05)
Other neuroepithelial tumors	100	20	0.0%	30.5	0.01	(0.01-0.01)	68	–	0.00	(0.00-0.01)	32	–	0.00	(0.00-0.00)
Neuronal and mixed neuronal-glial tumors	4,324	865	1.2%	27.0	0.28	(0.28-0.29)	827	165	0.05	(0.05-0.06)	3,497	699	0.23	(0.22-0.24)
Tumors of the pineal region	665	133	0.2%	33.0	0.04	(0.04-0.05)	360	72	0.02	(0.02-0.03)	305	61	0.02	(0.02-0.02)
Embryonal tumors	3,750	750	1.1%	9.0	0.26	(0.25-0.26)	3,641	728	0.25	(0.24-0.26)	109	22	0.01	(0.01-0.01)
Tumors of Cranial and Spinal Nerves	**28,980**	**5,796**	**8.1%**	**55.0**	1.76	(1.74-1.78)	233	47	0.01	(0.01-0.02)	28,747	5,749	1.75	(1.73-1.77)
Nerve sheath tumors	28,958	5,792	8.1%	55.0	1.76	(1.74-1.78)	233	47	0.01	(0.01-0.02)	28,725	5,745	1.75	(1.73-1.77)
Other tumors of cranial and spinal nerves	22	–	0.0%	54.0	0.00	(0.00-0.00)	–	–	–	–	22	–	0.00	(0.00-0.00)
Tumors of Meninges	**134,224**	**26,845**	**37.6%**	**65.0**	**8.13**	**(8.09-8.18)**	**2,455**	**491**	**0.15**	**(0.14-0.16)**	**131,769**	**26,354**	**7.98**	**(7.94-8.03)**
Meningioma	129,841	25,968	36.4%	65.0	7.86	(7.81-7.90)	1,685	337	0.10	(0.10-0.11)	128,156	25,631	7.75	(7.71-7.80)
Mesenchymal tumors	1,314	263	0.4%	48.0	0.08	(0.08-0.09)	409	82	0.03	(0.02-0.03)	905	181	0.06	(0.05-0.06)
Primary melanocytic lesions	141	28	0.0%	57.0	0.01	(0.01-0.01)	97	19	0.01	(0.00-0.01)	44	–	0.00	(0.00-0.00)
Other neoplasms related to the meninges	2,928	586	0.8%	49.0	0.18	(0.18-0.19)	264	53	0.02	(0.01-0.02)	2,664	533	0.17	(0.16-0.17)
Lymphomas and Hematopoietic Neoplasms	**7,476**	**1,495**	**2.1%**	**65.0**	**0.46**	**(0.45-0.47)**	**7,448**	**1,490**	**0.45**	**(0.44-0.47)**	**28**	**–**	**0.00**	**(0.00-0.00)**
Lymphoma	7,244	1,449	2.0%	65.0	0.44	(0.43-0.45)	7,244	1,449	0.44	(0.43-0.45)	–	–	–	–
Other hematopoietic neoplasms	232	46	0.1%	49.0	0.01	(0.01-0.02)	204	41	0.01	(0.01-0.01)	28	–	0.00	(0.00-0.00)
Germ Cell Tumors and Cysts	**1,471**	**294**	**0.4%**	**16.0**	**0.10**	**(0.09-0.10)**	**997**	**199**	**0.07**	**(0.06-0.07)**	**474**	**95**	**0.03**	**(0.03-0.03)**
Germ cell tumors, cysts and heterotopias	1,471	294	0.4%	16.0	0.10	(0.09-0.10)	997	199	0.07	(0.06-0.07)	474	95	0.03	(0.03-0.03)
Tumors of Sellar Region	**58,248**	**11,650**	**16.3%**	**51.0**	**3.68**	**(3.65-3.71)**	**120**	**24**	**0.01**	**(0.01-0.01)**	**58,128**	**11,626**	**3.67**	**(3.64-3.70)**
Tumors of the pituitary	55,396	11,079	15.5%	51.0	3.49	(3.46-3.52)	113	23	0.01	(0.01-0.01)	55,283	11,057	3.49	(3.46-3.52)
Craniopharyngioma	2,845	569	0.8%	42.0	0.18	(0.18-0.19)	–	–	–	–	2,845	569	0.18	(0.18-0.19)
Unclassified Tumors	**19,838**	**3,968**	**5.6%**	**63.0**	**1.23**	**(1.21-1.24)**	**6,666**	**1,333**	**0.40**	**(0.39-0.41)**	**13,172**	**2,634**	**0.82**	**(0.81-0.84)**
Hemangioma	5,406	1,081	1.5%	49.0	0.34	(0.33-0.35)	23	–	0.00	(0.00-0.00)	5,383	1,077	0.34	(0.33-0.35)
Neoplasm, unspecified	14,341	2,868	4.0%	70.0	0.88	(0.87-0.90)	6,619	1,324	0.40	(0.39-0.41)	7,722	1,544	0.48	(0.47-0.49)
All other	91	18	0.0%	61.0	0.01	(0.00-0.01)	24	–	0.00	(0.00-0.00)	67	–	0.00	(0.00-0.01)
TOTAL[c]	**356,858**	**71,372**	**100.0%**	**59.0**	**21.97**	**(21.9-22.05)**	**117,023**	**23,405**	**7.23**	**(7.18-7.27)**	**239,835**	**47,967**	**14.75**	**(14.69-14.81)**

[a]Annual average cases are calculated by dividing the five year total by five.
[b]Rates are per 100,000 and are age-adjusted to the 2000 US standard population.
[c]Refers to all brain tumors including histologies not presented in this table.
- Counts are not presented when fewer than 16 cases were reported for the specific histology category. The suppressed cases are included in the counts for totals.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified.

Table 8. Distribution of Histologically Confirmed Brain and Central Nervous System Tumors by WHO grade and Major Histology Groupings, CBTRUS Statistical Report: NPCR and SEER, 2011-2012

Histology	Number of newly diagnosed tumors	Histologically Confirmed	Complete WHO grade Information[a]	Assigned Grade			
				Grade I	Grade II	Grade III	Grade IV
Tumors of Neuroepithelial Tissue	**42,735**	**89.8%**	**82.1%**	**11.0%**	**15.1%**	**13.9%**	**60.0%**
Pilocytic astrocytoma	2,029	0.0%	82.2%	91.8%	6.7%	0.9%	0.6%
Diffuse astrocytoma	3,050	92.7%	84.4%	4.4%	57.1%	23.3%	15.1%
Anaplastic astrocytoma	2,485	99.3%	91.8%	0.1%	1.1%	90.2%	8.5%
Unique astrocytoma variants	422	80.3%	78.2%	27.5%	53.2%	15.5%	3.8%
Glioblastoma	22,133	93.3%	83.2%	0.2%	0.2%	1.0%	98.6%
Oligodendroglioma	1,440	96.2%	91.8%	1.7%	84.9%	6.8%	6.5%
Anaplastic oligodendroglioma	664	99.1%	95.0%	0.3%	2.2%	88.6%	8.8%
Oligoastrocytic tumors	1,211	99.7%	94.6%	1.1%	53.1%	37.0%	8.9%
Ependymal tumors	2,695	91.5%	81.7%	34.3%	51.2%	13.8%	0.6%
Glioma malignant, NOS	2,846	32.0%	49.9%	24.4%	25.9%	22.0%	27.7%
Choroid plexus tumors	308	87.3%	70.3%	66.1%	16.9%	15.9%	1.1%
Other neuroepithelial tumors	41	97.6%	32.5%	15.4%	61.5%	15.4%	7.7%
Neuronal and mixed neuronal-glial tumors	1,730	94.3%	61.1%	78.4%	16.5%	4.2%	0.8%
Tumors of the pineal region	271	75.3%	64.7%	22.7%	23.5%	15.2%	38.6%
Embryonal tumors	1,410	98.2%	70.8%	1.0%	0.1%	0.9%	98.0%
Tumors of Cranial and Spinal Nerves	**11,704**	**53.5%**	**28.8%**	**99.1%**	**0.4%**	**0.4%**	**0.2%**
Nerve sheath tumors	11,696	53.5%	28.9%	99.1%	0.4%	0.4%	0.2%
Other tumors of cranial and spinal nerves	–	–	–	–	–	–	–
Tumors of Meninges	**53,654**	**45.0%**	**73.8%**	**80.9%**	**17.0%**	**1.9%**	**0.2%**
Meningioma	51,946	43.6%	75.7%	81.1%	17.2%	1.6%	0.1%
Mesenchymal tumors	494	71.1%	45.3%	5.7%	52.8%	37.7%	3.8%
Primary melanocytic lesions	54	92.6%	10.0%	60.0%	0.0%	20.0%	20.0%
Other neoplasms related to the meninges	1,160	91.6%	46.9%	99.0%	0.8%	0.0%	0.2%
Lymphomas and Hematopoietic Neoplasms	**2,996**	**93.3%**	**4.5%**	**100.0%**	**0.0%**	**0.0%**	**0.0%**
Lymphoma	2,898	93.3%	4.7%	100.0%	0.0%	0.0%	0.0%
Other hemopoietic neoplasms	98	92.9%	0.0%	0.0%	0.0%	0.0%	0.0%
Germ Cell Tumors and Cysts	**1,471**	**31.6%**	**3.2%**	**6.7%**	**20.0%**	**20.0%**	**53.3%**
Germ cell tumors, cysts and heterotopias	550	84.5%	3.2%	6.7%	20.0%	20.0%	53.3%
Tumors of Sellar Region	**23,718**	**53.8%**	**6.2%**	**94.8%**	**3.3%**	**0.6%**	**1.3%**
Tumors of the pituitary	22,623	52.3%	4.1%	92.6%	4.5%	0.8%	2.1%
Craniopharyngioma	1,095	83.8%	33.8%	98.4%	1.3%	0.3%	0.0%
Unclassified Tumors	**8,001**	**17.7%**	**5.9%**	**70.2%**	**4.8%**	**11.9%**	**13.1%**
Hemangioma	2,460	29.1%	3.1%	95.5%	0.0%	0.0%	4.5%
Neoplasm, unspecified	5,499	12.5%	8.4%	60.3%	6.9%	17.2%	15.5%
All other	42	38.1%	25.0%	75.0%	0.0%	0.0%	25.0%
TOTAL	**144,279**	**59.7%**	**60.5%**	**39.5%**	**15.0%**	**9.1%**	**36.4%**

[a]Completeness is defined as having an assigned code that corresponds with a WHO grade as defined by the American Joint Commission on Cancer's Collaborative Staging schema (http://web2.facs.org/cstage0205/brain/Brain_jpo.html).
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; CNS, central nervous system; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; WHO, World Health Organization.

Table 9. Brain and Central Nervous System Tumor Five Year Total, Annual Average Total[a] and Average Annual Age-Adjusted Incidence Rates[b] by Site[c] and Gender, CBTRUS Statistical Report: NPCR and SEER, 2008-2012

ICD-O-3 Code	Site	Total				Male				Female			
		5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI
C71.1-C71.4	Frontal, temporal, parietal, and occipital lobes of the brain	70,573	14,115	4.32	(4.28-4.35)	39,161	7,832	5.11	(5.06-5.16)	31,412	6,282	3.63	(3.59-3.68)
	C71.1 - Frontal lobe	30,299	6,060	1.87	(1.85-1.89)	16,082	3,216	2.10	(2.07-2.14)	14,217	2,843	1.66	(1.63-1.69)
	C71.2 - Temporal lobe	22,509	4,502	1.37	(1.35-1.39)	13,374	2,675	1.74	(1.71-1.77)	9,135	1,827	1.06	(1.03-1.08)
	C71.3 - Parietal lobe	13,927	2,785	0.84	(0.83-0.86)	7,571	1,514	0.99	(0.97-1.01)	6,356	1,271	0.72	(0.71-0.74)
	C71.4 - Occipital lobe	3,838	768	0.23	(0.23-0.24)	2,134	427	0.28	(0.27-0.29)	1,704	341	0.19	(0.18-0.20)
C71.0	Cerebrum	6,364	1,273	0.40	(0.39-0.41)	3,349	670	0.44	(0.42-0.46)	3,015	603	0.36	(0.35-0.38)
C71.5	Ventricle	3,995	799	0.26	(0.25-0.27)	2,188	438	0.29	(0.28-0.30)	1,807	361	0.23	(0.22-0.24)
C71.6	Cerebellum	9,142	1,828	0.60	(0.59-0.61)	4,928	986	0.66	(0.64-0.68)	4,214	843	0.54	(0.53-0.56)
C71.7	Brain stem	5,523	1,105	0.36	(0.35-0.37)	2,981	596	0.40	(0.38-0.41)	2,542	508	0.33	(0.32-0.35)
C71.8-C71.9	Other brain	32,708	6,542	2.00	(1.98-2.03)	17,057	3,411	2.27	(2.24-2.31)	15,651	3,130	1.78	(1.75-1.81)
C72.0-C72.1	Spinal cord and cauda equina	10,558	2,112	0.66	(0.65-0.68)	5,424	1,085	0.70	(0.69-0.72)	5,134	1,027	0.62	(0.61-0.64)
C72.2-C72.5	Cranial nerves	24,300	4,860	1.48	(1.46-1.50)	11,383	2,277	1.45	(1.42-1.47)	12,917	2,583	1.51	(1.49-1.54)
C72.8-C72.9	Other nervous system	2,274	455	0.14	(0.14-0.15)	1,165	233	0.15	(0.14-0.16)	1,109	222	0.13	(0.13-0.14)
C70.0-C70.9	Meninges (cerebral & spinal)	129,855	25,971	7.86	(7.81-7.90)	34,655	6,931	4.70	(4.65-4.75)	95,200	19,040	10.59	(10.52-10.66)
C75.1-C75.2	Pituitary and craniopharyngeal duct	59,366	11,873	3.75	(3.72-3.78)	26,732	5,346	3.48	(3.44-3.53)	32,634	6,527	4.08	(4.04-4.13)
C75.3	Pineal	1,578	316	0.10	(0.10-0.11)	893	179	0.12	(0.11-0.13)	685	137	0.09	(0.08-0.10)
C30.0[c]	Olfactory tumors of the nasal cavity	622	124	0.04	(0.04-0.04)	366	73	0.05	(0.04-0.05)	256	51	0.03	(0.03-0.04)
TOTAL		**356,858**	**71,372**	**21.97**	**(21.90-22.05)**	**150,282**	**30,056**	**19.82**	**(19.72-19.93)**	**206,576**	**41,315**	**23.95**	**(23.85-24.06)**

[a]Annual average cases are calculated by dividing the five year total by five.
[b]Rates are per 100,000 and are age adjusted to the 2000 US standard population.
[c]The sites referred to in this table are loosely based on the categories and site codes defined in the SEER site/histology validation list.
[d]ICD-O-3 histology codes 9522-9523 only.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval.

Table 10. Five Year Total, Annual Average Total[a] and Average Annual Age-Adjusted Incidence Rates[b] for Brain and Central Nervous System Tumors by Major Histology Groupings, Histology and Race[c], CBTRUS Statistical Report: NPCR and SEER, 2008-2012

Histology	White				Black				AIAN				API			
	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI
Tumors of Neuroepithelial Tissue	**93,840**	**18,768**	**7.14**	**(7.09-7.18)**	**7,807**	**1,561**	**3.98**	**(3.89-4.07)**	**568**	**114**	**3.48**	**(3.17-3.81)**	**3,276**	**655**	**4.12**	**(3.98-4.27)**
Pilocytic astrocytoma	4,103	821	0.37	(0.36-0.38)	603	121	0.26	(0.24-0.29)	35	–	0.15	(0.11-0.22)	232	46	0.28	(0.25-0.32)
Diffuse astrocytoma	7,346	1,469	0.58	(0.57-0.59)	621	124	0.31	(0.29-0.34)	61	–	0.34	(0.26-0.45)	264	53	0.33	(0.29-0.37)
Anaplastic astrocytoma	5,344	1,069	0.41	(0.40-0.42)	376	75	0.20	(0.18-0.22)	40	–	0.22	(0.16-0.31)	175	35	0.22	(0.19-0.25)
Unique astrocytoma variants	793	159	0.07	(0.06-0.07)	144	29	0.06	(0.05-0.08)	–	–	–	–	54	–	0.06	(0.05-0.08)
Glioblastoma	48,942	9,788	3.45	(3.42-3.48)	3,165	633	1.76	(1.70-1.82)	193	39	1.54	(1.31-1.79)	1,187	237	1.59	(1.50-1.69)
Oligodendroglioma	3,494	699	0.29	(0.28-0.30)	198	40	0.10	(0.09-0.12)	29	–	0.16	(0.11-0.24)	132	26	0.15	(0.13-0.18)
Anaplastic oligodendroglioma	1,473	295	0.12	(0.11-0.12)	89	18	0.05	(0.04-0.06)	–	–	–	–	76	15	0.09	(0.07-0.11)
Oligoastrocytic tumors	2,781	556	0.23	(0.22-0.24)	189	38	0.09	(0.08-0.11)	21	–	0.12	(0.07-0.18)	118	24	0.13	(0.11-0.16)
Ependymal tumors	5,737	1,147	0.46	(0.45-0.47)	566	113	0.28	(0.25-0.30)	54	–	0.27	(0.20-0.36)	276	55	0.32	(0.28-0.36)
Glioma malignant, NOS	5,951	1,190	0.49	(0.47-0.50)	777	155	0.38	(0.36-0.41)	41	–	0.22	(0.16-0.31)	312	62	0.40	(0.36-0.45)
Choroid plexus tumors	672	134	0.06	(0.05-0.06)	72	–	0.03	(0.03-0.04)	–	–	–	–	34	–	0.04	(0.03-0.06)
Other neuroepithelial tumors	85	17	0.01	(0.01-0.01)	–	–	–	–	–	–	–	–	–	–	–	–
Neuronal and mixed neuronal-glial tumors	3,581	716	0.30	(0.29-0.31)	442	88	0.20	(0.19-0.22)	32	–	0.16	(0.11-0.24)	210	42	0.25	(0.22-0.28)
Tumors of the pineal region	506	101	0.04	(0.04-0.05)	121	24	0.06	(0.05-0.07)	–	–	–	–	23	–	0.03	(0.02-0.04)
Embryonal tumors	3,032	606	0.27	(0.26-0.28)	436	87	0.19	(0.17-0.21)	31	–	0.14	(0.09-0.20)	178	36	0.22	(0.19-0.25)
Tumors of Cranial and Spinal Nerves	**24,904**	**4,981**	**1.85**	**(1.83-1.88)**	**1,726**	**345**	**0.90**	**(0.85-0.94)**	**166**	**33**	**1.02**	**(0.86-1.20)**	**1,847**	**369**	**2.27**	**(2.16-2.37)**
Nerve sheath tumors	24,888	4,978	1.85	(1.83-1.88)	1,725	345	0.90	(0.85-0.94)	166	33	1.02	(0.86-1.20)	1,843	369	2.26	(2.16-2.37)
Other tumors of cranial and spinal nerves	16	–	0.00	(0.00-0.00)	–	–	–	–	–	–	–	–	–	–	–	–
Tumors of Meninges	**110,055**	**22,011**	**7.94**	**(7.89-7.99)**	**16,512**	**3,302**	**9.64**	**(9.49-9.79)**	**689**	**138**	**5.33**	**(4.90-5.78)**	**5,846**	**1,169**	**8.08**	**(7.87-8.30)**
Meningioma	106,427	21,285	7.66	(7.61-7.71)	16,079	3,216	9.42	(9.27-9.57)	650	130	5.11	(4.69-5.56)	5,609	1,122	7.80	(7.59-8.02)
Mesenchymal tumors	1,087	217	0.09	(0.08-0.09)	126	25	0.06	(0.05-0.08)	16	3	0.09	(0.05-0.15)	70	–	0.08	(0.06-0.10)
Primary melanocytic lesions	125	25	0.01	(0.01-0.01)	–	–	–	–	–	–	–	–	–	–	–	–
Other neoplasms related to the meninges	2,416	483	0.19	(0.18-0.20)	299	60	0.15	(0.14-0.17)	21	–	0.12	(0.07-0.18)	163	33	0.19	(0.16-0.22)
Lymphomas and Hematopoietic Neoplasms	**6,298**	**1,260**	**0.46**	**(0.44-0.47)**	**680**	**136**	**0.36**	**(0.34-0.39)**	**44**	**–**	**0.32**	**(0.22-0.43)**	**369**	**74**	**0.51**	**(0.46-0.56)**
Lymphoma	6,106	1,221	0.44	(0.43-0.45)	656	131	0.35	(0.32-0.38)	42	–	0.31	(0.21-0.42)	360	72	0.50	(0.44-0.55)
Other hematopoietic neoplasms	192	38	0.02	(0.01-0.02)	24	–	0.01	(0.01-0.02)	–	–	–	–	–	–	–	–
Germ Cell Tumors and Cysts	**1,158**	**232**	**0.10**	**(0.10-0.11)**	**152**	**30**	**0.07**	**(0.06-0.08)**	**–**	**–**	**–**	**–**	**139**	**28**	**0.17**	**(0.14-0.20)**
Germ cell tumors, cysts and heterotopias	1,158	232	0.10	(0.10-0.11)	152	30	0.07	(0.06-0.08)	–	–	–	–	139	28	0.17	(0.14-0.20)
Tumors of Sellar Region	**42,828**	**8,566**	**3.35**	**(3.32-3.38)**	**11,040**	**2,208**	**5.92**	**(5.81-6.03)**	**493**	**99**	**3.01**	**(2.73-3.31)**	**3,189**	**638**	**3.91**	**(3.77-4.05)**
Tumors of the pituitary	40,732	8,146	3.18	(3.15-3.21)	10,506	2,101	5.66	(5.55-5.77)	472	94	2.89	(2.62-3.19)	3,032	606	3.71	(3.58-3.85)
Craniopharyngioma	2,096	419	0.17	(0.16-0.18)	534	107	0.26	(0.24-0.29)	21	–	0.12	(0.07-0.19)	157	31	0.19	(0.16-0.23)
Unclassified Tumors	**16,727**	**3,345**	**1.24**	**(1.23-1.26)**	**2,044**	**409**	**1.17**	**(1.12-1.22)**	**140**	**28**	**1.09**	**(0.90-1.31)**	**791**	**158**	**1.09**	**(1.01-1.17)**
Hemangioma	4,579	916	0.36	(0.35-0.37)	472	94	0.24	(0.22-0.26)	45	–	0.27	(0.19-0.36)	264	53	0.32	(0.28-0.36)
Neoplasm, unspecified	12,077	2,415	0.88	(0.86-0.90)	1,561	312	0.92	(0.88-0.97)	93	19	0.80	(0.63-0.99)	521	104	0.76	(0.70-0.83)
All other	71	–	0.01	(0.00-0.01)	–	–	–	–	–	–	–	–	–	–	–	–
TOTAL[d]	**295,810**	**59,162**	**22.09**	**(22.01-22.17)**	**39,961**	**7,992**	**22.04**	**(21.81-22.26)**	**2,105**	**421**	**14.28**	**(13.61-14.96)**	**15,457**	**3,091**	**20.14**	**(19.82-20.47)**

[a]Annual average cases are calculated by dividing the five year total by five.
[b]Rates are per 100,000 and are age-adjusted to the 2000 US standard population.
[c]Individuals with unknown race were excluded (N = 2,176).
[d]Refers to all brain tumors including histologies not presented in this table.
- Counts and rates are not presented when fewer than 16 cases were reported for the specific histology category. The suppressed cases are included in the counts and rates for totals.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified; AIAN, American Indian/Alaskan Native; API, Asian/Pacific Islander.

Table 11. Five Year Total, Annual Average Total[a] and Average Annual Age-Adjusted Incidence Rates[b] for Brain and Central Nervous System Tumor by Major Histology Groupings, Histology and Hispanic Ethnicity[c], CBTRUS Statistical Report: NPCR and SEER, 2008-2012

Histology	Hispanic				Non-Hispanic			
	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI
Tumors of Neuroepithelial Tissue	**9,773**	**1,955**	**5.03**	**(4.92-5.14)**	**96,466**	**19,293**	**6.88**	**(6.83-6.92)**
Pilocytic astrocytoma	698	140	0.23	(0.21-0.25)	4,316	863	0.37	(0.36-0.38)
Diffuse astrocytoma	819	164	0.41	(0.38-0.44)	7,536	1,507	0.56	(0.55-0.57)
Anaplastic astrocytoma	518	104	0.26	(0.24-0.29)	5,471	1,094	0.39	(0.38-0.40)
Unique astrocytoma variants	140	28	0.05	(0.04-0.06)	875	175	0.07	(0.07-0.08)
Glioblastoma	3,586	717	2.39	(2.31-2.47)	50,200	10,040	3.28	(3.25-3.31)
Oligodendroglioma	381	76	0.18	(0.16-0.20)	3,503	701	0.27	(0.26-0.28)
Anaplastic oligodendroglioma	178	36	0.09	(0.08-0.11)	1,484	297	0.11	(0.10-0.11)
Oligoastrocytic tumors	282	56	0.13	(0.11-0.15)	2,859	572	0.22	(0.21-0.23)
Ependymal tumors	853	171	0.38	(0.35-0.40)	5,827	1,165	0.44	(0.43-0.45)
Glioma malignant, NOS	820	164	0.37	(0.34-0.40)	6,313	1,263	0.49	(0.48-0.51)
Choroid plexus tumors	123	25	0.05	(0.04-0.06)	673	135	0.06	(0.05-0.06)
Other neuroepithelial tumors	–	–	–	–	86	17	0.01	(0.01-0.01)
Neuronal and mixed neuronal-glial tumors	507	101	0.20	(0.18-0.22)	3,794	759	0.30	(0.29-0.31)
Tumors of the pineal region	84	17	0.03	(0.03-0.04)	579	116	0.05	(0.04-0.05)
Embryonal tumors	770	154	0.26	(0.24-0.28)	2,950	590	0.26	(0.25-0.27)
Tumors of Cranial and Spinal Nerves	**2,318**	**464**	**1.25**	**(1.20-1.31)**	**26,590**	**5,318**	**1.84**	**(1.82-1.86)**
Nerve sheath tumors	2,314	463	1.25	(1.20-1.31)	26,572	5,314	1.84	(1.82-1.86)
Other tumors of cranial and spinal nerves	–	–	–	–	18	–	0.00	(0.00-0.00)
Tumors of Meninges	**11,570**	**2,314**	**7.96**	**(7.81-8.12)**	**122,299**	**24,460**	**8.20**	**(8.15-8.24)**
Meningioma	11,053	2,211	7.71	(7.56-7.86)	118,451	23,690	7.92	(7.87-7.96)
Mesenchymal tumors	139	28	0.06	(0.05-0.08)	1,170	234	0.09	(0.08-0.09)
Primary melanocytic lesions	–	–	–	–	128	26	0.01	(0.01-0.01)
Other neoplasms related to the meninges	366	73	0.18	(0.16-0.20)	2,550	510	0.19	(0.18-0.19)
Lymphomas and Hematopoietic Neoplasms	**786**	**157**	**0.50**	**(0.46-0.54)**	**6,674**	**1,335**	**0.45**	**(0.44-0.46)**
Lymphoma	746	149	0.48	(0.45-0.52)	6,484	1,297	0.44	(0.43-0.45)
Other hemopoietic neoplasms	40	–	0.02	(0.01-0.02)	190	38	0.01	(0.01-0.02)
Germ Cell Tumors and Cysts	**262**	**52**	**0.09**	**(0.08-0.11)**	**1,200**	**240**	**0.10**	**(0.10-0.11)**
Germ cell tumors, cysts and heterotopias	262	52	0.09	(0.08-0.11)	1,200	240	0.10	(0.10-0.11)
Tumors of Sellar Region	**8,353**	**1,671**	**4.33**	**(4.23-4.43)**	**49,657**	**9,931**	**3.61**	**(3.58-3.64)**
Tumors of the pituitary	7,909	1,582	4.13	(4.04-4.23)	47,270	9,454	3.43	(3.40-3.46)
Craniopharyngioma	444	89	0.19	(0.17-0.21)	2,387	477	0.18	(0.17-0.19)
Unclassified Tumors	**2,108**	**422**	**1.28**	**(1.22-1.34)**	**17,685**	**3,537**	**1.23**	**(1.21-1.25)**
Hemangioma	652	130	0.33	(0.30-0.36)	4,738	948	0.35	(0.34-0.36)
Neoplasm, unspecified	1,442	288	0.94	(0.89-1.00)	12,870	2,574	0.88	(0.86-0.89)
All other	–	–	–	–	77	–	0.01	(0.00-0.01)
TOTAL[d]	**35,170**	**7,034**	**20.45**	**(20.22-20.68)**	**320,571**	**64,114**	**22.31**	**(22.23-22.39)**

[a]Annual average cases are calculated by dividing the five year total by five.
[b]Rates are per 100,000 and age-adjusted to the 2000 US standard population.
[c]Hispanic ethnicity is not mutually exclusive of race; Classified using the North American Association of Central Cancer Registries Hispanic Identification Algorithm, version 2 (NHIA v2).
[d]Refers to all brain tumors including histologies not presented in this table.
- Counts and rates are not presented when fewer than 16 cases were reported for the specific histology category. The suppressed cases are included in the counts and rates for totals.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified.

Table 12. Average Annual Age-Adjusted and Age-Specific Incidence Rates[a] by Major Histology Groupings, Histology and Age at Diagnosis, CBTRUS Statistical Report: NPCR and SEER, 2008-2012

Histology	Age At Diagnosis															
	0-19		20-34		35-44		45-54		55-64		65-74		75-84		85+	
	Rate	(95% CI)	Rate	(95% CI)	Rate	(95% CI)	Rate	(95% CI)	Rate	(95% CI)	Rate	(95% CI)	Rate	(95% CI)	Rate	(95% CI)
Tumors of Neuroepithelial Tissue	**3.71**	**(3.65-3.77)**	**3.40**	**(3.33-3.46)**	**4.45**	**(4.36-4.54)**	**6.86**	**(6.75-6.97)**	**11.66**	**(11.51-11.82)**	**17.13**	**(16.89-17.38)**	**19.60**	**(19.26-19.94)**	**12.41**	**(12.00-12.84)**
Pilocytic astrocytoma	0.87	(0.84-0.90)	0.23	(0.22-0.25)	0.12	(0.11-0.14)	0.09	(0.08-0.10)	0.09	(0.07-0.10)	0.06	(0.04-0.07)	0.07	(0.05-0.09)	–	–
Diffuse astrocytoma	0.27	(0.25-0.28)	0.49	(0.47-0.52)	0.56	(0.53-0.59)	0.57	(0.54-0.61)	0.77	(0.73-0.81)	0.96	(0.91-1.02)	1.07	(0.99-1.15)	0.60	(0.51-0.70)
Anaplastic astrocytoma	0.09	(0.08-0.10)	0.29	(0.27-0.31)	0.40	(0.37-0.43)	0.46	(0.43-0.49)	0.65	(0.61-0.68)	0.92	(0.86-0.98)	0.91	(0.84-0.98)	0.42	(0.34-0.50)
Unique astrocytoma variants	0.10	(0.10-0.12)	0.07	(0.06-0.08)	0.04	(0.03-0.05)	0.04	(0.03-0.05)	0.04	(0.03-0.05)	0.05	(0.04-0.07)	0.07	(0.05-0.10)	0.07	(0.04-0.10)
Glioblastoma	0.16	(0.15-0.17)	0.42	(0.40-0.45)	1.21	(1.16-1.25)	3.54	(3.47-3.62)	8.08	(7.95-8.21)	13.05	(12.84-13.27)	15.24	(14.94-15.54)	9.12	(8.77-9.48)
Oligodendroglioma	0.05	(0.05-0.06)	0.31	(0.29-0.33)	0.45	(0.42-0.48)	0.40	(0.37-0.42)	0.31	(0.28-0.33)	0.21	(0.19-0.24)	0.20	(0.16-0.23)	0.10	(0.07-0.15)
Anaplastic oligodendroglioma	0.01	(0.00-0.01)	0.08	(0.07-0.09)	0.17	(0.15-0.19)	0.18	(0.16-0.20)	0.21	(0.19-0.23)	0.16	(0.14-0.19)	0.11	(0.09-0.14)	–	–
Oligoastrocytic tumors	0.03	(0.03-0.04)	0.30	(0.28-0.32)	0.33	(0.30-0.35)	0.28	(0.26-0.30)	0.26	(0.24-0.29)	0.21	(0.18-0.24)	0.15	(0.12-0.18)	–	–
Ependymal tumors	0.29	(0.27-0.30)	0.37	(0.35-0.39)	0.48	(0.45-0.51)	0.62	(0.58-0.65)	0.56	(0.53-0.60)	0.58	(0.54-0.63)	0.43	(0.38-0.48)	0.19	(0.14-0.25)
Glioma malignant, NOS	0.66	(0.63-0.68)	0.25	(0.23-0.27)	0.26	(0.24-0.29)	0.29	(0.27-0.31)	0.36	(0.33-0.39)	0.60	(0.56-0.65)	1.08	(1.00-1.16)	1.69	(1.54-1.85)
Choroid plexus tumors	0.10	(0.09-0.11)	0.03	(0.03-0.04)	0.03	(0.02-0.04)	0.04	(0.03-0.05)	0.04	(0.03-0.05)	0.04	(0.03-0.05)	0.05	(0.03-0.07)	–	–
Other neuroepithelial tumors	0.01	(0.01-0.01)	0.01	(0.00-0.01)	0.01	(0.00-0.01)	–	–	–	–	–	–	–	–	–	–
Neuronal and mixed neuronal-glial tumors	0.38	(0.37-0.04)	0.32	(0.30-0.34)	0.24	(0.22-0.26)	0.23	(0.21-0.25)	0.21	(0.19-0.24)	0.20	(0.17-0.23)	0.17	(0.14-0.20)	0.06	(0.04-0.10)
Tumors of the pineal region	0.05	(0.04-0.05)	0.05	(0.04-0.06)	0.05	(0.04-0.06)	0.04	(0.03-0.05)	0.04	(0.03-0.05)	0.03	(0.02-0.05)	0.03	(0.02-0.04)	–	–
Embryonal tumors	0.64	(0.62-0.67)	0.17	(0.15-0.18)	0.11	(0.10-0.13)	0.08	(0.07-0.09)	0.05	(0.04-0.06)	0.04	(0.03-0.06)	0.03	(0.02-0.05)	–	–
Tumors of Cranial and Spinal Nerves	**0.28**	**(0.27-0.30)**	**0.83**	**(0.80-0.86)**	**1.81**	**(1.75-1.87)**	**2.86**	**(2.79-2.93)**	**4.01**	**(3.92-4.10)**	**4.56**	**(4.43-4.68)**	**3.51**	**(3.36-3.65)**	**1.73**	**(1.58-1.89)**
Nerve sheath tumors	0.28	(0.27-0.30)	0.83	(0.80-0.86)	1.81	(1.75-1.87)	2.85	(2.78-2.92)	4.01	(3.92-4.10)	4.55	(4.43-4.68)	3.51	(3.36-3.65)	1.73	(1.57-1.89)
Other tumors of cranial and spinal nerves	–	–	–	–	–	–	–	–	–	–	–	–	0.00	(0.00-0.01)	–	–
Tumors of Meninges	**0.23**	**(0.22-0.25)**	**1.64**	**(1.59-1.69)**	**5.16**	**(5.06-5.26)**	**9.39**	**(9.27-9.52)**	**15.24**	**(15.06-15.42)**	**26.45**	**(26.14-26.76)**	**39.11**	**(38.64-39.6)**	**51.50**	**(50.66-52.36)**
Meningioma	0.14	(0.13-0.16)	1.39	(1.35-1.44)	4.82	(4.72-4.91)	9.02	(8.89-9.14)	14.77	(14.59-14.95)	25.96	(25.66-26.27)	38.70	(38.22-39.18)	51.31	(50.47-52.16)
Mesenchymal tumors	0.05	(0.04-0.05)	0.06	(0.05-0.07)	0.10	(0.08-0.11)	0.10	(0.09-0.12)	0.15	(0.13-0.16)	0.14	(0.11-0.16)	0.11	(0.09-0.14)	0.06	(0.04-0.10)
Primary melanocytic lesions	–	–	–	–	–	–	0.01	(0.01-0.02)	0.02	(0.01-0.02)	0.02	(0.01-0.03)	0.03	(0.02-0.05)	–	–
Other neoplasms related to the meninges	0.04	(0.03-0.05)	0.18	(0.17-0.20)	0.24	(0.22-0.26)	0.26	(0.24-0.29)	0.30	(0.28-0.33)	0.33	(0.30-0.37)	0.28	(0.24-0.32)	0.11	(0.08-0.16)
Lymphomas and Hematopoietic Neoplasms	**0.03**	**(0.02-0.04)**	**0.11**	**(0.10-0.12)**	**0.27**	**(0.25-0.29)**	**0.43**	**(0.40-0.46)**	**0.89**	**(0.85-0.93)**	**1.82**	**(1.74-1.90)**	**2.40**	**(2.28-2.52)**	**1.19**	**(1.07-1.33)**
Lymphoma	0.01	(0.01-0.02)	0.11	(0.09-0.12)	0.26	(0.24-0.28)	0.41	(0.39-0.44)	0.87	(0.82-0.91)	1.79	(1.71-1.87)	2.38	(2.26-2.50)	1.18	(1.05-1.31)
Other hematopoietic neoplasms	0.02	(0.01-0.02)	0.01	(0.00-0.01)	0.01	(0.01-0.02)	0.01	(0.01-0.02)	0.02	(0.02-0.03)	0.03	(0.02-0.05)	–	–	–	–
Germ Cell Tumors and Cysts	**0.22**	**(0.20-0.23)**	**0.10**	**(0.09-0.11)**	**0.05**	**(0.04-0.06)**	**0.03**	**(0.02-0.04)**	**0.02**	**(0.01-0.03)**	**0.03**	**(0.02-0.04)**	**0.03**	**(0.02-0.05)**	**–**	**–**
Germ cell tumors, cysts and heterotopias	0.22	(0.20-0.23)	0.10	(0.09-0.11)	0.05	(0.04-0.06)	0.03	(0.02-0.04)	0.02	(0.01-0.03)	0.03	(0.02-0.04)	0.03	(0.02-0.05)	–	–
Tumors of Sellar Region	**0.78**	**(0.75-0.81)**	**3.28**	**(3.22-3.35)**	**4.52**	**(4.43-4.61)**	**4.85**	**(4.76-4.95)**	**5.61**	**(5.50-5.72)**	**7.55**	**(7.39-7.72)**	**7.54**	**(7.32-7.75)**	**4.80**	**(4.55-5.07)**
Tumors of the pituitary	0.58	(0.56-0.61)	3.16	(3.10-3.23)	4.36	(4.27-4.45)	4.64	(4.55-4.73)	5.37	(5.27-5.48)	7.30	(7.14-7.46)	7.32	(7.11-7.53)	4.69	(4.44-4.95)
Craniopharyngioma	0.19	(0.18-0.21)	0.12	(0.11-0.13)	0.16	(0.14-0.18)	0.21	(0.19-0.23)	0.24	(0.22-0.26)	0.25	(0.22-0.28)	0.22	(0.18-0.26)	0.11	(0.07-0.15)
Unclassified Tumors	**0.33**	**(0.31-0.34)**	**0.61**	**(0.58-0.63)**	**0.88**	**(0.84-0.93)**	**1.11**	**(1.07-1.16)**	**1.59**	**(1.53-1.65)**	**2.58**	**(2.48-2.67)**	**5.16**	**(4.99-5.33)**	**11.47**	**(11.07-11.87)**
Hemangioma	0.12	(0.11-0.13)	0.29	(0.27-0.31)	0.41	(0.39-0.44)	0.47	(0.45-0.50)	0.53	(0.50-0.57)	0.56	(0.51-0.60)	0.56	(0.5-0.62)	0.52	(0.44-0.61)
Neoplasm, unspecified	0.20	(0.19-0.22)	0.31	(0.29-0.33)	0.47	(0.44-0.50)	0.63	(0.60-0.67)	1.05	(1.00-1.10)	2.00	(1.92-2.09)	4.58	(4.42-4.75)	10.91	(10.53-11.31)
All other	0.00	(0.00-0.01)	–	–	–	–	–	–	–	–	0.01	(0.01-0.02)	–	–	–	–
TOTAL[c]	**5.57**	**(5.5-5.65)**	**9.96**	**(9.85-10.08)**	**17.14**	**(16.97-17.32)**	**25.53**	**(25.32-25.75)**	**39.02**	**(38.73-39.31)**	**60.11**	**(59.65-60.58)**	**77.35**	**(76.67-78.02)**	**83.14**	**(82.06-84.22)**

[a]Rates are per 100,000 and age-adjusted to the 2000 US. standard population.
[b]Adolescents and Young Adults (AYA), as defined by the National Cancer Institute, see: http://www.cancer.gov/cancertopics/aya.
[c]Refers to all brain tumors including histologies not presented in this table.
- Counts and rates are not presented when fewer than 16 cases were reported for the specific histology category. The suppressed cases are included in the counts and rates for totals.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified.

Table 13. Most Common Primary Brain and CNS Tumors[a] by Age, CBTRUS Statistical Report: NPCR and SEER, 2008-2012

Age (years)	Most Common Histology			Second Most Common Histology			Third Most Common Histology			Fourth Most Common Histology		
	Histology	Rate[b]	(95% CI)	Histology	Rate	(95% CI)	Histology	Rate	(95% CI)	Histology	Rate	(95% CI)
0-4	Embryonal Tumors	1.24	(1.17-1.31)	Pilocytic Astrocytoma	1.03	(0.96-1.09)	Glioma Malignant, NOS	0.93	(0.87-0.99)	Ependymal Tumors	0.48	(0.44-0.53)
5-9	Pilocytic Astrocytoma	1.01	(0.95-1.07)	Glioma Malignant, NOS	0.88	(0.82-0.94)	Embryonal Tumors	0.72	(0.67-0.77)	Neuronal and Mixed Neuronal Glial Tumors	0.31	(0.27-0.34)
10-14	Pilocytic Astrocytoma	0.86	(0.81-0.92)	Glioma Malignant, NOS	0.51	(0.47-0.56)	Tumors of the Pituitary	0.49	(0.45-0.53)	Neuronal and Mixed Neuronal Glial Tumors	0.47	(0.43-0.51)
15-19	Tumors of the Pituitary	1.66	(1.58-1.73)	Pilocytic Astrocytoma	0.60	(0.55-0.65)	Neuronal and Mixed Neuronal Glial Tumors	0.48	(0.44-0.53)	Nerve Sheath Tumors	0.35	(0.32-0.39)
20-34	Tumors of the Pituitary	3.16	(3.10-3.23)	Meningioma	1.39	(1.35-1.43)	Nerve Sheath Tumors	0.83	(0.80-0.86)	Diffuse Astrocytoma	0.49	(0.47-0.52)
35-44	Meningioma	4.82	(4.72-4.91)	Tumors of the Pituitary	4.36	(4.27-4.45)	Nerve Sheath Tumors	1.81	(1.75-1.87)	Glioblastoma	1.21	(1.16-1.25)
45-54	Meningioma	9.02	(8.89-9.14)	Tumors of the Pituitary	4.64	(4.55-4.73)	Glioblastoma	3.54	(3.47-3.62)	Nerve Sheath Tumors	2.85	(2.78-2.92)
55-64	Meningioma	14.77	(14.59-14.95)	Glioblastoma	8.08	(7.95-8.21)	Tumors of the Pituitary	5.37	(5.27-5.48)	Nerve Sheath Tumors	4.01	(3.92-4.10)
65-74	Meningioma	25.96	(25.66-26.27)	Glioblastoma	13.05	(12.84-13.27)	Tumors of the Pituitary	7.30	(7.14-7.46)	Nerve Sheath Tumors	4.55	(4.43-4.68)
75-84	Meningioma	38.70	(38.22-39.18)	Glioblastoma	15.24	(14.94-15.54)	Tumors of the Pituitary	7.32	(7.11-7.53)	Nerve Sheath Tumors	3.51	(3.36-3.65)
85+	Meningioma	51.31	(50.47-52.16)	Glioblastoma	9.12	(8.77-9.48)	Tumors of the Pituitary	4.69	(4.44-4.95)	Nerve Sheath Tumors	1.73	(1.57-1.89)
OVERALL	**Meningioma**	**7.86**	**(7.81-7.90)**	**Tumors of the Pituitary**	**3.49**	**(3.46-3.52)**	**Glioblastoma**	**3.20**	**(3.17-3.22)**	**Nerve Sheath Tumors**	**1.76**	**(1.74-1.78)**

[a]Excludes ICD-0-3 Codes 8000-8005, 8010 and 8021.
[b]Rates are per 100,000 and age-adjusted to the 2000 US. standard population.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified.

Table 14. Five Year Total, Annual Average Total[a] and Average Annual Age-Adjusted Incidence Rates[b] for Children and Adolescents (Age 0-19 years), Brain and Central Nervous System Tumors by Major Histology Groupings, Histology and Gender, CBTRUS Statistical Report: NPCR and SEER, 2008-2012

Histology	Total				Male				Female			
	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI
Tumors of Neuroepithelial Tissue	**15,297**	**3,059**	**3.71**	**(3.65-3.77)**	**8,297**	**1,659**	**3.93**	**(3.85-4.02)**	**7,000**	**1,400**	**3.47**	**(3.39-3.55)**
Pilocytic astrocytoma	3,594	719	0.87	(0.84-0.90)	1,871	374	0.89	(0.85-0.93)	1,723	345	0.86	(0.82-0.90)
Diffuse astrocytoma	1,106	221	0.27	(0.25-0.28)	597	119	0.28	(0.26-0.31)	509	102	0.25	(0.23-0.27)
Anaplastic astrocytoma	355	71	0.09	(0.08-0.10)	193	39	0.09	(0.08-0.11)	162	32	0.08	(0.07-0.09)
Unique astrocytoma variants	432	86	0.10	(0.10-0.12)	247	49	0.12	(0.10-0.13)	185	37	0.09	(0.08-0.11)
Glioblastoma	659	132	0.16	(0.15-0.17)	371	74	0.17	(0.16-0.19)	288	58	0.14	(0.13-0.16)
Oligodendroglioma	217	43	0.05	(0.05-0.06)	120	24	0.06	(0.05-0.07)	97	19	0.05	(0.04-0.06)
Anaplastic oligodendroglioma	30	–	0.01	(0.00-0.01)	–	–	–	–	–	–	–	–
Oligoastrocytic tumors	138	28	0.03	(0.03-0.04)	63	–	0.03	(0.02-0.04)	75	–	0.04	(0.03-0.05)
Ependymal tumors	1,194	239	0.29	(0.27-0.30)	681	136	0.32	(0.30-0.35)	513	103	0.25	(0.23-0.28)
Glioma malignant, NOS	2,698	540	0.66	(0.63-0.68)	1,336	267	0.64	(0.60-0.67)	1,362	272	0.68	(0.64-0.72)
Choroid plexus tumors	409	82	0.10	(0.09-0.11)	228	46	0.11	(0.09-0.12)	181	36	0.09	(0.08-0.10)
Other neuroepithelial tumors	35	–	0.01	(0.01-0.01)	–	–	–	–	26	–	0.01	(0.01-0.02)
Neuronal and mixed neuronal-glial tumors	1,595	319	0.38	(0.37-0.40)	886	177	0.42	(0.39-0.45)	709	142	0.35	(0.32-0.38)
Tumors of the pineal region	190	38	0.05	(0.04-0.05)	91	18	0.04	(0.03-0.05)	99	20	0.05	(0.04-0.06)
Embryonal tumors	2,645	529	0.64	(0.62-0.67)	1,589	318	0.76	(0.72-0.79)	1,056	211	0.52	(0.49-0.56)
Medulloblastoma[c]	*1,690*	*338*	*0.41*	*(0.39-0.43)*	*1,063*	*213*	*0.51*	*(0.48-0.54)*	*627*	*125*	*0.31*	*(0.29-0.34)*
Primitive neuroectodermal tumor[d]	*370*	*74*	*0.09*	*(0.08-0.10)*	*216*	*43*	*0.10*	*(0.09-0.12)*	*154*	*31*	*0.08*	*(0.06-0.09)*
Atypical teratoid/rhabdoid tumor[e]	*376*	*75*	*0.09*	*(0.08-0.10)*	*201*	*40*	*0.09*	*(0.08-0.11)*	*175*	*35*	*0.09*	*(0.07-0.10)*
Other embryonal histologies[f]	*209*	*42*	*0.05*	*(0.04-0.06)*	*109*	*22*	*0.05*	*(0.04-0.06)*	*100*	*20*	*0.05*	*(0.04-0.06)*
Tumors of Cranial and Spinal Nerves	**1,176**	**235**	**0.28**	**(0.27-0.30)**	**610**	**122**	**0.29**	**(0.26-0.31)**	**566**	**113**	**0.28**	**(0.26-0.30)**
Nerve sheath tumors	1,175	235	0.28	(0.27-0.30)	610	122	0.29	(0.26-0.31)	565	113	0.28	(0.26-0.30.)
Other tumors of cranial and spinal nerves	–	–	–	–	–	–	–	–	–	–	–	–
Tumors of Meninges	**980**	**196**	**0.23**	**(0.22-0.25)**	**496**	**99**	**0.23**	**(0.21-0.25)**	**484**	**97**	**0.24**	**(0.22-0.26)**
Meningioma	606	121	0.14	(0.13-0.16)	299	60	0.14	(0.12-0.16)	307	61	0.15	(0.13-0.17)
Mesenchymal tumors	197	39	0.05	(0.04-0.05)	93	19	0.04	(0.04-0.05)	104	21	0.05	(0.04-0.06)
Primary melanocytic lesions	–	–	–	–	–	–	–	–	–	–	–	–
Other neoplasms related to the meninges	165	33	0.04	(0.03-0.05)	97	19	0.04	(0.04-0.05)	68	–	0.03	(0.03-0.04)
Lymphomas and Hematopoietic Neoplasms	**123**	**25**	**0.03**	**(0.02-0.04)**	**74**	**–**	**0.03**	**(0.03-0.04)**	**49**	**–**	**0.02**	**(0.02-0.03)**
Lymphoma	59	–	0.01	(0.01-0.02)	34	–	0.02	(0.01-0.02)	25	–	0.01	(0.01-0.02)
Other hematopoietic neoplasms	64	–	0.02	(0.01-0.02)	40	–	0.02	(0.01-0.03)	24	–	0.01	(0.01-0.02)
Germ Cell Tumors and Cysts	**892**	**178**	**0.22**	**(0.20-0.23)**	**628**	**126**	**0.30**	**(0.27-0.32)**	**264**	**53**	**0.13**	**(0.12-0.15)**
Germ cell tumors, cysts and heterotopias	892	178	0.22	(0.20-0.23)	628	126	0.30	(0.27-0.32)	264	53	0.13	(0.12-0.15)
Tumors of Sellar Region	**3,287**	**657**	**0.78**	**(0.75-0.81)**	**1,076**	**215**	**0.50**	**(0.47-0.53)**	**2,211**	**442**	**1.07**	**(1.02-1.11)**
Tumors of the pituitary	2,493	499	0.58	(0.56-0.61)	680	136	0.31	(0.29-0.34)	1,813	363	0.87	(0.83-0.91)
Craniopharyngioma	**794**	**159**	**0.19**	**(0.18-0.21)**	**396**	**79**	**0.19**	**(0.17-0.21)**	**398**	**80**	**0.20**	**(0.18-0.22)**
Unclassified Tumors	1,358	272	0.33	(0.31-0.34)	680	136	0.32	(0.30-0.34)	678	136	0.33	(0.31-0.36)
Hemangioma	494	99	0.12	(0.11-0.13)	250	50	0.12	(0.10-0.13)	244	49	0.12	(0.10-0.14)
Neoplasm, unspecified	844	169	0.20	(0.19-0.22)	420	84	0.20	(0.18-0.22)	424	85	0.21	(0.19-0.23)
All other	20	–	0.00	(0.00-0.01)	–	–	–	–	–	–	–	–
TOTAL[g]	**23,113**	**4,623**	**5.57**	**(5.50-5.65)**	**11,861**	**2,372**	**5.60**	**(5.50-5.71)**	**11,252**	**2,250**	**5.54**	**(5.44-5.65)**

[a]Annual average cases are calculated by dividing the five year total by five.
[b]Rates are per 100,000 and are age-adjusted to the 2000 US standard population.
[c]ICD-O-3 histology codes: 9470/3, 9471/3, 9472/3, 9474/3.
[d]ICD-O-3 histology code: 9473/3.
[e]ICD-O-3 histology code: 9508/3.
[f]ICD-O-3 histology codes: 8963/3, 9364/3, 9480/3, 9490/0, 9490/3, 9500/3, 9501/3, 9502/3.
[g]Refers to all brain tumors including histologies not presented in this table.
- Counts and rates are not presented when fewer than 16 cases were reported for the specific histology category. Suppressed cases are included in the total counts and rates.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified.

Table 15. Five Year Total, Annual Average Total[a] and Average Annual Age-Adjusted Incidence Rates[b] for Children and Adolescents (Age 0-19 years), Brain and Central Nervous System Tumors by Major Histology Groupings and Race[c], CBTRUS Statistical Report: NPCR and SEER, 2008-2012

	White				Black				AIAN				API			
	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI
Tumors of Neuroepithelial Tissue	**12,205**	**2,441**	**3.89**	**(3.83-3.96)**	**2,011**	**402**	**2.93**	**(2.81-3.06)**	**141**	**28**	**2.01**	**(1.69-2.37)**	**796**	**159**	**3.48**	**(3.24-3.73)**
Pilocytic astrocytoma	2,890	578	0.92	(0.89-0.96)	469	94	0.69	(0.62-0.75)	25	–	0.35	(0.23-0.52)	176	35	0.77	(0.66-0.89)
Diffuse astrocytoma	888	178	0.28	(0.26-0.30)	144	29	0.21	(0.18-0.25)	–	–	–	–	55	–	0.24	(0.18-0.32)
Anaplastic astrocytoma	286	57	0.09	(0.08-0.10)	49	–	0.07	(0.05-0.10)	–	–	–	–	–	–	–	–
Unique astrocytoma variants	317	63	0.10	(0.09-0.11)	81	16	0.12	(0.09-0.15)	–	–	–	–	27	–	0.12	(0.08-0.17)
Glioblastoma	502	100	0.16	(0.15-0.17)	103	21	0.15	(0.12-0.18)	–	–	–	–	41	–	0.18	(0.13-0.25)
Oligodendroglioma	183	37	0.06	(0.05-0.07)	17	–	0.02	(0.01-0.04)	–	–	–	–	–	–	–	–
Anaplastic oligodendroglioma	24	–	0.01	(0.00-0.01)	–	–	–	–	–	–	–	–	–	–	–	–
Oligoastrocytic tumors	112	22	0.04	(0.03-0.04)	18	–	0.03	(0.02-0.04)	–	–	–	–	–	–	–	–
Ependymal tumors	959	192	0.30	(0.28-0.32)	142	28	0.20	(0.17-0.24)	22	–	0.31	(0.19-0.47)	60	–	0.26	(0.20-0.33)
Glioma malignant, NOS	2,154	431	0.69	(0.66-0.72)	365	73	0.54	(0.48-0.60)	22	–	0.32	(0.20-0.48)	137	27	0.60	(0.50-0.71)
Choroid plexus tumors	328	66	0.10	(0.09-0.12)	46	–	0.07	(0.05-0.09)	–	–	–	–	25	–	0.11	(0.07-0.16)
Other neuroepithelial tumors	25	–	0.01	(0.01-0.01)	–	–	–	–	–	–	–	–	–	–	–	–
Neuronal and mixed neuronal-glial tumors	1,308	262	0.42	(0.39-0.44)	177	35	0.26	(0.22-0.30)	–	–	–	–	86	17	0.38	(0.31-0.47)
Tumors of the pineal region	123	25	0.04	(0.03-0.05)	56	–	0.08	(0.06-0.11)	–	–	–	–	–	–	–	–
Embryonal tumors	2,106	421	0.68	(0.65-0.70)	334	67	0.49	(0.44-0.54)	25	–	0.35	(0.23-0.52)	146	29	0.63	(0.53-0.74)
Medulloblastoma[e]	*1,365*	*273*	*0.44*	*(0.42-0.46)*	*195*	*39*	*0.29*	*(0.25-0.33)*	*18*	–	*0.26*	*(0.15-0.41)*	*90*	*18*	*0.39*	*(0.31-0.48)*
Primitive neuroectodermal tumor[e]	*291*	*58*	*0.09*	*(0.08-0.10)*	*55*	–	*0.08*	*(0.06-0.10)*	–	–	–	–	*17*	–	*0.07*	*(0.04-0.12)*
Atypical teratoid/rhabdoid tumor[f]	*297*	*59*	*0.09*	*(0.08-0.11)*	*46*	–	*0.07*	*(0.05-0.09)*	**–**	**–**	**–**	**–**	*26*	–	*0.11*	*(0.07-0.16)*
Other embryonal histologies[g]	*153*	*31*	*0.05*	*(0.04-0.06)*	*38*	–	*0.05*	*(0.04-0.07)*	–	–	–	–	–	–	–	–
Tumors of Cranial and Spinal Nerves	**902**	**180**	**0.29**	**(0.27-0.30)**	**148**	**30**	**0.21**	**(0.18-0.25)**	**–**	**–**	**–**	**–**	**97**	**19**	**0.42**	**(0.34-0.52)**
Nerve sheath tumors	901	180	0.29	(0.27-0.30)	148	30	0.21	(0.18-0.25)	–	–	–	–	97	19	0.42	(0.34-0.52)
Other tumors of cranial and spinal nerves	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tumors of Meninges	**759**	**152**	**0.24**	**(0.22-0.26)**	**139**	**28**	**0.20**	**(0.17-0.23)**	**–**	**–**	**–**	**–**	**68**	**–**	**0.30**	**(0.23-0.38)**
Meningioma	461	92	0.14	(0.13-0.16)	96	19	0.14	(0.11-0.17)	–	–	–	–	39	–	0.17	(0.12-0.23)
Mesenchymal tumors	161	32	0.05	(0.04-0.06)	17	–	0.02	(0.01-0.04)	–	–	–	–	16	–	0.07	(0.04-0.11)
Primary melanocytic lesions	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Other neoplasms related to the meninges	127	25	0.04	(0.03-0.05)	24	–	0.03	(0.02-0.05)	–	–	–	–	–	–	–	–
Lymphomas and Hematopoietic Neoplasms	**100**	**20**	**0.03**	**(0.03-0.04)**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**
Lymphoma	44	–	0.01	(0.01-0.02)	–	–	–	–	–	–	–	–	–	–	–	–
Other hematopoietic neoplasms	56	–	0.02	(0.01-0.02)	–	–	–	–	–	–	–	–	–	–	–	–
Germ Cell Tumors and Cysts	**692**	**138**	**0.22**	**(0.20-0.24)**	**98**	**20**	**0.14**	**(0.11-0.17)**	**–**	**–**	**–**	**–**	**95**	**19**	**0.43**	**(0.34-0.52)**
Germ cell tumors, cysts and heterotopias	692	138	0.22	(0.20-0.24)	98	20	0.14	(0.11-0.17)	–	–	–	–	95	19	0.43	(0.34-0.52)
Tumors of Sellar Region	**2,497**	**499**	**0.78**	**(0.75-0.81)**	**488**	**98**	**0.69**	**(0.63-0.75)**	**48**	**–**	**0.69**	**(0.51-0.91)**	**221**	**44**	**0.98**	**(0.86-1.12)**
Tumors of the pituitary	1,910	382	0.59	(0.56-0.62)	350	70	0.49	(0.44-0.54)	39	–	0.56	(0.40-0.76)	170	34	0.75	(0.65-0.88)
Craniopharyngioma	587	117	0.19	(0.17-0.20)	138	28	0.20	(0.17-0.24)	–	–	–	–	51	–	0.23	(0.17-0.30)
Unclassified Tumors	**1,077**	**215**	**0.34**	**(0.32-0.36)**	**165**	**33**	**0.24**	**(0.20-0.28)**	**16**	**–**	**0.23**	**(0.13-0.37)**	**87**	**17**	**0.38**	**(0.31-0.47)**
Hemangioma	406	81	0.13	(0.12-0.14)	50	–	0.07	(0.05-0.09)	–	–	–	–	29	–	0.13	(0.09-0.18)
Neoplasm, unspecified	653	131	0.21	(0.19-0.22)	115	23	0.17	(0.14-0.20)	–	–	–	–	57	–	0.25	(0.19-0.33)
All other	18	–	0.01	(0.00-0.01)	–	–	–	–	–	–	–	–	–	–	–	–
TOTAL[h]	**18,232**	**3,646**	**5.79**	**(5.70-5.87)**	**3,061**	**612**	**4.43**	**(4.27-4.59)**	**231**	**46**	**3.29**	**(2.88-3.75)**	**1,373**	**275**	**6.03**	**(5.71-6.36)**

[a]Annual average cases are calculated by dividing the five year total by five.
[b]Rates are per 100,000 and are age-adjusted to the 2000 US standard population.
[c]Individuals with unknown race were excluded (N = 188).
[d]ICD-O-3 histology codes: 9470/3, 9471/3, 9472/3, 9474/3.
[e]ICD-O-3 histology code: 9473/3.
[f]ICD-O-3 histology code: 9508/3.
[g]ICD-O-3 histology codes: 8963/3, 9364/3, 9480/3, 9490/0, 9490/3, 9500/3, 9501/3, 9502/3.
[h]Refers to all brain tumors including histologies not presented in this table.
- Counts and rates are not presented when fewer than 16 cases were reported for the specific histology category. Suppressed cases are included in the total counts and rates.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified; AIAN, American Indian/Alaskan Native; API, Asian/Pacific Islander.

Table 16. Five Year Total, Annual Average Total[a] and Average Annual Age-Adjusted Incidence Rates[b] for Children and Adolescents (Age 0-19 years), Brain and Central Nervous System Tumors by Major Histology Groupings, Histology and Hispanic Ethnicity[c], CBTRUS Statistical Report: NPCR and SEER, 2008-2012

Histology	Hispanic				Non-Hispanic			
	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI
Tumors of Neuroepithelial Tissue	**2,738**	**548**	**2.85**	**(2.74-2.96)**	**12,559**	**2,512**	**3.96**	**(3.89-4.03)**
Pilocytic astrocytoma	579	116	0.60	(0.55-0.65)	3015	603	0.95	(0.92-0.99)
Diffuse astrocytoma	161	32	0.17	(0.14-0.20)	945	189	0.30	(0.28-0.32)
Anaplastic astrocytoma	76	–	0.09	(0.07-0.11)	279	56	0.09	(0.08-0.10)
Unique astrocytoma variants	90	18	0.10	(0.08-0.12)	342	68	0.11	(0.10-0.12)
Glioblastoma	149	30	0.16	(0.13-0.18)	510	102	0.16	(0.15-0.17)
Oligodendroglioma	22	–	0.02	(0.01-0.04)	195	39	0.06	(0.05-0.07)
Anaplastic oligodendroglioma	–	–	–	–	24	–	0.01	(0.0-0.01)
Oligoastrocytic tumors	23	–	0.02	(0.02-0.04)	115	23	0.04	(0.03-0.04)
Ependymal tumors	278	56	0.29	(0.26-0.33)	916	183	0.29	(0.27-0.31)
Glioma malignant, NOS	434	87	0.44	(0.40-0.48)	2264	453	0.72	(0.69-0.75)
Choroid plexus tumors	76	–	0.08	(0.06-0.10)	333	67	0.11	(0.09-0.12)
Other neuroepithelial tumors	–	–	–	–	30	–	0.01	(0.01-0.01)
Neuronal and mixed neuronal-glial tumors	252	50	0.27	(0.24-0.31)	1343	269	0.42	(0.39-0.44)
Tumors of the pineal region	35	–	0.04	(0.03-0.05)	155	31	0.05	(0.04-0.06)
Embryonal tumors	552	110	0.57	(0.52-0.62)	2093	419	0.67	(0.64-0.70)
Medulloblastoma[d]	*347*	*69*	*0.10*	*(0.08-0.12)*	*1,343*	*269*	*0.09*	*(0.08-0.10)*
Primitive neuroectodermal tumor[e]	*68*	–	*0.07*	*(0.05-0.09)*	*301*	*60*	*0.10*	*(0.09-0.11)*
Atypical teratoid/rhabdoid tumor[f]	*102*	*20*	*0.36*	*(0.32-0.40)*	*274*	*55*	*0.43*	*(0.41-0.45)*
Other embryonal histologies[g]	*35*	–	*0.04*	*(0.03-0.05)*	*174*	*35*	*0.06*	*(0.05-0.06)*
Tumors of Cranial and Spinal Nerves	**195**	**39**	**0.22**	**(0.19-0.25)**	**981**	**196**	**0.30**	**(0.29-0.32)**
Nerve sheath tumors	195	39	0.22	(0.19-0.25)	980	196	0.30	(0.29-0.32)
Other tumors of cranial and spinal nerves	–	–	–	–	–	–	–	–
Tumors of Meninges	**159**	**32**	**0.18**	**(0.15-0.21)**	**821**	**164**	**0.25**	**(0.23-0.27)**
Meningioma	84	17	0.10	(0.08-0.12)	522	104	0.16	(0.14-0.17)
Mesenchymal tumors	33	–	0.04	(0.02-0.05)	164	33	0.05	(0.04-0.06)
Primary melanocytic lesions	–	–	–	–	–	–	–	–
Other neoplasms related to the meninges	39	–	0.04	(0.03-0.06)	126	25	0.04	(0.03-0.04)
Lymphomas and Hematopoietic Neoplasms	**29**	**–**	**0.03**	**(0.02-0.05)**	**94**	**19**	**0.03**	**(0.02-0.04)**
Lymphoma	–	–	–	–	47	–	0.01	(0.01-0.02)
Other hematopoietic neoplasms	17	–	0.02	(0.01-0.03)	47	–	0.01	(0.01-0.02)
Germ Cell Tumors and Cysts	**177**	**35**	**0.19**	**(0.17-0.22)**	**715**	**143**	**0.22**	**(0.21-0.24)**
Germ cell tumors, cysts and heterotopias	177	35	0.19	(0.17-0.22)	715	143	0.22	(0.21-0.24)
Tumors of Sellar Region	**751**	**150**	**0.84**	**(0.78-0.90)**	**2536**	**507**	**0.76**	**(0.73-0.79)**
Tumors of the pituitary	569	114	0.64	(0.59-0.70)	1924	385	0.57	(0.54-0.60)
Craniopharyngioma	182	36	0.20	(0.17-0.23)	612	122	0.19	(0.18-0.21)
Unclassified Tumors	**282**	**56**	**0.31**	**(0.27-0.35)**	**1076**	**215**	**0.33**	**(0.31-0.35)**
Hemangioma	103	21	0.11	(0.09-0.13)	391	78	0.12	(0.11-0.13)
Neoplasm, unspecified	175	35	0.19	(0.17-0.23)	669	134	0.21	(0.19-0.22)
All other	–	–	–	–	16	–	0.01	(0.00-0.01)
TOTAL[h]	**4,331**	**866**	**4.62**	**(4.48-4.76)**	**18,782**	**3,756**	**5.86**	**(5.78-5.94)**

[a]Annual average cases are calculated by dividing the five year total by five.
[b]Rates are per 100,000 and are age-adjusted to the 2000 US standard population.
[c]Hispanic ethnicity is not mutually exclusive of race; Classified using the North American Association of Central Cancer Registries Hispanic Identification Algorithm, version 2 (NHIA v2).
[d]ICD-O-3 histology codes: 9470/3, 9471/3, 9472/3, 9474/3.
[e]ICD-O-3 histology code: 9473/3.
[f]ICD-O-3 histology code: 9508/3.
[g]ICD-O-3 histology codes: 8963/3, 9364/3, 9480/3, 9490/0, 9490/3, 9500/3, 9501/3, 9502/3.
[h]Refers to all brain tumors including histologies not presented in this table.
- Counts and rates are not presented when fewer than 16 cases were reported for the specific histology category. The suppressed cases are included in the counts and rates for totals.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified.

Table 17. Five Year Total, Annual Average Total[a] and Age-Adjusted and Age-Specific Incidence Rates[b] for Children and Adolescents, (Age 0-19 years), Brain and Central Nervous System Tumors: Malignant and Non-Malignant by International Classification of Childhood Cancer (ICCC),[c] CBTRUS Statistical Report: NPCR and SEER, 2008-2012

ICCC Category	0-14[c] years				0-19[c] years				<1 year		1-4 years		5-9 years		10-14 years		15-19 years	
	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI
II Lymphomas and reticuloendothelial neoplasms	68	–	0.02	(0.02-0.03)	104	21	0.03	(0.02-0.03)	–	–	–	–	0.03	(0.02-0.04)	0.02	(0.01-0.03)	0.03	(0.02-0.05)
III CNS and misc. intracranial and intraspinal neoplasms	14,116	2,823	4.63	(4.55-4.70)	19,527	3,905	4.71	(4.65-4.78)	4.89	(4.59-5.21)	5.25	(5.09-5.41)	4.43	(4.30-4.57)	4.30	(4.17-4.43)	4.96	(4.83-5.10)
III(a) Ependymomas and choroid plexus tumor	1,282	256	0.42	(0.39-0.44)	1,603	321	0.39	(0.37-0.40)	0.99	(0.86-1.14)	0.69	(0.63-0.75)	0.27	(0.24-0.30)	0.25	(0.22-0.28)	0.29	(0.26-0.33)
III(b) Astrocytomas	5,502	1,100	1.80	(1.76-1.85)	6,921	1,384	1.68	(1.64-1.72)	1.41	(1.25-1.58)	2.21	(2.10-2.31)	1.80	(1.72-1.89)	1.57	(1.50-1.65)	1.30	(1.24-1.37)
III(c) Intracranial and intraspinal embryonal tumors	2,211	442	0.72	(0.69-0.75)	2,458	492	0.60	(0.57-0.62)	1.24	(1.09-1.40)	1.07	(1.00-1.15)	0.69	(0.64-0.74)	0.39	(0.35-0.43)	0.23	(0.20-0.26)
III(d) Other gliomas	1,847	369	0.61	(0.58-0.64)	2,347	469	0.57	(0.55-0.59)	0.29	(0.22-0.37)	0.62	(0.57-0.68)	0.73	(0.68-0.79)	0.54	(0.49-0.59)	0.46	(0.42-0.50)
III(e) Other specified intracranial and intraspinal neoplasms	2,715	543	0.89	(0.86-0.93)	5,355	1,071	1.28	(1.24-1.31)	0.63	(0.53-0.75)	0.52	(0.48-0.58)	0.80	(0.75-0.86)	1.31	(1.24-1.38)	2.42	(2.33-2.51)
III(f) Unspecified intracranial and intraspinal neoplasms	559	112	0.18	(0.17-0.20)	843	169	0.20	(0.19-0.22)	0.34	(0.26-0.43)	0.14	(0.12-0.17)	0.14	(0.12-0.16)	0.23	(0.20-0.26)	0.26	(0.23-0.29)
IV Neuroblastoma and other peripheral nervous cell tumors	137	27	0.04	(0.04-0.05)	150	30	0.04	(0.03-0.04)	0.26	(0.19-0.34)	0.07	(0.05-0.09)	0.02	(0.01-0.03)	–	–	–	–
IX Soft tissue and other extraosseous sarcomas	64	–	0.02	(0.02-0.03)	91	18	0.02	(0.02-0.03)	–	–	–	–	0.02	(0.01-0.03)	0.02	(0.01-0.03)	0.02	(0.02-0.04)
X(a) Intracranial & intraspinal germ cell tumors	596	119	0.20	(0.18-0.21)	892	178	0.22	(0.20-0.23)	0.33	(0.26-0.42)	0.08	(0.06-0.11)	0.17	(0.15-0.20)	0.28	(0.25-0.32)	0.27	(0.24-0.31)
All other categories	17	–	0.01	(0.00-0.01)	26	–	0.01	(0.00-0.01)	0.00	(0.00-0.02)	–	–	–	–	–	–	–	–
Not classified by ICCC	1,366	273	0.45	(0.42-0.47)	2,321	464	0.56	(0.53-0.58)	0.66	(0.55-0.79)	0.41	(0.36-0.45)	0.39	(0.35-0.43)	0.50	(0.46-0.54)	0.88	(0.82-0.93)
TOTAL[d]	**16,366**	**3,273**	**5.37**	**(5.28-5.45)**	**23,113**	**4,623**	**5.57**	**(5.50-5.65)**	**6.20**	**(5.86-6.55)**	**5.86**	**(5.69-6.03)**	**5.06**	**(4.93-5.20)**	**5.14**	**(5.00-5.28)**	**6.19**	**(6.04-6.34)**

[a]Annual average cases are calculated by dividing the five year total by five.
[b]Rates are per 100,000.
[c]See the CBTRUS website for additional information on this classification scheme: http://www.cbtrus.org.
[d]Rates are age adjusted to the 2000 U.S. standard population.
[e]Refers to all brain tumors including histologies not presented in this table.
- Counts and rates are not presented when fewer than 16 cases were reported for the specific ICCC category. The suppressed cases are included in the counts and rates for totals.
Abbreviations: ICCC, International Classification of Childhood Cancer; CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval.

Table 18. Estimated Number of Cases[a,b] of Brain and Central Nervous System Tumors Overall and by Behavior by State, 2015, 2016

STATE	2015 Estimated New Cases			2016 Estimated New Cases		
	All	Malignant	Non-Malignant	All	Malignant	Non-Malignant
Alabama	930	410	520	940	420	520
Alaska	180	60	120	190	60	130
Arizona	1,680	530	1,150	1,730	530	1,190
Arkansas	540	260	280	540	270	270
California	7,470	2,630	4,840	7,450	2,660	4,780
Colorado	1,510	400	1,110	1,540	410	1,140
Connecticut	920	290	630	940	290	650
Delaware	220	80	140	220	80	140
District of Columbia	140	–	100	140	–	100
Florida	5,350	1,610	3,740	5,400	1,630	3,780
Georgia	2,760	720	2,040	2,910	730	2,170
Hawaii	250	70	170	240	70	170
Idaho	370	120	250	380	120	260
Illinois	3,290	1,020	2,270	3,350	1,030	2,320
Indiana	1,310	550	760	1,270	560	710
Iowa	1,020	290	730	1,070	290	780
Kansas	640	240	400	640	240	400
Kentucky	1,400	430	960	1,430	450	990
Louisiana	1,150	320	820	1,190	330	860
Maine	280	130	150	280	130	150
Maryland	1,450	440	1,010	1,510	450	1,060
Massachusetts	1,540	540	1,000	1,580	540	1,040
Michigan	2,480	820	1,670	2,510	820	1,690
Minnesota	1,170	450	710	1,220	460	750
Mississippi	670	230	440	680	230	450
Missouri	1,430	500	930	1,420	500	920
Montana	270	90	180	270	90	180
Nebraska	380	160	220	380	160	220
Nevada	460	170	290	470	170	290
New Hampshire	320	130	190	330	130	190
New Jersey	2,300	740	1,570	2,370	740	1,630
New Mexico	510	150	360	530	150	380
New York	5,310	1,470	3,840	5,360	1,460	3,900
North Carolina	2,610	800	1,810	2,690	820	1,870
North Dakota	150	50	90	150	50	100
Ohio	2,610	750	1,860	2,660	720	1,940
Oklahoma	950	290	670	1,000	290	710
Oregon	840	360	470	840	370	470
Pennsylvania	3,750	1,180	2,570	3,810	1,190	2,610
Rhode Island	200	70	120	190	70	120
South Carolina	1,080	400	680	1,080	410	670
South Dakota	220	70	140	220	70	150
Tennessee	1,980	540	1,440	2,060	550	1,510
Texas	6,040	1,830	4,210	6,080	1,860	4,220
Utah	800	220	590	840	220	620
Vermont	150	70	80	140	70	80
Virginia	1,570	610	960	1,560	620	950
Washington	2,180	620	1,560	2,220	630	1,590
West Virginia	380	150	220	370	150	220
Wisconsin	1,180	400	780	1,120	380	740
Wyoming	160	60	100	160	60	110
United States	**76,520**	**24,560**	**51,960**	**77,670**	**24,790**	**52,880**

[a]Source: Estimation based on CBTRUS NPCR and SEER 2000-2012 data for malignant tumors, and NPCR and SEER 2006-2012 data for non-malignant tumors.
[b]Rounded to the nearest 10.
- Estimated number is less than 50 and may affect totals.

Table 19. Estimated Number of Cases[a,b] of Brain and Central Nervous System Tumors Overall and by Behavior by Major Histology Groupings and Histology, 2015, 2016

Histology	2015 Estimated New Cases			2016 Estimated New Cases		
	All	Malignant	Non-Malignant	All	Malignant	Non-Malignant
Tumors of Neuroepithelial Tissue	**21,740**	**20,110**	**1,630**	**21,880**	**20,220**	**1,660**
Pilocytic astrocytoma	1,090	1,090	–	1,100	1,100	–
Diffuse astrocytoma	1,130	1,130	–	1,040	1,040	–
Anaplastic astrocytoma	1,260	1,250	–	1,270	1,270	–
Unique astrocytoma variants	230	170	60	240	180	60
Glioblastoma	11,890	11,890	–	12,120	12,120	–
Oligodendroglioma	530	530	–	490	490	–
Anaplastic oligodendroglioma	380	380	–	400	400	–
Oligoastrocytic tumors	600	600	–	590	590	–
Ependymal tumors	1,420	840	580	1,440	850	590
Glioma malignant, NOS	1,330	1,330	–	1,310	1,310	–
Choroid plexus tumors	150	–	120	150	–	120
Other neuroepithelial tumors	–	–	–	–	–	–
Neuronal and mixed neuronal-glial tumors	960	200	760	980	200	780
Tumors of the pineal region	160	90	70	160	90	70
Embryonal tumors	590	570	–	560	540	–
Tumors of Cranial and Spinal Nerves	**5,970**	–	**5,920**	**6,000**	–	**5,960**
Nerve sheath tumors	5,960	–	5,910	5,990	–	5,950
Other tumors of cranial and spinal nerves	–	–	–	–	–	–
Tumors of Meninges	**26,020**	**450**	**25,560**	**25,810**	**440**	**25,360**
Meningioma	25,110	290	24,810	24,880	280	24,600
Mesenchymal tumors	270	80	180	270	80	180
Primary melanocytic lesions	–	–	–	50	–	–
Other neoplasms related to the meninges	600	50	550	610	50	560
Lymphomas and Hematopoietic Neoplasms	**1,650**	**1,650**	–	**1,690**	**1,690**	–
Lymphoma	1,590	1,590	–	1,620	1,620	–
Other hematopoietic neoplasms	60	60	–	70	70	–
Germ Cell Tumors and Cysts	**290**	**210**	**80**	**290**	**210**	**80**
Germ cell tumors, cysts and heterotopias	290	210	80	290	210	80
Tumors of Sellar Region	**12,180**	–	**12,150**	**12,270**	–	**12,240**
Tumors of the pituitary	11,610	–	11,590	11,700	–	11,680
Craniopharyngioma	570	–	560	570	–	560
Unclassified Tumors	**3,960**	**1,010**	**2,950**	**3,950**	**950**	**2,990**
Hemangioma	1,370	–	1,360	1,410	–	1,400
Neoplasm, unspecified	2,580	1,000	1,580	2,530	940	1,580
All other	–	–	–	–	–	–
TOTAL‡	**76,520**	**24,560**	**51,960**	**77,670**	**24,790**	**52,880**

[a]Source: Estimation based on CBTRUS NPCR and SEER 2000-2012 data for malignant tumors, and NPCR and SEER 2006-2012 data for non-malignant tumors.
[b]Rounded to the nearest 10. Numbers may not add up due to rounding.
–Estimated number is less than 50 and may affect totals.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified.

Table 20. Estimated Number of Cases[a,b] of Brain and Central Nervous System Tumors by Age, Major Histology Groupings, and Histology, 2015, 2016

Histology	2015 Estimated New Cases				2016 Estimated New Cases			
	0-14	15-39	40-64	65+	0-14	15-39	40-64	65+
Tumors of Neuroepithelial Tissue	**3,040**	**3,500**	**8,530**	**7,610**	**3,040**	**3,490**	**8,580**	**7,750**
Pilocytic astrocytoma	780	290	90	–	780	290	90	–
Diffuse astrocytoma	120	440	430	320	120	430	390	310
Anaplastic astrocytoma	70	320	600	360	70	330	620	360
Unique astrocytoma variants	80	80	–	–	80	80	–	–
Glioblastoma	160	540	5,280	5,940	160	550	5,360	6,070
Oligodendroglioma	–	250	320	70	–	240	310	70
Anaplastic oligodendroglioma	–	60	210	50	–	60	210	50
Oligoastrocytic tumors	–	290	250	60	30	290	240	60
Ependymal tumors	250	360	600	270	250	360	610	280
Glioma malignant, NOS	560	290	320	360	560	300	320	360
Choroid plexus tumors	70	–	–	–	70	–	–	–
Other neuroepithelial tumors	–	–	–	–	–	–	–	–
Neuronal and mixed neuronal-glial tumors	340	310	250	70	340	300	250	80
Tumors of the pineal region	–	60	–	–	40	60	–	–
Embryonal tumors	480	170	50	–	480	170	–	–
Tumors of Cranial and Spinal Nerves	**190**	**890**	**3,230**	**1,750**	**190**	**890**	**3,240**	**1,790**
Nerve sheath tumors	190	890	3,230	1,740	190	890	3,240	1,790
Other tumors of cranial and spinal nerves	–	–	–	–	–	–	–	–
Tumors of Meninges	**200**	**1,830**	**10,150**	**13,510**	**200**	**1,840**	**10,000**	**13,460**
Meningioma	140	1,760	10,070	13,450	140	1,780	9,920	13,400
Mesenchymal tumors	60	60	70	50	60	60	70	50
Primary melanocytic lesions	–	–	–	–	–	–	–	–
Other neoplasms related to the meninges	–	190	280	120	–	190	280	120
Lymphomas and Hematopoietic Neoplasms	**50**	**110**	**590**	**850**	**50**	**110**	**590**	**860**
Lymphoma	–	100	570	830	−0	90	570	850
Other hematopoietic neoplasms	–	–	–	–	–	–	–	–
Germ Cell Tumors and Cysts	**100**	**100**	–	–	**100**	**100**	–	–
Germ cell tumors, cysts and heterotopias	100	100	–	–	100	100	–	–
Tumors of Sellar Region	**750**	**3,250**	**5,380**	**3,500**	**750**	**3,230**	**5,400**	**3,640**
Tumors of the pituitary	600	3,150	5,160	3,400	600	3,130	5,180	3,550
Craniopharyngioma	150	100	220	100	150	100	220	100
Unclassified Tumors	**300**	**710**	**1,640**	**2,040**	**300**	**730**	**1,750**	**2,100**
Hemangioma	170	400	870	450	170	420	990	510
Neoplasm, unspecified	120	320	760	1,590	120	310	760	1,580
All other	–	–	–	–	–	–	–	–
TOTAL‡	**4,630**	**10,390**	**29,540**	**29,260**	**4,630**	**10,390**	**29,590**	**29,610**

[a]Source: Estimation based on CBTRUS NPCR and SEER 2006-2012 data.
[b]Rounded to the nearest 10. Numbers may not add up due to rounding.
– Estimated number is less than 50 and may affect totals.
Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified.

Table 21. Five Year Total, Average Annual Total[a] and Average Annual Age-Adjusted Mortality Rates[b] for Malignant Brain and Central Nervous System Cancer Overall and by State and Gender, United States, 2008-2012[c]

State	TOTAL				Males				Females			
	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI
Alabama	1,318	264	4.92	(4.65-5.20)	730	146	6.01	(5.57-6.47)	588	118	4.00	(3.68-4.35)
Alaska	141	28	4.73	(3.92-5.65)	84	17	6.12	(4.72-7.77)	57	–	3.58	(2.67-4.71)
Arizona	1,444	289	4.17	(3.96-4.40)	808	162	4.98	(4.64-5.34)	636	127	3.47	(3.20-3.75)
Arkansas	811	162	4.92	(4.58-5.28)	450	90	6.00	(5.44-6.59)	361	72	4.02	(3.61-4.47)
California	7,943	1,589	4.28	(4.19-4.38)	4,472	894	5.23	(5.08-5.39)	3,471	694	3.47	(3.35-3.59)
Colorado	1,106	221	4.42	(4.16-4.70)	638	128	5.46	(5.03-5.92)	468	94	3.54	(3.23-3.89)
Connecticut	873	175	4.24	(3.96-4.54)	486	97	5.27	(4.80-5.77)	387	77	3.37	(3.03-3.74)
Delaware	214	43	4.24	(3.68-4.86)	115	23	5.05	(4.15-6.09)	99	20	3.63	(2.93-4.44)
District of Columbia	103	21	3.60	(2.93-4.38)	54	–	4.39	(3.27-5.77)	49	–	3.03	(2.23-4.04)
Florida	4,850	970	4.07	(3.96-4.19)	2,782	556	5.09	(4.90-5.29)	2,068	414	3.18	(3.04-3.32)
Georgia	1,886	377	4.09	(3.90-4.28)	1,062	212	5.11	(4.79-5.45)	824	165	3.27	(3.05-3.51)
Hawaii	193	39	2.42	(2.08-2.79)	115	23	3.03	(2.49-3.66)	78	16	1.87	(1.47-2.36)
Idaho	385	77	4.79	(4.32-5.31)	253	51	6.60	(5.79-7.48)	132	26	3.12	(2.60-3.71)
Illinois	2,760	552	4.06	(3.91-4.22)	1,548	310	5.03	(4.78-5.29)	1,212	242	3.28	(3.09-3.47)
Indiana	1,604	321	4.59	(4.37-4.83)	899	180	5.60	(5.23-5.99)	705	141	3.74	(3.46-4.03)
Iowa	886	177	5.07	(4.74-5.43)	515	103	6.39	(5.84-6.98)	371	74	3.95	(3.54-4.39)
Kansas	779	156	5.08	(4.72-5.45)	460	92	6.53	(5.94-7.17)	319	64	3.84	(3.42-4.30)
Kentucky	1,140	228	4.74	(4.46-5.03)	607	121	5.45	(5.01-5.91)	533	107	4.13	(3.78-4.50)
Louisiana	1007	201	4.24	(3.97-4.51)	550	110	5.14	(4.70-5.60)	457	91	3.49	(3.17-3.83)
Maine	425	85	5.04	(4.56-5.56)	258	52	6.60	(5.79-7.49)	167	33	3.69	(3.13-4.32)
Maryland	1,214	243	3.94	(3.72-4.18)	682	136	4.92	(4.55-5.32)	532	106	3.15	(2.88-3.43)
Massachusetts	1,570	314	4.25	(4.04-4.47)	850	170	5.14	(4.80-5.51)	720	144	3.51	(3.25-3.79)
Michigan	2,696	539	4.85	(4.66-5.04)	1,520	304	5.92	(5.62-6.23)	1,176	235	3.93	(3.71-4.17)
Minnesota	1,296	259	4.52	(4.27-4.77)	740	148	5.51	(5.11-5.93)	556	111	3.64	(3.34-3.96)
Mississippi	731	146	4.63	(4.30-4.98)	378	76	5.39	(4.85-5.98)	353	71	4.05	(3.63-4.50)
Missouri	1,515	303	4.51	(4.28-4.74)	830	166	5.37	(5.00-5.75)	685	137	3.75	(3.47-4.05)
Montana	271	54	4.56	(4.02-5.16)	151	30	5.32	(4.48-6.27)	120	24	3.87	(3.19-4.66)
Nebraska	502	100	5.10	(4.66-5.58)	274	55	6.07	(5.36-6.84)	228	46	4.20	(3.66-4.80)
Nevada	569	114	4.14	(3.79-4.50)	356	71	5.35	(4.79-5.96)	213	43	3.01	(2.61-3.45)
New Hampshire	365	73	4.77	(4.28-5.30)	219	44	6.19	(5.37-7.10)	146	29	3.58	(3.01-4.23)
New Jersey	1,821	364	3.74	(3.56-3.92)	1,030	206	4.75	(4.46-5.06)	791	158	2.91	(2.71-3.12)
New Mexico	419	84	3.79	(3.43-4.17)	236	47	4.53	(3.95-5.16)	183	37	3.14	(2.69-3.64)
New York	4,012	802	3.75	(3.64-3.87)	2,181	436	4.59	(4.39-4.78)	1,831	366	3.09	(2.95-3.24)
North Carolina	2,197	439	4.31	(4.13-4.50)	1,246	249	5.48	(5.17-5.80)	951	190	3.39	(3.18-3.62)
North Dakota	146	29	3.87	(3.25-4.57)	74	–	4.15	(3.24-5.23)	72	–	3.60	(2.79-4.57)
Ohio	2,933	587	4.48	(4.32-4.65)	1,621	324	5.42	(5.16-5.70)	1,312	262	3.66	(3.46-3.87)
Oklahoma	966	193	4.72	(4.42-5.03)	530	106	5.59	(5.12-6.10)	436	87	3.95	(3.58-4.34)
Oregon	1,081	216	4.98	(4.68-5.29)	641	128	6.21	(5.73-6.73)	440	88	3.87	(3.51-4.26)
Pennsylvania	3,183	637	4.17	(4.02-4.32)	1,753	351	5.07	(4.83-5.31)	1,430	286	3.42	(3.24-3.61)
Rhode Island	253	51	4.16	(3.65-4.72)	143	29	5.25	(4.41-6.21)	110	22	3.23	(2.64-3.92)
South Carolina	1,117	223	4.36	(4.10-4.63)	642	128	5.56	(5.12-6.02)	475	95	3.34	(3.04-3.67)
South Dakota	254	51	5.52	(4.85-6.26)	136	27	6.20	(5.19-7.36)	118	24	4.89	(4.02-5.90)
Tennessee	1,662	332	4.76	(4.53-5.00)	899	180	5.66	(5.28-6.05)	763	153	3.99	(3.71-4.29)
Texas	4,733	947	4.03	(3.91-4.15)	2,628	526	4.84	(4.65-5.04)	2,105	421	3.34	(3.20-3.49)
Utah	498	100	4.31	(3.93-4.71)	290	58	5.28	(4.68-5.94)	208	42	3.45	(2.99-3.96)
Vermont	192	38	5.10	(4.38-5.90)	114	23	6.32	(5.18-7.65)	78	16	3.91	(3.07-4.93)
Virginia	1,685	337	3.97	(3.78-4.17)	934	187	4.78	(4.47-5.11)	751	150	3.29	(3.06-3.54)
Washington	1,857	371	5.16	(4.93-5.41)	1,077	215	6.38	(5.99-6.78)	780	156	4.09	(3.80-4.39)

Continued

Table 21. *Continued*

State	TOTAL				Males				Females			
	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI	5 year total	Annual average	Rate	95% CI
West Virginia	500	100	4.24	(3.86-4.64)	273	55	4.94	(4.35-5.58)	227	45	3.62	(3.15-4.14)
Wisconsin	1,579	316	4.97	(4.73-5.23)	898	180	6.09	(5.69-6.51)	681	136	4.03	(3.72-4.35)
Wyoming	146	29	4.83	(4.06-5.70)	83	17	5.66	(4.47-7.07)	63	–	4.02	(3.07-5.17)
United States	**71,831**	**14,366**	**4.31**	**(4.27-4.34)**	**40,315**	**8,063**	**5.28**	**(5.22-5.33)**	**31,516**	**6,303**	**3.48**	**(3.44-3.52)**

[a]Annual average deaths are calculated by dividing the five year total by five.
[b]Rates are per 100,000 and are age-adjusted to the 2000 US standard population.
[c]Estimated by CBTRUS using Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2011 on CDC WONDER Online Database, released 2014. Data are from the Multiple Cause of Death Files, 1999-2012, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at http://wonder.cdc.gov/ucd-icd10.html.
- Counts and rates are not presented when fewer than 20 cases were reported for the specific category. The suppressed cases are included in the counts and rates for totals.
Abbreviations: NCHS, National Center for Health Statistics; CI, confidence interval.

Table 22. One-, Two-, Five- and Ten-Year Relative Survival Rates[a] for Malignant Brain and Central Nervous System Tumors by Site[b], SEER 18 Registries, 1995-2012[c]

ICD-O-3 CODE	SITE[b]	N[d]	1-Year		2-Year		5-Year		10-Year	
			%	95% CI	%	95% CI	%	95% CI	%	95% CI
C71.1	Frontal lobe of the brain	17,629	60.4	(59.7-61.2)	45.8	(45.0-46.6)	34.3	(33.5-35.1)	26.1	(25.2-26.9)
C71.2	Temporal lobe of the brain	12,619	55.8	(54.9-56.7)	35.0	(34.2-35.9)	23.0	(22.1-23.8)	17.5	(16.6-18.3)
C71.3	Parietal lobe of the brain	8,368	48.6	(47.5-49.7)	30.2	(29.1-31.2)	19.6	(18.6-20.6)	14.3	(13.4-15.3)
C71.4	Occipital lobe of the brain	2,090	50.3	(48.1-52.5)	30.7	(28.6-32.8)	20.8	(18.9-22.8)	17.3	(15.3-19.4)
C71.0	Cerebrum	3,759	49.4	(47.8-51.1)	35.9	(34.3-37.5)	27.3	(25.7-28.8)	23.3	(21.7-25.0)
C71.5	Ventricle	1,384	75.0	(72.6-77.3)	68.4	(65.8-70.9)	61.9	(59.0-64.6)	58.0	(54.8-61.0)
C71.6	Cerebellum	4,282	84.7	(83.6-85.8)	78.7	(77.4-80.0)	71.1	(69.6-72.6)	66.3	(64.5-67.9)
C71.7	Brain stem	3,461	69.6	(68.9-71.1)	56.8	(55.0-58.5)	48.4	(46.6-50.2)	43.3	(41.3-45.3)
C71.8-C71.9	Other brain	16,967	42.9	(42.1-43.6)	30.6	(29.9-31.4)	22.0	(21.3-22.7)	17.6	(16.9-18.3)
C72.0-C72.1	Spinal cord and cauda equina	2,595	89.3	(88.0-90.5)	84.8	(83.3-86.3)	80.0	(78.2-81.8)	76.0	(73.6-78.3)
C72.2-C72.5	Cranial nerves	851	96.7	(95.1-97.7)	95.1	(93.2-96.4)	92.8	(90.4-94.6)	91.2	(88.3-93.4)
C72.8-C72.9	Other nervous system	724	60.5	(56.7-64.1)	51.4	(47.4-55.2)	43.5	(39.3-47.6)	39.2	(34.6-43.8)
C70.0-C70.9	Meninges (cerebral and spinal)	1,419	82.3	(80.0-84.3)	75.5	(72.9-77.9)	64.7	(61.5-67.7)	57.8	(53.9-61.5)
C75.1-C75.2	Pituitary and craniopharyngeal duct	289	85.0	(80.1-88.8)	82.0	(76.7-86.3)	72.7	(66.3-78.2)	67.1	(59.6-73.6)
C75.3	Pineal	786	88.5	(86.0-90.6)	82.3	(79.2-84.9)	75.8	(72.3-78.9)	69.5	(65.1-73.5)
C30.0[d]	Olfactory tumors of the nasal cavity	429	90.2	(86.7-92.9)	83.8	(79.5-87.3)	77.2	(72.1-81.4)	63.0	(55.3-69.7)
All Codes	**All Sites**	**77,652**	**58.1**	**(57.7-58.4)**	**44.1**	**(43.7-44.5)**	**34.4**	**(34.0-34.7)**	**28.8**	**(28.4-29.2)**

[a]The cohort analysis of survival rates was utilized for calculating the survival estimates presented in this table. Long-term cohort-based survival estimates reflect the survival experience of individuals diagnosed over the time period, and they may not necessarily reflect the long-term survival outlook of newly diagnosed cases.
[b]The sites referred to in this table are loosely based on the categories and site codes defined in the SEER Site/Histology Validation List.
[c]Estimated by CBTRUS using Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Registries Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2014 Sub (1973-2012 varying) - Linked To County Attributes - Total U.S., 1969-2013 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2015, based on the November 2014 submission.
[d]Total number of case that occurred within the SEER registries between 1995 and 2012
[d]ICD-O-3 histology codes 9522-9523 only.
Abbreviation: SEER, Survival, Epidemiology and End Results; CI, confidence interval.

Table 23. One-, Two-, Three-, Four-, Five- and Ten-Year Relative Survival Rates[a,b] for Selected Malignant Brain and Central Nervous System Tumors by Histology, SEER 18 Registries, 1995-2012[c]

Histology	N[d]	1-Year		2-Year		3-Year		4-Year		5-Year		10-Year	
		%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Pilocytic astrocytoma	3,849	97.9	(97.4-98.4)	96.6	(95.9-97.2)	95.5	(94.8-96.2)	94.7	(93.9-95.5)	94.2	(93.3-95.0)	92.1	(90.8-93.1)
Diffuse astrocytoma	6,635	72.2	(71.1-73.3)	61.5	(60.3-62.7)	55.4	(54.1-56.7)	51.2	(49.9-52.5)	47.9	(46.6-49.3)	37.6	(36.1-39.0)
Anaplastic astrocytoma	4,101	62.1	(60.5-63.6)	44.0	(42.4-45.6)	35.7	(34.1-37.3)	31.2	(29.6-32.8)	27.9	(26.4-29.5)	19.8	(18.2-21.4)
Glioblastoma	33,204	37.2	(36.7-37.7)	15.2	(14.8-15.7)	8.8	(8.5-9.2)	6.3	(6.0-6.6)	5.1	(4.8-5.4)	2.6	(2.4-2.9)
Oligodendroglioma	3,602	93.9	(93.0-94.7)	89.5	(88.4-90.6)	86.2	(84.9-87.3)	82.9	(81.5-84.3)	79.8	(78.2-81.2)	64.0	(61.9-66.1)
Anaplastic oligodendroglioma	1,441	81.5	(79.3-83.4)	68.9	(66.3-71.3)	62.4	(59.6-65.0)	57.0	(54.1-59.7)	52.5	(49.6-55.4)	38.9	(35.6-42.2)
Ependymal tumors	2,929	93.8	(92.8-94.7)	89.7	(88.5-90.9)	86.8	(85.3-88.1)	84.8	(83.2-86.2)	83.4	(81.7-84.9)	79.1	(76.9-81.1)
Oligoastrocytic tumors	2,130	87.6	(86.1-89.0)	77.9	(76.0-79.7)	71.4	(69.2-73.4)	66.1	(63.8-68.3)	62.0	(59.6-64.3)	47.8	(44.8-50.8)
Glioma malignant, NOS	4,717	63.2	(61.8-64.6)	52.7	(51.1-54.2)	49.3	(47.8-50.8)	47.6	(46.0-49.1)	46.1	(44.5-47.7)	41.3	(39.5-43.0)
Neuronal and mixed neuronal-glial tumors	545	90.5	(87.4-92.8)	83.5	(79.8-86.7)	79.3	(75.1-82.8)	75.8	(71.3-79.6)	75.2	(70.6-79.2)	61.4	(54.7-67.4)
Embryonal tumors	3,040	81.6	(80.1-82.9)	71.5	(69.8-73.1)	66.7	(64.9-68.4)	63.7	(61.9-65.5)	61.2	(59.3-63.1)	54.2	(52.1-56.3)
Medulloblastoma[e]	*1,815*	*88.5*	*(86.9-89.9)*	*82.0*	*(80.1-83.7)*	*77.5*	*(75.4-79.5)*	*74.5*	*(72.2-76.5)*	*71.9*	*(69.5-74.1)*	*63.3*	*(60.5-65.9)*
Primitive neuroectodermal tumor[f]	*710*	*75.9*	*(72.6-79.0)*	*59.6*	*(55.8-63.2)*	*53.7*	*(49.8-57.4)*	*50.2*	*(46.3-54.0)*	*48.0*	*(44.1-51.8)*	*42.1*	*(38.0-46.0)*
Atypical teratoid/rhabdoid tumor[g]	*219*	*49.1*	*(42.2-55.6)*	*34.3*	*(27.8-40.9)*	*30.5*	*(24.2-37.1)*	*29.8*	*(23.4-36.4)*	*28.9*	*(22.5-35.5)*	*26.5*	*(20.0-33.5)*
Other embryonal histologies[h]	*296*	*77.3*	*(71.9-81.7)*	*64.4*	*(58.4-69.8)*	*59.9*	*(53.7-65.5)*	*57.2*	*(50.9-63.0)*	*53.5*	*(47.1-59.5)*	*50.9*	*(44.1-57.2)*
Meningioma	1,239	82.9	(80.5-85.0)	75.8	(73.0-78.4)	71.0	(67.9-73.8)	68.6	(65.4-71.6)	65.2	(61.8-68.4)	57.5	(53.2-61.5)
Lymphoma	5,172	48.5	(47.1-49.9)	39.9	(38.5-41.4)	35.3	(33.9-36.8)	32.1	(30.7-33.5)	29.9	(28.5-31.3)	22.2	(20.6-23.8)
TOTAL: All Brain and Other Nervous System[i]	**77,652**	**58.1**	**(57.7-58.4)**	**44.1**	**(43.7-44.5)**	**38.9**	**(38.6-39.3)**	**36.2**	**(35.8-36.6)**	**34.4**	**(34.0-34.7)**	**28.8**	**(28.4-29.2)**

[a]The cohort analysis of survival rates was utilized for calculating the survival estimates presented in this table. Long-term cohort-based survival estimates reflect the survival experience of individuals diagnosed over the time period, and they may not necessarily reflect the long-term survival outlook of newly diagnosed cases.
[b]Rates are an estimate of the percentage of patients alive at one, two, three, four, five, and ten year, respectively.
[c]Estimated by CBTRUS using Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Registries Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2014 Sub (1973-2012 varying) - Linked To County Attributes - Total U.S., 1969-2013 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2015, based on the November 2014 submission.
[d]Total number of case that occurred within the SEER registries between 1995 and 2012
[e]ICD-O-3 histology codes: 9470/3, 9471/3, 9472/3, 9474/3.
[f]ICD-O-3 histology code: 9473/3.
[g]ICD-O-3 histology code: 9508/3.
[h]ICD-O-3 histology codes: 8963/3, 9364/3, 9480/3, 9490/0, 9490/3, 9500/3, 9501/3, 9502/3.
[i]Includes histologies not listed in this table.
Abbreviation: SEER, Survival, Epidemiology and End Results; CI, confidence interval; NOS, not otherwise specified.

Table 24. One-, Two-, Five- and Ten-Year Relative Survival Rates[a,b] for Selected Malignant Brain and Central Nervous System Tumors by Age Groups, SEER 18 Registries, 1995-2012[c]

Histology	Age Group (years)	N[d]	1-Year		2-Year		5-Year		10-Year	
			%	95% CI	%	95% CI	%	95% CI	%	95% CI
Pilocytic astrocytoma	0-19	2,790	98.7	(98.2-99.1)	98.4	(97.8-98.8)	96.9	(96.1-97.6)	95.9	(94.8-96.8)
	20-44	779	96.7	(95.1-97.7)	94.6	(92.7-96.1)	91.1	(88.5-93.1)	86.1	(82.5-89.0)
	45-54	142	94.5	(88.8-97.4)	85.4	(77.8-90.6)	77.4	(68.3-84.2)	74.1	(63.6-82.0)
	55-64	82	97.0	(87.7-99.3)	89.3	(78.5-94.8)	80.1	(67.4-88.3)	68.4	(50.7-80.8)
	65-74	–	–	–	–	–	–	–	–	–
	75+	–	–	–	–	–	–	–	–	–
Diffuse astrocytoma	0-19	992	92.7	(90.8-94.2)	87.0	(84.7-89.0)	82.7	(80.0-85.0)	80.3	(77.3-82.9)
	20-44	2,349	92.4	(91.2-93.4)	85.2	(83.6-86.6)	65.9	(63.7-68.0)	47.2	(44.5-49.8)
	45-54	1,046	74.6	(71.7-77.1)	60.2	(57.0-63.2)	42.9	(39.6-46.2)	31.2	(27.5-35.1)
	55-64	933	54.7	(51.4-57.9)	34.4	(31.2-37.6)	21.0	(18.1-24.1)	12.8	(9.8-16.2)
	65-74	712	37.6	(33.9-41.2)	24.3	(21.0-27.7)	13.4	(10.6-16.6)	9.3	(6.3-13.1)
	75+	603	21.3	(17.9-24.8)	10.8	(8.3-13.8)	5.4	(3.3-8.3)	2.0	(0.6-5.2)
Anaplastic astrocytoma	0-19	317	65.5	(59.8-70.5)	43.4	(37.7-49.0)	32.1	(26.6-37.7)	26.0	(20.5-31.9)
	20-44	1,346	88.0	(86.1-89.7)	73.5	(70.9-75.9)	51.4	(48.3-54.5)	37.4	(33.9-40.9)
	45-54	729	71.2	(67.7-74.4)	48.6	(44.7-52.3)	29.4	(25.7-33.2)	18.5	(14.7-22.6)
	55-64	711	50.9	(47.1-54.7)	27.5	(24.0-31.1)	11.9	(9.1-15.0)	6.4	(3.7-10.1)
	65-74	579	34.0	(30.1-38.0)	15.2	(12.2-18.6)	6.0	(3.9-8.7)	3.9	(2.0-6.6)
	75+	419	16.7	(13.2-20.6)	7.2	(4.8-10.3)	0.5	(0.1-2.5)	–	–
Glioblastoma	0-19	433	57.1	(52.1-61.7)	32.9	(28.2-37.6)	17.7	(13.8-22.0)	12.9	(9.1-17.3)
	20-44	3,166	67.6	(66.0-69.3)	37.6	(35.8-39.4)	17.9	(16.4-19.5)	10.4	(9.0-11.9)
	45-54	5,851	54.7	(53.4-56.0)	22.7	(21.5-23.8)	6.5	(5.8-7.3)	3.3	(2.6-4.1)
	55-64	8,780	43.2	(42.2-44.3)	15.7	(14.9-16.6)	4.1	(3.6-4.7)	1.5	(1.1-2.1)
	65-74	8,143	26.2	(25.2-27.1)	8.9	(8.2-9.6)	2.1	(1.7-2.6)	0.8	(0.5-1.4)
	75+	6,831	11.0	(10.3-11.8)	3.3	(2.8-3.8)	0.9	(0.6-1.3)	–	–
Oligodendroglioma	0-19	273	96.7	(93.6-98.3)	94.7	(91.2-96.9)	91.9	(87.7-94.7)	89.3	(84.3-92.8)
	20-44	1,832	98.0	(97.2-98.6)	95.4	(94.3-96.3)	86.0	(84.1-87.7)	68.6	(65.7-71.3)
	45-54	792	94.2	(92.2-95.6)	89.1	(86.6-91.2)	79.1	(75.7-82.2)	61.8	(56.7-66.4)
	55-64	431	87.8	(84.1-90.7)	78.2	(73.6-82.1)	65.4	(59.7-70.4)	48.3	(41.1-55.2)
	65-74	176	77.3	(69.9-83.1)	68.4	(60.1-75.2)	50.6	(41.3-59.1)	34.4	(23.3-45.8)
	75+	98	61.0	(49.5-70.6)	50.6	(38.7-61.4)	38.4	(24.8-51.8)	18.4	(7.3-33.4)
Anaplastic oligodendroglioma	0-19	–	–	–	–	–	–	–	–	–
	20-44	579	93.9	(91.5-95.6)	84.2	(80.8-87.1)	68.6	(64.2-72.6)	51.4	(45.9-56.6)
	45-54	338	85.9	(81.5-89.3)	73.6	(68.2-78.2)	57.4	(51.3-63.1)	42.3	(35.4-49.2)
	55-64	290	75.6	(70.0-80.3)	59.9	(53.6-65.6)	41.2	(34.5-47.7)	28.8	(21.2-36.7)
	65-74	141	50.9	(42.1-59.0)	33.9	(25.7-42.2)	15.7	(9.4-23.4)	7.7	(2.6-16.5)
	75+	57	32.3	(20.1-45.1)	–	–	–	–	–	–
Ependymal tumors	0-19	832	94.0	(92.2-95.5)	87.5	(85.0-89.7)	75.2	(71.7-78.3)	66.6	(62.4-70.4)
	20-44	934	96.9	(95.5-97.9)	94.7	(92.9-96.0)	91.0	(88.6-92.9)	89.2	(86.3-91.5)
	45-54	524	94.3	(91.7-96.0)	91.6	(88.6-93.9)	87.0	(83.1-90.1)	85.5	(82.2-88.8)
	55-64	364	92.3	(88.8-94.8)	88.8	(84.6-91.9)	85.9	(80.6-89.8)	85.5	(77.7-90.8)
	65-74	179	88.9	(82.5-93.1)	80.1	(72.3-86.0)	77.5	(69.0-84.0)	72.6	(59.4-82.1)
	75+	96	74.2	(62.7-82.6)	69.6	(56.7-79.4)	57.8	(41.2-71.2)	25.7	(9.3-46.0)
Oligoastrocytic tumors	0-19	137	93.3	(87.5-96.5)	87.0	(79.8-91.7)	82.3	(74.1-88.1)	75.4	(65.2-83.0)
	20-44	1,136	96.3	(94.9-97.3)	90.0	(87.9-91.7)	72.0	(68.8-74.9)	55.6	(51.4-59.5)
	45-54	422	87.4	(83.7-90.3)	76.3	(71.6-80.3)	61.6	(56.0-66.7)	43.2	(35.7-50.5)
	55-64	245	73.1	(66.9-78.4)	52.0	(45.0-58.5)	32.7	(25.6-40.1)	25.2	(17.3-33.8)
	65-74	130	62.4	(53.0-70.4)	43.9	(34.5-52.8)	28.9	(19.8-38.6)	14.4	(6.1-26.3)
	75+	–	–	–	–	–	–	–	–	–

Continued

Table 24. *Continued*

Histology	Age Group (years)	N[d]	1-Year		2-Year		5-Year		10-Year	
			%	95% CI	%	95% CI	%	95% CI	%	95% CI
Glioma malignant, NOS	0-19	1,739	76.9	(74.8-78.9)	65.1	(62.7-67.3)	61.2	(58.7-63.5)	59.6	(57.0-62.1)
	20-44	933	87.5	(85.1-89.5)	78.0	(75.0-80.6)	65.8	(62.3-69.1)	51.7	(47.2-56.0)
	45-54	472	72.0	(67.6-76.0)	57.7	(52.8-62.2)	48.1	(43.0-53.0)	39.3	(33.6-45.0)
	55-64	402	50.9	(45.8-55.8)	38.5	(33.5-43.5)	29.7	(24.6-34.9)	26.1	(20.4-32.2)
	65-74	411	35.4	(30.6-40.2)	22.8	(18.5-27.3)	16.4	(12.4-20.9)	13.7	(9.7-18.4)
	75+	760	16.0	(13.3-18.8)	11.5	(9.1-14.2)	8.1	(5.7-11.1)	7.4	(4.1-12.0)
Neuronal and mixed neuronal-glial tumors	0-19	67	95.4	(86.3-98.5)	87.3	(76.1-93.5)	83.6	(71.3-90.9)	78.7	(61.8-88.8)
	20-44	147	95.2	(90.0-97.7)	92.3	(86.3-95.8)	78.4	(69.6-84.9)	61.4	(49.0-71.7)
	45-54	135	92.7	(86.4-96.1)	89.8	(82.7-94.1)	80.3	(71.0-86.9)	74.9	(62.4-83.8)
	55-64	101	89.2	(80.6-94.2)	72.5	(61.5-80.8)	63.0	(51.0-72.8)	47.4	(32.0-61.4)
	65-74	57	80.3	(65.7-89.2)	77.3	(61.3-87.3)	73.7	(56.3-85.0)	39.9	(13.9-65.2)
	75+	–	–	–	–	–	–	–	–	–
Embryonal tumors	0-19	2,226	80.9	(79.2-82.5)	70.7	(68.7-72.6)	61.7	(59.5-63.9)	55.9	(53.5-58.3)
	20-44	633	87.0	(84.1-89.5)	79.1	(75.6-82.3)	65.5	(61.2-69.4)	55.7	(50.8-60.3)
	45-54	91	79.3	(68.9-86.5)	66.2	(54.6-75.5)	53.7	(41.0-64.8)	37.0	(22.6-51.5)
	55-64	51	70.0	(54.8-80.9)	48.2	(33.1-61.7)	32.9	(18.8-47.7)	–	–
	65-74	–	–	–	–	–	–	–	–	–
	75+	–	–	–	–	–	–	–	–	–
Meningioma	0-19	–	–	–	–	–	–	–	–	–
	20-44	165	95.8	(91.2-98.0)	95.4	(90.5-97.8)	87.9	(81.1-92.4)	82.2	(74.1-88.0)
	45-54	200	92.7	(87.9-95.7)	87.0	(81.1-91.2)	76.6	(69.1-82.4)	70.1	(61.4-77.2)
	55-64	286	87.9	(83.3-91.3)	79.6	(74.0-84.1)	68.7	(62.0-74.5)	54.5	(46.0-62.2)
	65-74	264	83.2	(77.6-87.5)	72.9	(66.4-78.4)	55.5	(47.7-62.6)	51.7	(43.3-59.5)
	75+	309	63.6	(57.3-69.3)	55.3	(48.4-61.6)	48.2	(39.5-56.4)	36.3	(24.4-48.1)
Lymphoma	0-19	73	84.6	(74.0-91.2)	78.8	(67.2-86.7)	74.0	(61.8-82.8)	68.2	(53.8-79.0)
	20-44	1,150	42.2	(39.3-45.1)	36.0	(33.2-38.9)	30.4	(27.6-33.3)	24.7	(21.7-27.7)
	45-54	814	56.4	(52.9-59.8)	48.2	(44.6-51.7)	37.9	(34.3-41.5)	28.1	(24.1-32.1)
	55-64	1,033	59.5	(56.4-62.5)	50.1	(46.8-53.3)	37.4	(34.0-40.8)	27.6	(23.8-31.5)
	65-74	1,127	49.2	(46.1-52.1)	39.7	(36.7-42.8)	25.1	(22.1-28.3)	14.7	(11.4-18.4)
	75+	975	33.5	(30.4-36.7)	23.1	(20.2-26.2)	14.2	(11.4-17.4)	10.8	(7.0-15.4)
TOTAL: All Brain and Other Nervous System[e]	0-19	11,200	86.8	(86.2-87.4)	79.6	(78.8-80.4)	73.6	(72.7-74.4)	69.8	(68.8-70.8)
	20-44	16,101	84.1	(83.5-84.6)	73.0	(72.3-73.7)	59.0	(58.2-59.9)	47.3	(46.3-48.3)
	45-54	11,996	66.9	(66.0-67.7)	45.9	(45.0-46.9)	32.1	(31.2-33.0)	25.2	(24.2-26.2)
	55-64	14,145	51.6	(50.8-52.5)	29.5	(28.7-30.3)	17.9	(17.1-18.6)	13.2	(12.5-14.0)
	65-74	12,504	34.0	(33.2-34.9)	18.9	(18.2-19.6)	10.8	(10.1-11.4)	7.6	(6.9-8.4)
	75+	11,706	17.1	(16.4-17.9)	9.8	(9.2-10.4)	6.1	(5.5-6.7)	4.1	(3.4-4.9)

[a]The cohort analysis of survival rates was utilized for calculating the survival estimates presented in this table. Long-term cohort-based survival estimates reflect the survival experience of individuals diagnosed over the time period, and they may not necessarily reflect the long-term survival outlook of newly diagnosed cases.
[b]Rates are an estimate of the percentage of patients alive at one, two, five, and ten year, respectively. Rates were not presented for categories with 50 or less cases and were suppressed for rates where less than 16 cases were surviving within a category.
[c]Estimated by CBTRUS using Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Registries Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2013 Sub (1973-2012 varying) - Linked To County Attributes - Total U.S., 1969-2013 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2015, based on the November 2014 submission.
[d]Total number of case that occurred within the SEER registries between 1995 and 2012.
[e]Includes histologies not listed in this table.

Table 25. Average Annual Age-Adjusted Incidence Rates[a,b] of Brain and Central Nervous System Tumors by Major Histology Groupings, Histology and NCI Age Groups, CBTRUS Statistical Report: NPCR and SEER, 2008-2012

Histology	Age at Diagnosis (years)					
	Children[c] (0-14)		AYA[d] (15-39)		Adults (40+)	
	Rate	(95% CI)	Rate	(95% CI)	Rate	(95% CI)
Tumors of Neuroepithelial Tissue	**4.00**	**(3.93-4.07)**	**3.45**	**(3.40-3.50)**	**10.54**	**(10.46-10.62)**
Pilocytic astrocytoma	0.97	(0.93-1.00)	0.28	(0.27-0.30)	0.08	(0.08-0.09)
Diffuse astrocytoma	0.27	(0.25-0.28)	0.47	(0.45-0.49)	0.72	(0.70-0.74)
Anaplastic astrocytoma	0.08	(0.07-0.09)	0.27	(0.26-0.29)	0.61	(0.59-0.62)
Unique astrocytoma variants	0.10	(0.09-0.11)	0.07	(0.06-0.08)	0.05	(0.04-0.05)
Glioblastoma	0.15	(0.13-0.16)	0.48	(0.46-0.5)	6.96	(6.90-7.02)
Oligodendroglioma	0.04	(0.03-0.05)	0.29	(0.28-0.31)	0.33	(0.31-0.34)
Anaplastic oligodendroglioma	–	–	0.08	(0.08-0.09)	0.17	(0.16-0.18)
Oligoastrocytic tumors	0.02	(0.02-0.03)	0.26	(0.25-0.28)	0.25	(0.24-0.26)
Ependymal tumors	0.30	(0.28-0.32)	0.37	(0.35-0.38)	0.54	(0.53-0.56)
Glioma malignant, NOS	0.77	(0.74-0.80)	0.27	(0.25-0.28)	0.48	(0.47-0.50)
Choroid plexus tumors	0.12	(0.10-0.13)	0.04	(0.03-0.04)	0.04	(0.03-0.04)
Other neuroepithelial tumors	0.01	(0.01-0.01)	0.01	(0.00-0.01)	0.01	(0.00-0.01)
Neuronal and mixed neuronal-glial tumors	0.35	(0.33-0.37)	0.34	(0.32-0.35)	0.21	(0.20-0.22)
Tumors of the pineal region	0.05	(0.04-0.05)	0.05	(0.04-0.06)	0.04	(0.03-0.04)
Embryonal tumors	0.78	(0.75-0.81)	0.17	(0.16-0.18)	0.07	(0.06-0.07)
Tumors of Cranial and Spinal Nerves	**0.26**	**(0.24-0.28)**	**0.91**	**(0.88-0.94)**	**3.22**	**(3.18-3.26)**
Nerve sheath tumors	0.26	(0.24-0.28)	0.91	(0.88-0.94)	3.21	(3.17-3.26)
Other tumors of cranial and spinal nerves	–	–	–	–	0.00	(0.00-0.00)
Tumors of Meninges	**0.16**	**(0.15-0.17)**	**1.99**	**(1.95-2.03)**	**17.18**	**(17.08-17.27)**
Meningioma	0.09	(0.08-0.10)	1.74	(1.71-1.78)	16.77	(16.68-16.87)
Mesenchymal tumors	0.05	(0.04-0.06)	0.07	(0.06-0.07)	0.11	(0.11-0.12)
Primary melanocytic lesions	–	–	0.00	(0.00-0.01)	0.02	(0.01-0.02)
Other neoplasms related to the meninges	0.02	(0.01-0.02)	0.18	(0.17-0.19)	0.27	(0.26-0.29)
Lymphomas and Hematopoietic Neoplasms	**0.03**	**(0.02-0.03)**	**0.12**	**(0.12-0.14)**	**0.94**	**(0.92-0.97)**
Lymphoma	0.01	(0.01-0.01)	0.12	(0.11-0.13)	0.93	(0.90-0.95)
Other hematopoietic neoplasms	0.02	(0.01-0.02)	0.01	(0.01-0.01)	0.02	(0.02-0.02)
Germ Cell Tumors and Cysts	**0.20**	**(0.18-0.21)**	**0.12**	**(0.11-0.13)**	**0.03**	**(0.03-0.04)**
Germ cell tumors, cysts and heterotopias	0.20	(0.18-0.21)	0.12	(0.11-0.13)	0.03	(0.03-0.04)
Tumors of Sellar Region	**0.44**	**(0.42-0.46)**	**3.24**	**(3.19-3.29)**	**5.65**	**(5.60-5.71)**
Tumors of the pituitary	0.22	(0.21-0.24)	3.11	(3.06-3.16)	5.44	(5.38-5.49)
Craniopharyngioma	0.22	(0.20-0.23)	0.13	(0.12-0.14)	0.21	(0.20-0.22)
Unclassified Tumors	**0.28**	**(0.26-0.30)**	**0.63**	**(0.61-0.65)**	**2.19**	**(2.16-2.23)**
Hemangioma	0.09	(0.08-0.10)	0.30	(0.29-0.32)	0.50	(0.48-0.52)
Neoplasm, unspecified	0.18	(0.17-0.20)	0.32	(0.31-0.34)	1.69	(1.66-1.72)
All other	0.01	(0.00-0.01)	–	–	0.01	(0.01-0.01)
TOTAL[e]	**5.37**	**(5.28-5.45)**	**10.47**	**(10.38-10.56)**	**39.75**	**(39.61-39.9)**

[a]Rates are per 100,000 and age-adjusted to the 2000 US. standard population.
[b]Children as defined by the National Cancer Institute, see: http://www.cancer.gov/researchandfunding/snapshots/pediatric.
[c]Adolescents and Young Adults (AYA), as defined by the National Cancer Institute, see: http://www.cancer.gov/researchandfunding/snapshots/adolescent-young-adult.
[d]Refers to all brain tumors including histologies not presented in this table.
[e]Source: Estimation based on CBTRUS NPCR and SEER 2006-2012 data.
- Counts and rates are not presented when fewer than 16 cases were reported for the specific histology category. The suppressed cases are included in the counts and rates for totals.
*Estimated number is less than 50 and may affect totals.
Abbreviations: AYA, Adolescents and Young Adults, CBTRUS, Central Brain Tumor Registry of the United States; NPCR, National Program of Cancer Registries; SEER, Surveillance, Epidemiology and End Results program; CI, confidence interval; NOS, not otherwise specified.

Table 26. One-, Two-, Five- and Ten-Year Relative Survival Rates[a,b] for Selected Malignant Brain and Central Nervous System Tumors by NCI Age Groups, SEER 18 Registries, 1995-2012[c]

Histology	Age Group (years)	N[d]	1-Year		2-Year		5-Year		10-Year	
			%	95% CI	%	95% CI	%	95% CI	%	95% CI
Pilocytic astrocytoma	Children[e] (0-14)	2,315	98.8	(98.3-99.2)	98.5	(97.9-99.0)	97.2	(96.3-97.9)	96.0	(94.8-96.9)
	AYA[f] (15-39)	1,148	97.2	(96.0-98.0)	95.8	(94.3-96.8)	93.1	(91.3-94.6)	90.4	(87.9-92.4)
	Adults (40+)	386	94.9	(91.9-96.9)	87.5	(83.2-90.7)	79.4	(73.9-83.9)	73.3	(66.2-79.2)
Diffuse astrocytoma	Children[d] (0-14)	770	91.5	(89.2-93.3)	86.5	(83.8-88.8)	82.3	(79.2-84.9)	80.3	(77.0-83.2)
	AYA[e] (15-39)	2,050	93.5	(92.3-94.5)	86.7	(85.0-88.1)	69.5	(67.2-71.7)	51.7	(48.8-54.5)
	Adults (40+)	3,815	56.8	(55.2-58.4)	42.7	(41.1-44.4)	28.9	(27.3-30.6)	20.3	(18.5-22.0)
Anaplastic astrocytoma	Children[d] (0-14)	229	60.3	(53.6-66.4)	39.3	(32.8-45.8)	28.5	(22.4-34.9)	23.5	(17.6-29.9)
	AYA[e] (15-39)	1,107	88.5	(86.4-90.3)	74.4	(71.5-77.0)	51.3	(47.8-54.7)	37.6	(33.7-41.5)
	Adults (40+)	2,765	51.7	(49.7-53.6)	32.2	(30.4-34.1)	18.5	(16.8-20.2)	12.1	(10.5-13.9)
Glioblastoma	Children[d] (0-14)	297	50.5	(44.5-56.1)	28.9	(23.5-34.4)	20.0	(15.2-25.3)	14.8	(10.2-20.3)
	AYA[e] (15-39)	1,901	71.8	(69.6-73.8)	44.8	(42.4-47.1)	22.5	(20.4-24.7)	13.7	(11.7-15.9)
	Adults (40+)	31,006	34.9	(34.4-35.5)	13.3	(12.8-13.7)	3.7	(3.5-4.0)	1.7	(1.4-1.9)
Oligodendroglioma	Children[d] (0-14)	157	95.5	(90.7-97.8)	94.8	(89.8-97.4)	92.0	(86.2-95.4)	90.2	(83.7-94.2)
	AYA[e] (15-39)	1,476	98.4	(97.6-99.0)	96.1	(94.9-97.0)	87.6	(85.5-89.3)	71.0	(67.8-73.9)
	Adults (40+)	1,969	90.3	(88.8-91.6)	84.1	(82.2-85.7)	72.7	(70.3-74.9)	56.0	(52.8-59.0)
Anaplastic oligodendroglioma	Children[d] (0-14)	–	–	–	–	–	–	–	–	–
	AYA[e] (15-39)	403	93.4	(90.4-95.5)	83.6	(79.3-87.0)	67.2	(61.8-72.1)	50.0	(43.5-56.2)
	Adults (40+)	1,023	76.7	(73.9-79.3)	63.1	(59.9-66.2)	46.9	(43.4-50.3)	34.4	(30.5-38.3)
Ependymal tumors	Children[d] (0-14)	695	93.6	(91.5-95.2)	86.5	(83.6-88.9)	72.9	(69.1-76.4)	64.4	(59.8-68.6)
	AYA[e] (15-39)	842	96.6	(95.1-97.7)	94.0	(92.0-95.5)	89.8	(87.2-91.9)	86.2	(82.8-88.9)
	Adults (40+)	1,392	92.3	(90.6-93.7)	88.8	(86.7-90.5)	84.9	(82.4-87.2)	82.6	(79.3-85.5)
Oligoastrocytic tumors	Children[d] (0-14)	83	95.1	(87.3-98.2)	87.2	(77.3-92.9)	80.7	(69.3-88.2)	75.6	(62.0-84.9)
	AYA[e] (15-39)	928	96.8	(95.4-97.8)	90.9	(88.7-92.7)	74.4	(71.0-77.5)	57.1	(52.5-61.5)
	Adults (40+)	1,119	79.5	(76.9-81.8)	66.5	(63.4-69.4)	50.2	(46.8-53.6)	37.6	(33.4-41.7)
Glioma malignant, NOS	Children[d] (0-14)	1,567	75.5	(73.2-77.6)	63.0	(60.5-65.5)	59.7	(57.0-62.2)	58.1	(55.3-60.7)
	AYA[e] (15-39)	872	89.2	(86.9-91.1)	81.8	(78.9-84.3)	69.4	(65.7-72.7)	56.8	(52.2-61.1)
	Adults (40+)	2,278	44.6	(42.4-46.7)	34.1	(32.0-36.2)	27.5	(25.4-29.6)	23.2	(21.0-25.6)
Neuronal and mixed neuronal-glial tumors	Children[d] (0-14)	–	–	–	–	–	–	–	–	–
	AYA[e] (15-39)	132	96.2	(91.0-98.5)	91.4	(84.8-95.2)	78.9	(69.8-85.5)	66.6	(53.2-77.0)
	Adults (40+)	370	87.7	(83.6-90.9)	79.7	(74.7-83.9)	72.4	(66.3-77.5)	56.3	(47.8-64.0)
Embryonal tumors	Children[d] (0-14)	2,021	79.9	(78.1-81.6)	70.0	(67.8-72.0)	61.6	(59.3-63.9)	55.8	(53.3-58.3)
	AYA[e] (15-39)	773	88.6	(86.1-90.7)	79.7	(76.6-82.5)	64.9	(61.0-68.5)	55.7	(51.3-59.9)
	Adults (40+)	246	72.9	(66.6-78.2)	58.0	(51.1-64.3)	45.4	(38.1-52.4)	33.5	(25.9-41.4)
Meningioma	Children[d] (0-14)	–	–	–	–	–	–	–	–	–
	AYA[e] (15-39)	103	98.1	(92.1-99.6)	98.1	(92.1-99.6)	89.4	(80.4-94.4)	85.6	(75.4-91.8)
	Adults (40+)	1,126	81.6	(78.9-83.9)	73.8	(70.7-76.5)	62.8	(59.2-66.3)	54.7	(50.1-59.0)
Lymphoma	Children[d] (0-14)	–	–	–	–	–	–	–	–	–
	AYA[e] (15-39)	824	42.5	(39.0-45.9)	36.5	(33.2-39.9)	31.5	(28.2-34.8)	26.0	(22.6-29.6)
	Adults (40+)	4,306	49.3	(47.7-50.8)	40.2	(38.6-41.7)	28.9	(27.4-30.5)	20.7	(18.9-22.5)
TOTAL: All Brain and Other Nervous System[g]	Children[d] (0-14)	9,134	85.6	(84.8-86.3)	78.4	(77.5-79.2)	72.7	(71.7-73.6)	69.0	(67.9-70.1)
	AYA[e] (15-39)	13,701	87.3	(86.7-87.8)	78.5	(77.7-79.2)	65.4	(64.5-66.3)	54.2	(53.1-55.2)
	Adults (40+)	54,817	46.0	(45.6-46.5)	29.5	(29.0-29.9)	19.7	(19.3-20.1)	15.0	(14.6-15.5)

[a]The cohort analysis of survival rates was utilized for calculating the survival estimates presented in this table. Long-term cohort-based survival estimates reflect the survival experience of individuals diagnosed over the time period, and they may not necessarily reflect the long-term survival outlook of newly diagnosed cases.

[b]Rates are an estimate of the percentage of patients alive at one, two, five, and ten year, respectively. Rates were not presented for categories with 50 or less cases and were suppressed for rates where less than 16 cases were surviving within a category.

[c]Estimated by CBTRUS using Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Registries Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2014 Sub (1973-2012 varying) - Linked To County Attributes - Total U.S., 1969-2013 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2015, based on the November 2014 submission.

[d]Total number of case that occurred within the SEER registries between 1995 and 2012

[e]Children as defined by the National Cancer Institute, see: http://www.cancer.gov/researchandfunding/snapshots/pediatric.

[f]Adolescents and Young Adults (AYA), as defined by the National Cancer Institute, see: http://www.cancer.gov/researchandfunding/snapshots/adolescent-young-adult.

[g]Includes histologies not listed in this table.

Abbreviation: SEER, Survival, Epidemiology and End Results; CI, confidence interval; NOS, not otherwise specified.

Appendix A. 2000 US Standard Population

Age Group	2000 U.S.	Age Group	2000 U.S.	Age Group	2000 U.S.
0-4	18,986,520	45-49	19,805,793	**Total**	**274,633,642**
5-9	19,919,840	50-54	17,224,359		
10-14	20,056,779	55-59	13,307,234		
15-19	19,819,518	60-64	10,654,272		
20-24	18,257,225	65-69	9,409,940		
25-29	17,722,067	70-74	8,725,574		
30-34	19,511,370	75-79	7,414,559		
35-39	22,179,956	80-84	4,900,234		
40-44	22,479,229	85+	4,259,173		

Appendix B. Average Annual Populations[a] for 2008-2012[b] by Age, Gender and Race

Age Group	White	Black	AIAN	API	Total
Male					
0-4	7,753,267	1,718,911	193,170	598,134	10,263,482
5-9	7,871,304	1,665,900	186,427	581,098	10,304,729
10-14	8,066,986	1,733,116	185,618	557,727	10,543,446
15-19	8,515,937	1,888,284	197,230	591,389	11,192,840
20-24	8,525,811	1,713,867	190,386	670,783	11,100,847
25-29	8,296,572	1,465,887	173,417	700,196	10,636,071
30-34	7,846,363	1,345,942	157,470	679,973	10,029,748
35-39	7,842,959	1,300,866	145,846	685,568	9,975,239
40-44	8,338,467	1,334,859	140,406	619,875	10,433,606
45-49	8,959,082	1,377,781	137,480	566,913	11,041,257
50-54	8,931,580	1,300,690	122,404	505,797	10,860,471
55-59	7,970,699	1,056,836	95,877	427,491	9,550,903
60-64	6,840,681	786,640	71,666	339,163	8,038,149
65-69	5,104,103	527,348	46,980	239,834	5,918,265
70-74	3,708,355	368,898	30,513	175,356	4,283,122
75-79	2,811,598	248,426	18,721	116,953	3,195,699
80-84	2,062,130	151,651	10,870	72,917	2,297,567
85+	1,631,076	111,957	7,439	56,648	1,807,120
TOTAL	**121,076,970**	**20,097,859**	**2,111,919**	**8,185,814**	**151,472,562**
Female					
0-4	7,401,398	1,662,226	187,755	575,649	9,827,028
5-9	7,502,154	1,611,534	181,500	576,182	9,871,370
10-14	7,668,033	1,673,391	180,945	546,661	10,069,030
15-19	8,036,429	1,824,444	187,411	564,881	10,613,165
20-24	8,063,674	1,733,094	173,432	654,697	10,624,898
25-29	7,954,215	1,576,831	160,632	753,699	10,445,377
30-34	7,575,765	1,494,150	149,669	760,239	9,979,823
35-39	7,680,538	1,465,788	141,416	761,376	10,049,117
40-44	8,225,911	1,496,001	138,139	693,378	10,553,428
45-49	8,991,324	1,549,515	139,811	635,582	11,316,232
50-54	9,104,288	1,478,767	128,842	581,908	11,293,806
55-59	8,304,434	1,247,018	102,793	511,944	10,166,189
60-64	7,262,060	965,588	76,930	412,148	8,716,726
65-69	5,620,898	687,120	52,166	286,727	6,646,912
70-74	4,315,515	517,679	36,210	212,708	5,082,113
75-79	3,568,820	394,439	24,920	158,542	4,146,721
80-84	3,027,364	285,762	16,301	111,810	3,441,238
85+	3,323,205	285,114	14,345	96,747	3,719,412
TOTAL	**123,626,026**	**21,948,462**	**2,093,217**	**8,894,879**	**156,562,584**

[a]Population data source for 51 population-based geographic regions: Estimates from the United States. Bureau of the Census <http://seer.cancer.gov/popdata/index.html>.
Abbreviations: AIAN, American Indian Alaskan Native; API, Asian Pacific Islander.
[b]Estimated population for Nevada is for 2008-2010 only.

Appendix C. Average Annual Populations[a] for 2008-2012[b] by Age, Gender and Hispanic Ethnicity

Age Group	Hispanic	Non-Hispanic	Total
Male			
0-4	2,590,497	7,672,985	10,263,482
5-9	2,414,371	7,890,357	10,304,729
10-14	2,292,576	8,250,870	10,543,446
15-19	2,307,027	8,885,813	11,192,840
20-24	2,295,374	8,805,474	11,100,847
25-29	2,270,630	8,365,441	10,636,071
30-34	2,143,149	7,886,599	10,029,748
35-39	1,964,206	8,011,034	9,975,239
40-44	1,762,141	8,671,465	10,433,606
45-49	1,520,710	9,520,547	11,041,257
50-54	1,212,451	9,648,020	10,860,471
55-59	900,456	8,650,447	9,550,903
60-64	648,660	7,389,489	8,038,149
65-69	437,420	5,480,845	5,918,265
70-74	307,593	3,975,529	4,283,122
75-79	214,857	2,980,842	3,195,699
80-84	140,231	2,157,336	2,297,567
85+	97,974	1,709,146	1,807,120
TOTAL	**25,520,324**	**125,952,239**	**151,472,562**
Female			
0-4	2,488,235	7,338,793	9,827,028
5-9	2,318,119	7,553,251	9,871,370
10-14	2,196,562	7,872,467	10,069,030
15-19	2,149,441	8,463,724	10,613,165
20-24	2,017,353	8,607,545	10,624,898
25-29	2,009,218	8,436,159	10,445,377
30-34	1,966,944	8,012,879	9,979,823
35-39	1,867,593	8,181,524	10,049,117
40-44	1,681,833	8,871,595	10,553,428
45-49	1,486,209	9,830,022	11,316,232
50-54	1,229,436	10,064,369	11,293,806
55-59	961,709	9,204,480	10,166,189
60-64	728,702	7,988,024	8,716,726
65-69	527,013	6,119,898	6,646,912
70-74	396,517	4,685,596	5,082,113
75-79	299,424	3,847,298	4,146,721
80-84	213,743	3,227,496	3,441,238
85+	181,723	3,537,689	3,719,412
TOTAL	**24,719,774**	**131,842,811**	**156,562,584**

[a]Population data source for 51 population-based geographic regions: Estimates from the U.S. Census Bureau http://seer.cancer.gov/popdata/index.html.
[b]Estimated population for Nevada is for 2008-2010 only.