

CBTRUS

CENTRAL BRAIN TUMOR REGISTRY OF THE UNITED STATES



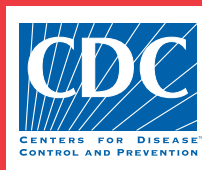
2005-2006

PRIMARY BRAIN TUMORS IN THE UNITED STATES

STATISTICAL REPORT

1998-2002

Years Data Collected



CBTRUS MISSION



The Central Brain Tumor Registry of the United States (CBTRUS) is a not-for-profit corporation committed to providing a resource for gathering and disseminating current epidemiologic data on all primary brain tumors, malignant and non-malignant, for the purposes of accurately describing their incidence and survival patterns, evaluating diagnosis and treatment, facilitating etiologic studies, establishing awareness of the disease, and ultimately, for the prevention of all brain tumors.

This report was prepared by the CBTRUS executive team and the research staff at the University of Illinois at Chicago School of Public Health. Publishing assistance was provided by the Stromberg Allen Company.

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CBTRUS has used published information from the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute, the American Cancer Society (ACS), the North American Association of Central Cancer Registries (NAACCR), the International Agency for Research on Cancer (IARC), and the World Health Organization (WHO) in the preparation of this report. CBTRUS acknowledges and appreciates the contributions of these materials to this report and to cancer surveillance in general.

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CBTRUS would appreciate your help in order to support its database. Contributions are tax deductible and can be mailed to:

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MESSAGE FROM THE PRESIDENT

This is the last report in which data have come voluntarily from central state cancer registries who have been our collaborators over the last years. On June 7, 2005 we held our last Collaborators Working Luncheon during the North American Association of Central Cancer Registries Annual Meeting where I had the opportunity to thank the individuals who have steadfastly supported us in word and in deed. Fortunately, we will continue to work with them, and we will continue to use their data, although collection will be different. Progress has been made!



Starting in 2007, we hope to be reporting primary brain tumor data through the National Program of Cancer Registries (NPCR). We are excited to know that data collected in 2004, the year Public Law 107-260 mandated NPCR to collect data on non-malignant (benign) brain tumors, will provide us with the opportunity to analyze data on all primary brain tumors from most of the United States. We have worked with NPCR in the preparation of this 2005-2006 report. Our commitment to provide high quality incidence data on all primary brain tumors in the United States will only be enhanced by this future relationship. During this interim period the CBTRUS will continue to work to improve the data collection practices for primary brain tumors, to foster the epidemiology of brain tumors through the Brain Tumor Epidemiology Consortium, and to contribute to the literature on the descriptive epidemiology of brain tumors.

On behalf of the Board of Directors and Advisors, I would like to thank our collaborating registries for providing data for this statistical report, our sponsors for providing financial support, and to all those who support our mission.

Sincerely,

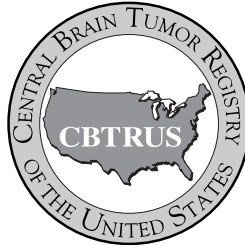
Carol Kruchko

Carol Kruchko

President & Administrator, CBTRUS

CBTRUS

CENTRAL BRAIN TUMOR REGISTRY OF THE UNITED STATES



2005-2006

PRIMARY BRAIN TUMORS IN THE UNITED STATES

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FACT SHEET

- *Incidence rates are age-adjusted using the 2000 United States standard population unless otherwise noted.*
- *CBTRUS (Central Brain Tumor Registry of the United States) incidence rates and estimated new cases include all primary malignant and non-malignant tumors of the brain, central nervous system, pituitary and pineal glands, and olfactory tumors of the nasal cavity.*
- *SEER (Surveillance, Epidemiology, and End Results Program) incidence and survival rates extracted from the SEER Cancer Statistics Review, 1975-2002 include primary malignant tumors of the brain and central nervous system, excluding lymphomas, leukemias, tumors of the pituitary and pineal gland, and olfactory tumors of the nasal cavity.*
- *SEER (Surveillance, Epidemiology, and End Results Program) incidence and survival rates estimated using the SEER Cancer Incidence Public-Use Database, 1973-2002 include all primary malignant tumors of the brain, central nervous system, pituitary and pineal glands, and olfactory tumors of the nasal cavity, including lymphomas and leukemias.*
- *ACS (American Cancer Society) estimated new cases and deaths include primary malignant tumors of the brain and central nervous system, excluding lymphoma, leukemias, tumors of the pituitary and pineal glands, and olfactory tumors of the nasal cavity.*
- *IARC (International Agency for Research on Cancer) worldwide incidence rates include primary malignant tumors of the brain and central nervous system, excluding lymphoma, leukemias, tumors of the pituitary and pineal glands, and olfactory tumors of the nasal cavity. Global rates are age-adjusted using the world standard population. These rates may be compared to other rates adjusted to the world standard population, but they cannot be compared to rates adjusted to other population standards, such as the 2000 United States standard population.*

Incidence

- CBTRUS: The incidence rate of all primary non-malignant and malignant brain and central nervous system tumors is 14.8 cases per 100,000 person-years (7.4 per 100,000 person-years for benign and borderline tumors and 7.4 per 100,000 person-years for malignant tumors). The rate is higher in females (15.1 per 100,000 person-years) than males (14.5 per 100,000 person-years).^{1a}
- CBTRUS: An estimated 43,800 new cases of primary non-malignant and malignant brain and central nervous system tumors are expected to be diagnosed in the United States in 2005.^{1b}
- SEER: The incidence rate of primary malignant brain and central nervous system tumors (excluding lymphomas, leukemias, tumors of pituitary and pineal glands, and olfactory tumors of the nasal cavity) is 6.4 cases per 100,000 person-years. This rate is higher in males (7.6 per 100,000 person-years) than females (5.3 per 100,000 person-years).^{2a}
- ACS: An estimated 18,500 new cases of primary malignant brain and central nervous system tumors are expected to be diagnosed in the United States in 2005 (10,620 in males and 7,880 in females). This represents 1.35% of all primary malignant cancers expected to be diagnosed in the United States in 2005.³
- IARC: The worldwide incidence rate of primary malignant brain and central nervous system tumors, age-adjusted using the world standard population, is 3.7 per 100,000 person-years in males and 2.6 per 100,000 person-years in females. The incidence rates are higher in more developed countries (males: 5.8 per 100,000 person-years; females: 4.1 per 100,000 person-years) than in less developed countries (males: 3.0 per 100,000 person-years; females: 2.1 per 100,000 person-years).⁴

Pediatric Incidence (Ages 0-19)

- CBTRUS: The incidence rate of childhood primary non-malignant and malignant brain and central nervous system tumors is 4.3 cases per 100,000 person-years. The rate is higher in males (4.5 per 100,000 person-years) than females (4.0 per 100,000 person-years).^{1a}
- CBTRUS: An estimated 3,410 new cases of childhood primary non-malignant and malignant brain and central nervous system tumors are expected to be diagnosed in the United States in 2005.^{1b} Of these 3,410 new cases, an estimated 2,590 will be in children less than 15 years of age.^{1b}

Mortality

- ACS: An estimated 12,760 deaths will be attributed to primary malignant brain and central nervous system tumors in the United States in 2005.³

Lifetime Risk

- SEER: Males have a 0.65% lifetime risk of being diagnosed with a primary malignant brain/central nervous system tumor and 0.49% chance of dying from a brain/central nervous system tumor (excluding lymphomas, leukemias, tumors of pituitary and pineal glands, and olfactory tumors of the nasal cavity).^{2b}
- SEER: Females have a 0.50% lifetime risk of being diagnosed with a primary malignant brain/central nervous system tumor and a 0.39% chance of dying from a brain/central nervous system tumor (excluding lymphomas, leukemias, tumors of pituitary and pineal glands, and olfactory tumors of the nasal cavity).^{2b}

Survival

- SEER: The five-year relative survival rate following diagnosis of a primary malignant brain and central nervous system tumor (including lymphomas and leukemias, tumors of the pituitary and pineal glands, and olfactory tumors of the nasal cavity) is 28.1% for males and 30.5% for females (1973-2002 data).⁵
- SEER: Five-year relative survival rates following diagnosis of a primary malignant brain and central nervous system tumor (including lymphomas and leukemias, tumors of the pituitary and pineal glands, and olfactory tumors of the nasal cavity) by age of diagnosis (1973-2002 data):⁵

Age 0-19 years:	64.8%	Age 55-64 years:	10.7%
Age 20-44 years:	47.9%	Age 65-74 years:	6.6%
Age 45-54 years:	23.1%	Age 75 or older:	4.8%

Prevalence

- CBTRUS: The prevalence rate for all primary brain and central nervous system tumors was estimated to be 130.8 per 100,000. It was estimated that more than 359,000 persons were living with a diagnosis of primary brain and central nervous system tumor in the United States in 2000 (malignant tumor: more than 81,000 persons; benign tumor: more than 267,000 persons; tumor of uncertain behavior: more than 10,000 persons). The prevalence rate for primary brain and central nervous system tumors by behavior was 29.5 per 100,000 (malignant), 97.5 per 100,000 (benign), and 3.8 per 100,000 (uncertain behavior).⁶
- CBTRUS: The prevalence rate for all pediatric (ages 0-19) primary brain and central nervous system tumors was estimated at 9.5 per 100,000 with more than 26,000 children estimated to be living with this diagnosis in the United States in 2000. The prevalence rate for pediatric primary malignant brain and central nervous system tumors was 7.9 per 100,000 with more than 21,000 children estimated to be living with a diagnosis of primary malignant brain/central nervous system tumor in the United States in 2000.⁶

1a. Central Brain Tumor Registry of the United States data, 1998-2002.
 1b. CBTRUS 1998-2002 data. United States population estimates by 5-year age group were obtained from United States census; estimates available at www.census.gov. Projections were from the middle series for July 1, 2005 with a total United States population of 287,716,000. (Internet release date: 01/13/2000). For further information on calculating expected numbers of tumors, please see Davis FG, McCarthy BJ, Jukich P, "The descriptive epidemiology of brain tumors" *Neuroimaging Clinics of North America*, V. 9, No. 4, November, 1999.

2. Ries LAG, Eisner MP, Kosary CL, Hankey BF, Miller BA, Clegg L, Mariotto A, Feuer EJ, Edwards BK (eds). SEER Cancer Statistics Review, 1975-2002. National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2002/, based on November 2004 SEER data submission, posted to the SEER web site 2005.

2a. Tables I(4) 1998-2002 data.
 2b. Table III(8) 2000-2002 data.

3. American Cancer Society. Cancer Facts and Figures 2005. Atlanta: American Cancer Society; 2005.

4. Ferlay J, Bray F, Pisani P and Parkin DM. GLOBOCAN 2002: Cancer Incidence, Mortality and Prevalence Worldwide, Version 2.0. IARC CancerBase No. 5. Lyon, IARC Press, 2004. Limited version available from: URL: <http://www-depdb.iarc.fr/globocan2002.htm>

5. Estimated by CBTRUS using Surveillance, Epidemiology and End Results (SEER) Program public use CD-ROM (1973-2002). National Cancer Institute, DCPC, Surveillance Program, Cancer Statistics Branch, issued April 2005, based on the November 2004 submission.

6. Davis FG, Kupelian V, Freels S, McCarthy B, Surawicz T. Prevalence estimates for primary brain tumors in the United States by behavior and major histology groups. *Neuro-Oncology*. 3(3):152-158, 2001.

BACKGROUND

The CBTRUS database contains the largest aggregation of population-based data on the incidence of all primary brain and central nervous system tumors in the United States. This database has been developed by compiling data from state cancer registries that include information on both non-malignant and malignant primary brain tumors. This current report includes data from eighteen state cancer registries.

CBTRUS was incorporated with a founding and sustaining grant from the Pediatric Brain Tumor Foundation of the United States in 1992 following a two-year study conducted by the American Brain Tumor Association to determine the feasibility of a central registry for all brain tumor cases. Until that time, standard data reporting in the United States had been limited to malignant cases only. Benign brain tumors, however, may, and often do, impose the same costs to society in terms of medical care, case fatality and lost productivity as malignant tumors. A histologically benign tumor may produce devastating effects based on its location, while a malignant tumor may not produce visible symptoms. In addition, as molecular markers have been discovered, it has become clear that certain benign brain tumors may become malignant over time. In order to present a complete picture of this disease, CBTRUS believes non-malignant (benign and borderline) brain tumor data must be collected and reported along with malignant data.

This statistical report continues the past efforts CBTRUS has made to provide accurate, population-based incidence rates for all primary brain tumors by histology, age, gender, race and Hispanic origin. As in previous CBTRUS reports, these data have been listed in histologic groupings with improved clinical relevance. They are useful for surveillance and may serve as a baseline for comparison with regional rates. They are also important for the allocation and planning of specialty health care services, for planning programs for disease prevention and control, and in the development of research proposals including those that investigate etiology.

CBTRUS welcomed passage of the Benign Brain Tumor Cancer Registries Amendment Act (Public Law 107-260) which required all cancer surveillance registries to expand their primary brain tumor data collection to include tumors of benign and uncertain behavior beginning in January 2004. CBTRUS believes that only by having complete data will the clues be found to investigate the causes of this terrible disease.

DISCLAIMER

The Central Brain Tumor Registry of the United States (CBTRUS) is a not-for-profit corporation that gathers and disseminates epidemiologic data on primary brain tumors in order to facilitate research and establish awareness of the disease. CBTRUS makes no representations or warranties, and gives no other assurances or guarantees, expressed or implied, with respect to the accuracy or completeness of the data presented. The information provided in this publication is not intended to assist in the evaluation, diagnosis or treatment of individual diseases. Persons with questions regarding individual diseases should contact their own physician to obtain medical assistance.

The objective of this report is to provide a current overview of the descriptive epidemiology of all primary brain tumors in the United States. CBTRUS compiles data from state cancer registries that include information on all primary brain and central nervous system tumors. Incidence rates of primary malignant and non-malignant brain and central nervous system tumors from 1998-2002 were calculated by gender, age, race, and Hispanic origin. Incidence and mortality rates for malignant brain and other nervous system tumors were obtained from the North American Association of Central Cancer Registries (NAACCR). Data from the Surveillance, Epidemiology and End Results (SEER) Program of the National Cancer Institute were used to estimate survival rates for primary malignant brain and central nervous system tumors. Estimated numbers of deaths for malignant brain and nervous system tumors were obtained from the American Cancer Society (ACS).

DEFINITION OF RATES

RATES measure the occurrence of disease in a population. They are calculated by counting the observed numbers of cases of an event occurring in a defined population within a specified time period and dividing by the total population at risk within the same time period. Statistical data are commonly measured over five-year periods. As an example, in this report the incidence of brain tumors in a state is calculated by adding the total number of newly diagnosed cases of brain tumors within that state for the years of interest and dividing by the state populations for the same years. Measuring data in smaller time periods, such as one-year intervals, can produce skewed statistics because small variations in the frequencies can create the appearance of dramatic shifts in rates. Rates in this report are expressed in units of PERSON-TIME with each person-year reflecting one individual over one year. For cancer, rates are usually expressed per 100,000 person-years. Other cancer surveillance and reporting agencies may express rates using synonymous terms. For example, the National Program of Cancer Registries (NPCR) of the Center for Disease Control and Prevention (CDC) expresses the rates in their statistical reports per 100,000 persons.

INCIDENCE RATES measure the occurrence of newly diagnosed cases of disease. PREVALENCE RATES measure the number of people with a disease at a particular point in time or during a particular period of time. MORTALITY RATES quantify the number of people who have died from the disease. SURVIVAL RATES (percents) are the probability of surviving for a specified time period. OBSERVED SURVIVAL RATES are computed from life-table estimates and yield the probability of surviving a specified time period (often five years) following diagnosis. RELATIVE SURVIVAL RATES are defined as the observed probability of survival adjusted for the expected survival rate of the United States population for that age, gender, and calendar year.

The rate of disease in an entire population is the CRUDE RATE. Crude rates are frequently adjusted by age. AGE-

ADJUSTING RATES to a common standard population allows for comparisons of rates across regions with different age structures. Cancer incidence rates in this report are adjusted to the YEAR 2000 U.S. STANDARD POPULATION. Rates adjusted to the Year 2000 standard *cannot* be compared to those rates found in earlier statistical reports containing rates adjusted to the 1970 standard.^{1,2,3} Differences between incidence rates adjusted to Year 2000 and Year 1970 standard populations are an artifact of the aging of the population over time and should not be interpreted as an increase in brain tumor incidence.

Rates for a subset of a population are specific rates. AGE-SPECIFIC RATES that describe the rate of disease in a defined age group are presented in this report. Specific rates by race, Hispanic origin, and gender are also reported.

The variability around the estimates of incidence rates is reflected in the STANDARD ERROR. Standard error is a measure of the potential error in the incidence rates. The standard error is one of the numbers incorporated into the formula for computing the confidence interval associated with a certain rate. A CONFIDENCE INTERVAL is the computed interval with a given probability, e.g., 95 percent, that the true value of a variable such as a mean, proportion, or rate is contained within the interval. For example, the age-adjusted primary brain tumor incidence rate is 14.8 cases per 100,000 person-years. We can be 95 percent certain that the actual incidence rate is between 14.7 and 14.9 cases per 100,000 person-years.

In order to be able to compare incidence rates among statistical reports, agencies, or registries, one must determine whether the case definition, data collection, and rate calculation are similar. How is an incidence case defined? Are all primary malignant and non-malignant tumors included in the analysis? Are only malignant tumors included in the analysis? What tumor locations (primary sites) are included in the analysis? Are lymphomas and hemopoietic neoplasms included in the rates? Are the populations comparable? Are the rates

BRAIN TUMOR STATISTICS REPORT AND FIGURES

age-adjusted? And if so, to which standard population are they age-adjusted? Differences in case definition, data collection, methodology, analysis, and rate computation may prevent the direct comparison of published rates between sources.

METHODS

Data Collection

CBTRUS obtained incidence data from eighteen collaborating state cancer registries that include cases of non-malignant (benign and uncertain) and malignant primary brain and central nervous system tumors. Data were requested from each registry on all cases newly diagnosed between 1998 and 2002 with a primary brain/central nervous system tumor at any of the following sites (International Classification of Diseases for Oncology (ICDO) codes in parentheses): 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)].⁴ Data were received without direct personal identifiers. Population data for each state were obtained from the SEER program website, which receives yearly population estimates from the U.S. Census Bureau.⁵

Sixteen states provided non-malignant and malignant incidence data for the entire five-year period (Figure 1). North Dakota and West Virginia began col-

lecting data on non-malignant tumors in 2001 and 2002, respectively.

Data were edited using a modified version of the NAACCR Call for Data 2005 metafile and EDITS⁶ software that generates warnings when illogical or impossible site, morphology, and/or behavior combinations were reported. When possible, queries were directed to the state cancer registry staff for correction or clarification.

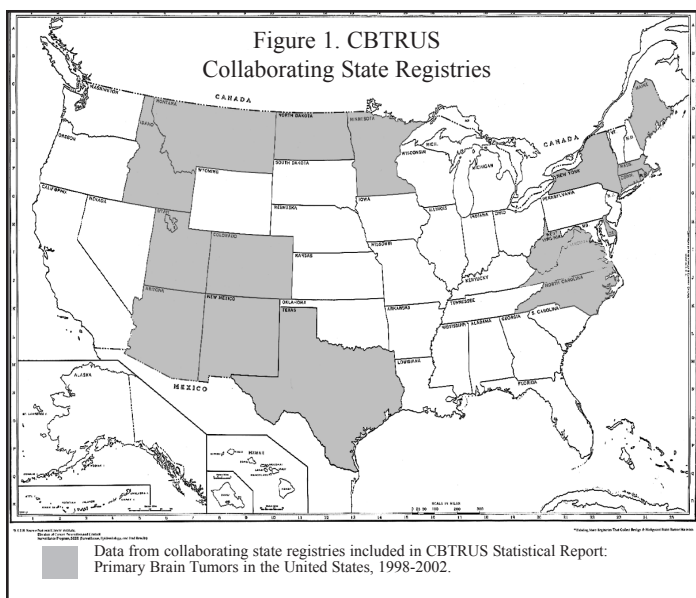
Classification by Histology

The histology groupings used in this report were developed in collaboration with the CBTRUS consulting neuropathologist, Dr. Janet Bruner, of the University of Texas M.D. Anderson Cancer Center. These groupings are broadly based on the World Health Organization (WHO) categories for brain tumors.⁷ The list of ICDO-morphology codes included in each group is presented in Table 1. The classification scheme utilizes ICDO-3 codes⁸ and may include morphology codes that were not previously reported to CBTRUS.⁹ In this report, incidence rates are provided by histology and by major histology grouping. The CBTRUS classification scheme reflects changes in the grouping and order of histology codes within the major histology categories compared to editions of the CBTRUS classification scheme prior to 2002.⁹

Definition of Tumor Locations (Sites)

Various terms are used to describe the regions of the brain and central nervous system. The sites referred to in this report are broadly based on the categories and site codes defined in the SEER Site/Histology Validation List¹⁰. The tumors included in this report include olfactory tumors of the nasal cavity in addition to brain tumors located in sites included in the standard definition from the Consensus Conference on Brain Tumor Definition for Registration⁹. According to the standard definition from the Consensus Conference⁹, reportable primary brain-related tumors (intracranial and central nervous system tumors) are all primary tumors, irrespective of histology and behavior, occurring in the following sites: meninges; brain; spinal cord, cranial nerves, other parts of the central nervous system, pituitary gland, craniopharyngeal duct, and pineal gland.

In this report, statistics by site are grouped in the following manner: The frontal lobe (ICDO site code C71.1), temporal lobe (C71.2), parietal lobe (C71.3), and occipital lobe (C71.4) are grouped together. Cerebrum (C71.0), ventricle



(C71.5), cerebellum (C71.6), and brain stem (C71.7) are each grouped independently. Overlapping lesion of the brain, as well as brain sites not otherwise specified (NOS), are defined by ICDO site codes C71.8-C71.9. The cranial nerve category (C72.2-72.5) includes the olfactory nerve, optic nerve, acoustic nerve, and other cranial nerves. The spinal cord (C72.0) and cauda equina (C72.1) are grouped together. Overlapping lesion of the brain and central nervous system, as well as nervous system sites not otherwise specified (NOS), are defined by ICDO site codes C72.8-C72.9. The meninges (C70.0-C70.9) include the cerebral meninges and spinal meninges. Pituitary tumors (C75.1-C75.2) include tumors located in the pituitary gland and craniopharyngeal duct. Pineal tumors (C75.3) include tumors located in the pineal gland. In this report, tumors located in the nasal cavity (C30.0) are olfactory tumors (defined by ICDO-3 morphology codes 9522-9523).

Estimation of Incidence and Mortality Rates

Incidence rates were generated using SAS, a computer based statistical analysis system.¹¹ Overall rates for non-malignant and malignant tumors and rates for selected histology groupings by gender, race, and age were estimated using data from the sixteen regions that provided five years of non-malignant and malignant tumor data, 1998-2002. Overall rates by Hispanic origin for non-malignant and malignant tumors and rates for selected histology groupings were estimated using data from the sixteen regions that provided complete Hispanic ethnicity data for the years 1998-2002, including the NAACCR Hispanic Identification Algorithm (NHIA) data field. Age-adjusted rates based on five-year age groupings were standardized to the Year 2000 U.S. standard population. Populations for the CBTRUS regions, 16 states combined, are shown in Tables 2 and 3, respectively. The age distribution of the 2000 U.S. standard population is shown in Table 4.

State incidence and mortality rates for malignant tumors from 1998-2002 were obtained from the most current Cancer Incidence in North America (CINA) Publication on the NAACCR website.¹² These rates were adjusted using the 2000 U.S. standard population.

Differences in Brain Tumor Definition

NAACCR, NPCR, and SEER categorize brain tumors differently than CBTRUS. The definition of brain tumors used by NAACCR, NPCR, and SEER

(in their published incidence and mortality statistics) includes tumors located in the brain, meninges, and other central nervous system tumors (C70.0-9, C71.0-9, and C72.0-9), but these are tumors of malignant behavior only (3).^{12,13} In addition, these reporting systems exclude lymphoma and leukemia morphologies (9590-9989) from all brain and central nervous system sites. However, this year for the first time, NPCR will include a new table reflecting the Consensus Conference definition for brain tumors in the publication *United States Cancer Statistics (USCS) 2002 Incidence and Mortality* (publication year 2005). The Consensus Conference defines primary brain tumors, irrespective of histology, as those occurring in the meninges, brain, spinal cord, cranial nerves, other parts of the central nervous system, pituitary gland, craniopharyngeal duct, and pineal gland (C70.0-9, C71.0-9, C72.0-9, C75.1-3). The additional table in *USCS 2002 and 2003 Incidence and Mortality* will be restricted to malignant brain tumors only. In 2007, as a result of Public Law 107-260, *USCS 2004 Incidence and Mortality* will include cases for non-malignant brain tumors in an additional table. An increase in rates in the following histology groups and subgroups may result: (groups) tumors of the cranial and spinal nerves; tumors of the sellar region and (subgroups) unique astrocytoma variants; neuronal/glial, neuronal; meningioma; hemangioma.

In contrast, the CBTRUS definition includes olfactory tumors of the nasal cavity [C30.0 (9522-9523)] in addition to tumors as defined by the standard definition from the Consensus Conference on Brain Tumor Definition for Registration. [The exception to this is Table 9A in this report, which excludes olfactory tumors of the nasal cavity, but includes incidence rates by gender and behavior for brain tumors as defined using the standard definition from the Consensus Conference. There will be a table similar to Table 9A in the publication, *USCS 2002 Incidence and Mortality* (publication year 2005), but only malignant brain tumors will be included. In the future publication *USCS 2004 Incidence and Mortality* (publication year 2007), additional tables will include the incidence of all primary brain tumors, malignant and non-malignant.] The CBTRUS reports data on all tumor morphologies located within the Consensus Conference site definition including the leukemia and lymphoma morphologies (9590-9989), as well as reporting all primary tumors, including those with a behavior code of 0 (benign) and 1 (uncertain), in addition to 3 (malignant). NAACCR, NPCR, and SEER include pilocytic astrocytomas, a tumor listed in the *WHO 2000 Classification of Tumours of the Nervous System* as having uncertain behavior, in their malignant brain tumor data and statistics. The CBTRUS has categorized pilocytic astrocy-

tomas in the malignant tumor category to enhance comparability of rates, especially for comparison of childhood brain tumor rates. It is important to understand these differences in definition as they prevent the direct comparison of published rates. Please keep in mind that statistics for lymphomas and hemopoietic neoplasms contained in this report refer only to lymphomas and hemopoietic neoplasms of the brain and central nervous system.

Even among CBTRUS collaborating registries there are differences in the requirements for reporting of benign tumors for the years of data included in this report. (Beginning with data for tumors diagnosed in 2004, brain tumor definition will be consistent with the Consensus Conference definition across all registries.) For example, one of the collaborating registries collects data on benign tumors of the brain and meninges, but excludes benign tumors of the spinal cord and acoustic nerve.¹⁴ A few collaborating registries do not actively collect pituitary or pineal gland tumors of benign or uncertain behavior. These reporting practices result in incidence estimates lower than in actuality. On the other hand, active collection of benign tumors is required in several states, resulting in apparently higher estimates of incidence. In addition, states that require the collection of all primary brain tumors regardless of the method of diagnosis will appear to have higher incidence rates than states that primarily collect histologically confirmed tumors. More detailed discussions of state reporting differences are available.^{14,15} Standardization of brain tumor reporting occurred with adoption of Uniform Data Standards (UDS) for benign brain tumors in July 2003 and will aid in distinguishing differences in reporting practices from true variation in the incidence of brain tumors between states. UDS were necessary for implementation of the Benign Brain Tumor Cancer Registries Amendment Act (Public Law 107-260) which required all NPCR registries to expand their primary brain tumor data collection to include tumors of benign and uncertain behavior. Public Law 107-260 went into effect January 1, 2004. These issues were recognized by CBTRUS and by the National Coordinating Council for Cancer Surveillance and were actively addressed by the Brain Tumor Working Group.

Estimation of Number of Cases and Number of Deaths

Estimated number of cases of malignant and non-malignant tumors were calculated using age-specific rates (CBTRUS 1998-2002 data). Population data

(projections) for each state for 2005 were obtained from the U.S. Census Bureau website.¹⁶

Estimated number of deaths for malignant tumors were obtained from the American Cancer Society publication, *Cancer Facts & Figures 2005*. The source for its data was the U.S. Mortality Public Use Data Tapes, 1969-2002, from the National Center for Health Statistics.¹⁷

Estimation of Survival Rates

SEER*Stat 5.2 statistical software was used to estimate one- through ten-year relative survival rates for primary malignant brain tumor cases diagnosed between 1973-2002 in nine SEER areas.¹⁸ This software utilizes life-table (actuarial) methods to compute survival estimates and accounts for current follow-up. The traditional cohort analysis of survival rates, not the period survival method, was utilized for the survival estimates presented in this report. Long-term cohort-based survival estimates reflect the survival experience of individuals diagnosed over the time period, often many years ago, whereas period survival analysis method reflects the survival experience during some more recent calendar period for which data is available. The National Cancer Institute publishes both types of survival estimates in their *SEER Cancer Statistics and Review, 1975-2002* publication.

Survival estimates were determined 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)]. Lymphomas and leukemias (morphology codes 9590-9989) and meningiomas (9530-9539) are included from all brain and central nervous system sites. 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 data analyses.

RESULTS

Primary Brain Tumors: Incidence by State, Year, Behavior, and Age

Distribution

The number of reported brain tumors from the participating registries is listed by state in Table 5. Over 64,000 tumors were reported to CBTRUS from a combined population of 91.2 million that represents approx-

BRAIN TUMOR STATISTICS REPORT AND FIGURES

imately 32% of the U.S. population. The overall percent of benign tumors varied considerably by state (range: 27-60%). Seventy-seven percent of all tumors had a histologically confirmed diagnosis, with substantial regional variation (state range: 62-97%). Note: SEER includes pilocytic astrocytomas, a tumor of uncertain, not malignant, behavior in their malignant brain tumor data and statistics. CBTRUS has categorized pilocytic astrocytomas in the malignant tumor category to enhance comparability of rates.

Among the reported brain tumors in Table 5, males accounted for 45% of the cases and females for 55% of the cases. Nine percent of the cases were in individuals less than 20 years of age at the time of diagnosis and 91% were in individuals 20 years of age or older at the time of the diagnosis. Caucasians accounted for 88% of the cases and African-Americans accounted for 8% of the cases. Ten percent of the cases were in individuals of Hispanic origin and 90% were in individuals not of Hispanic origin.

Overall Incidence

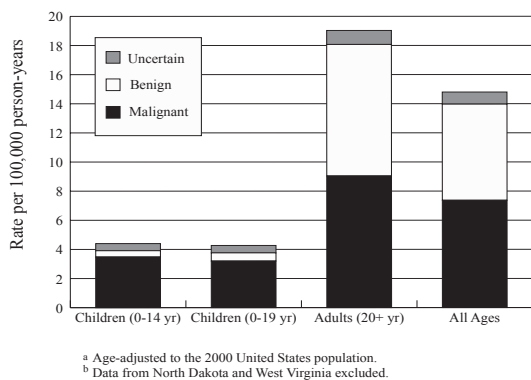
The inclusion of state data in the incidence rates in this report was limited to those registries that provided non-malignant and malignant tumor data for all five years, 1998-2002. Sixteen states (Arizona, Colorado, Connecticut, Delaware, Idaho, Maine, Massachusetts, Minnesota, Montana, New Mexico, New York, North Carolina, Rhode Island, Texas, Utah, and Virginia) met this criterion. Among those states, 63,698 tumors were reported. The overall incidence rate for primary

than 15 years) and 19.0 per 100,000 person-years for adults (20+ years). The overall incidence rates of tumors by behavior and age group (0-19 years and 20+ years) are shown in Figure 2.

Overall Incidence Rates by Year

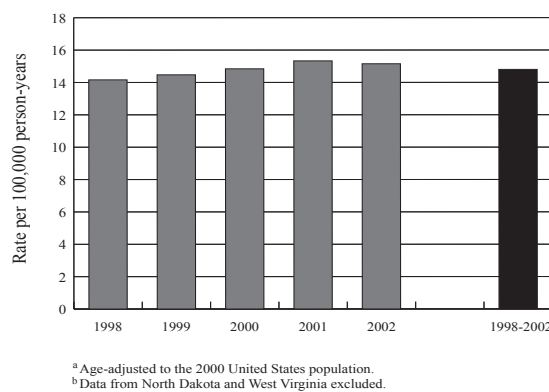
The overall incidence rates by calendar year varied slightly from 1998 through 2002 (Figure 3). The overall incidence rates were as follows: 14.2 per 100,000 person-years in 1998; 14.5 per 100,000 person-years in 1999; 14.8 per 100,000 person-years in 2000; 15.3 per 100,000 person-years in 2001; and 15.2 per 100,000 person-years in 2002. However, these differences in rates between years were not statistically significant. Slight fluctuation in the overall incidence rate on a yearly basis is to be expected and does not necessarily reflect any trends.

Figure 2. Total Average Annual Age-Adjusted Incidence Rates^a of Primary Brain and CNS Tumors by Age and Proportionally by Behavior CBTRUS 1998-2002^b



brain and central nervous system tumors was 14.8 per 100,000 person-years adjusted with the year 2000 standard (Table 6). The overall incidence rate was 4.3 per 100,000 person-years for children 0-19 years of age (4.4 per 100,000 person-years for children less

Figure 3. Average Annual Age-Adjusted Incidence Rates^a of Primary Brain and CNS Tumors by Year CBTRUS 1998-2002^b



100,000 person-years in 2001; and 15.2 per 100,000 person-years in 2002. However, these differences in rates between years were not statistically significant. Slight fluctuation in the overall incidence rate on a yearly basis is to be expected and does not necessarily reflect any trends.

Incidence Rates by State, Age, and Behavior

The overall average annual incidence rate by state, age, and behavior are displayed in Table 6. Note: CBTRUS has categorized pilocytic astrocytomas in the malignant tumor category to provide continuity between SEER and CBTRUS statistics, especially for comparison of childhood brain tumor statistics. The total state incidence rates of all primary brain tumors (malignant and non-malignant) ranged from 9.6 to 21.9 per 100,000 person-years. The state incidence rates of all primary non-malignant brain tumors ranged from 3.1 to 14.6 per 100,000 person-years and the state incidence rates of all primary malignant brain tumors ranged from 6.0 to 8.7 per 100,000 person-years. The state-specific incidence rates for non-malignant tumors ranged from 4.2 to 19.8 per 100,000 person-years among adults 20 years of age and older and

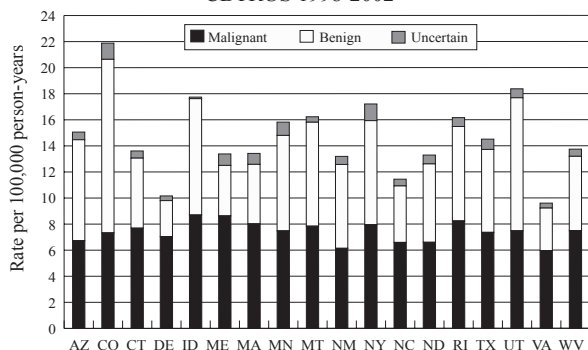
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from 0.4 to 1.6 per 100,000 person-years among children less than 20 years of age. The state-specific incidence rates for malignant tumors ranged from 7.3 to 10.5 per 100,000 person-years among adults 20 years of age and older and from 2.6 to 4.6 per 100,000 person-years among children less than 20 years of age. There is less variation by state in malignant tumor rates as compared to rates for tumors of benign and

for the benign tumors, likely reflects differences in registry reporting practices including case ascertainment. An example of this is Colorado, which has the highest estimated incidence for brain tumors overall. Colorado also has the highest percentage of reported benign brain tumors, as well as the lowest percentage of histologically confirmed tumors. Colorado law requires active collection of all primary brain tumors.

As many benign brain tumors are not histologically confirmed, this results in a lower percent of diagnostically confirmed tumors. A statistically significant negative correlation exists between the proportion of tumors with benign behavior and the proportion of tumors diagnostically confirmed by state for the data presented in Table 5. In addition, the active collection of all brain tumors in Colorado results in a higher incidence rate compared to other registries, some of which do not follow these same reporting practices (see prior section, Differences in Brain Tumor Definition, for further details) (Table 5). Standardization of brain tumor reporting will aid in distinguishing differences in reporting practices from true variation in the incidence of brain tumors between states.

Figure 4. Total Average Annual Age-Adjusted Incidence Rates^a of Primary Brain and CNS Tumors by State and Proportionally by Behavior CBTRUS 1998-2002^b



^aAge-adjusted to the 2000 United States population.
^bExcept for ND (2001-2002) and WV (2002).

uncertain behavior suggesting greater consistency in reporting of the malignant tumors. The variation in tumor rates by state for children is less than that for adults for both malignant tumors and tumors of benign or uncertain behavior. Because very few benign and uncertain tumors occur in children, the lower variability in incidence suggests reporting differences in benign tumors may be driving the variability in incidence rates between states in the adults. The small magnitude of tumors in children for several of the states listed in Table 6 may produce unstable rates, and thus it is prudent to use caution when interpreting and comparing these numbers. With the passage of the Benign Brain Tumor Cancer Registries Amendment Act (Public Law 107-260), non-malignant brain tumor rates will become comparable across states.

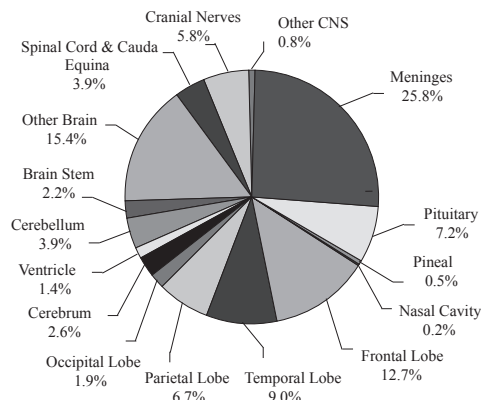
The incidence rates by tumor behavior and state are illustrated in Figure 4. The state rates for the malignant tumors (state range: 6.0 to 8.7 per 100,000 person-years) are much less variable than the reported rates for the benign tumors (state range: 2.8 to 13.3 per 100,000 person-years). The state variation shown in these figures and tables, especially in reported incidence rates

Primary Brain Tumors: Incidence by Histology, Gender, Race, Hispanic Origin, and Age

Distribution of Tumors

The distribution of tumors by site is shown in Figure 5. The majority of tumors (30%) are located within the frontal, temporal, parietal, and occipital lobes of the brain. Cerebrum, ventricle, cerebellum, and brain

Figure 5. Distribution of All Primary Brain and CNS Tumors by Site CBTRUS 1998-2002 (n=63,698)



stem tumors account for 3%, 1%, 4%, and 2% of all tumors, respectively. Other tumors of the brain account for 15% of all tumors. Tumors of the meninges represent 26% of all tumors reported to CBTRUS. The cranial nerves and the spinal cord/cauda equina account for 4% and 6% of all tumors, respectively. The pituitary and pineal glands account for about 8% of tumors. Olfactory tumors of the nasal cavity and other central nervous system tumors, NOS (not otherwise specified), each account for less than 1% of tumors reported to CBTRUS.

The distribution by histology is shown in Figure 6. The most frequently reported histology is a predominately benign tumor,

Figure 7. Distribution of All Primary Brain and CNS Gliomas by Site
CBTRUS 1998-2002 (n=25,539)

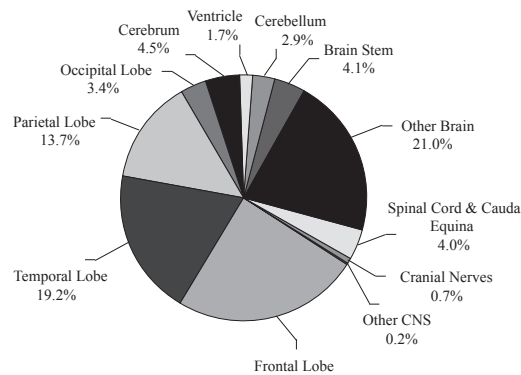
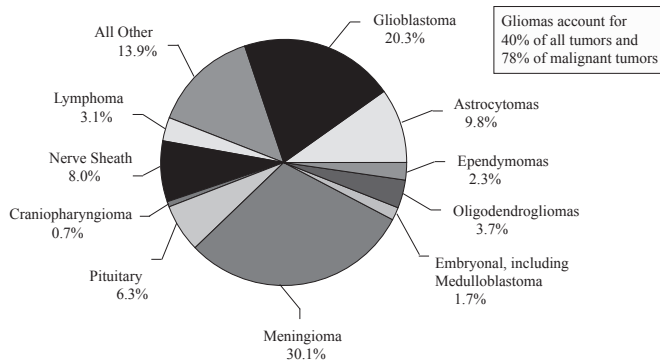


Figure 6. Distribution of All Primary Brain and CNS Tumors by Histology
CBTRUS 1998-2002 (n=63,698)



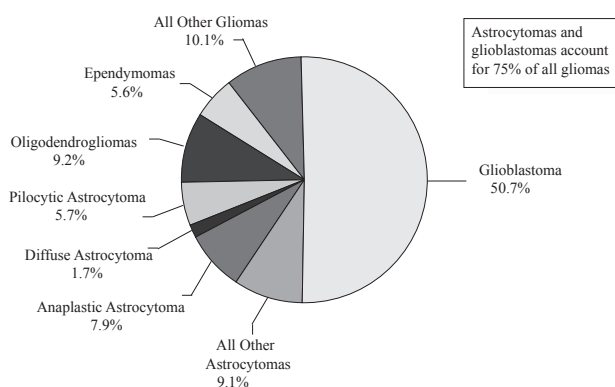
meningioma, which accounts for over 30% of all tumors, followed by glioblastomas and astrocytomas. The predominately benign nerve sheath tumors and pituitary tumors account for 8% and 6% of all tumors, respectively. Acoustic neuromas account for 55% of all nerve sheath tumors.

Gliomas are tumors that arise from glial cells, and include astrocytomas, glioblastomas, oligodendrogliomas, ependymomas, mixed gliomas, malignant gliomas NOS, and neuroepithelial tumors. The broad category glioma represents 40% of all tumors (Figure 6). The distribution of tumors by site for gliomas is shown in Figure 7. Sixty-one percent of gliomas occur in the frontal, temporal, parietal, and occipital lobes of the

brain. The distribution by specific histology for gliomas is illustrated in Figure 8. Glioblastomas account for the majority of gliomas, while astrocytomas and glioblastomas account for three-quarters of gliomas.

Among young adult men ages 20-39 years, brain tumor malignancies were the second leading cause of cancer death in 1998, 1999, 2001 and 2002 and the leading cause of cancer death in 2000. Among young adult women ages 20-39 years, brain tumor malignancies were the fifth leading cause of cancer death in 1998, 1999, 2000, and 2002.^{19,20,21,22,23} Nine percent of the tumors reported to CBTRUS occurred in persons between the ages of 20-34 years. The distribution of all brain tumors by site for young adults are shown in Figure 9. The majority of

Figure 8. Distribution of All Primary Brain and CNS Gliomas by Histology Subtypes
CBTRUS 1998-2002 (n=25,539)

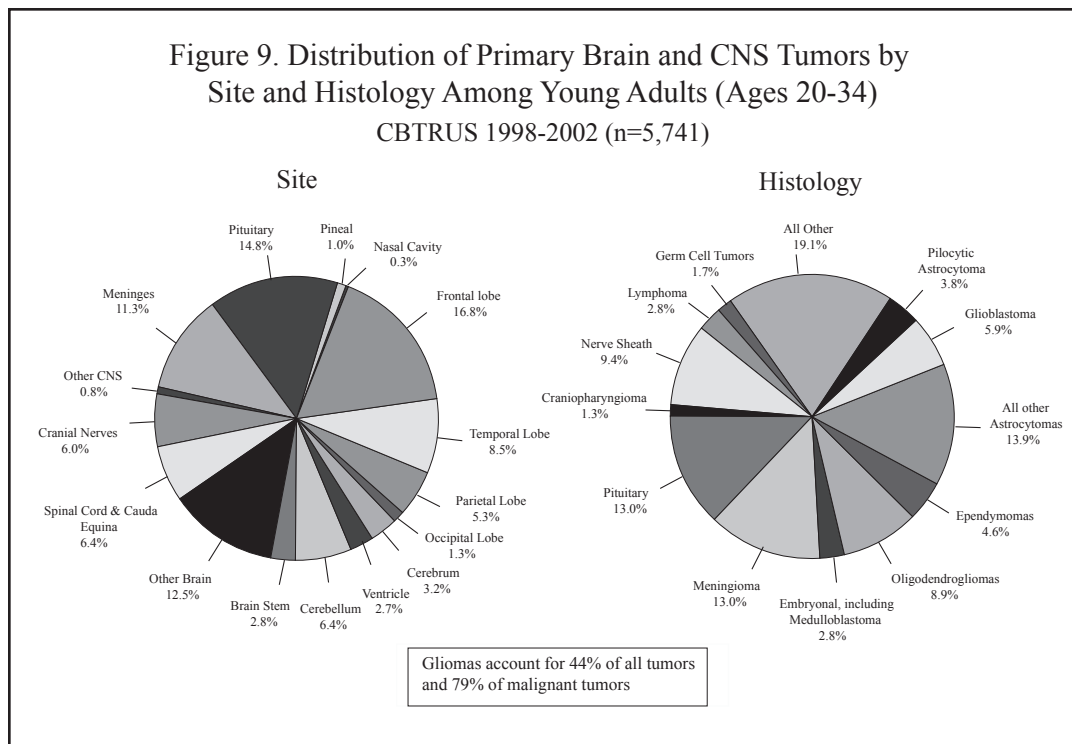


BRAIN TUMOR STATISTICS REPORT AND FIGURES

tumors (32%) in young adults (ages 20-34 years) are located within the frontal, temporal, parietal, and occipital lobes of the brain. Cerebrum, ventricle, cerebellum, and brain stem tumors account for 3%, 3%, 6%, and 3% of all young adult tumors, respectively. Other tumors of the brain account for 13% of all young adult tumors. Tumors of the meninges represent 11%

Incidence Rates by Site

Incidence rates by site are provided in Table 7. Rates were highest for tumors located in the four lobes of the brain (4.5 per 100,000 person-years), followed by tumors located in the meninges, other areas of the brain, pituitary, cranial nerves, cerebellum, spinal



of all young adult tumors reported to CBTRUS. The cranial nerves and the spinal cord/cauda equina account for 6% and 6% of all young adult tumors, respectively. The pituitary and pineal glands account for about 16% of young adult tumors. Olfactory tumors of the nasal cavity and other central nervous system tumors, NOS, each account for less than 1% of young adult tumors reported to CBTRUS.

The distribution by histology for young adults (ages 20-34 years) is shown in Figure 9. The most frequently reported histologies are the predominately benign tumors meningioma (13%) and pituitary (13%). Astrocytomas as a group account for 18% of all young adult tumors. Glioblastomas account for 6%. The predominately benign nerve sheath tumors account for 9% of all young adult tumors. The broad category glioma accounts for 44% of tumors in young adults.

cord/cauda equina, cerebrum, brain stem, ventricle, other nervous system, and pineal gland. Rates were lowest for olfactory tumors of the nasal cavity (less than 0.1 per 100,000 person-years). By gender, rates were higher in females than in

males for tumors located in the meninges. Males had higher or similar rates compared to females for all other sites.

Median Age at Diagnosis

The median age of diagnosis for all primary brain tumors is 57 years (Table 8). The histology-specific median ages range from 9 to 71 years. Pilocytic astrocytomas, medulloblastomas, and germ cell tumors have a median age of onset under 20 years of age. Meningiomas and glioblastomas are primarily diagnosed at older ages. Unclassified tumors had a median age of 68 years, suggesting that younger individuals may receive more specific tumor identification and classification.

Incidence Rates by Major Histology Groupings and Specific Histologies

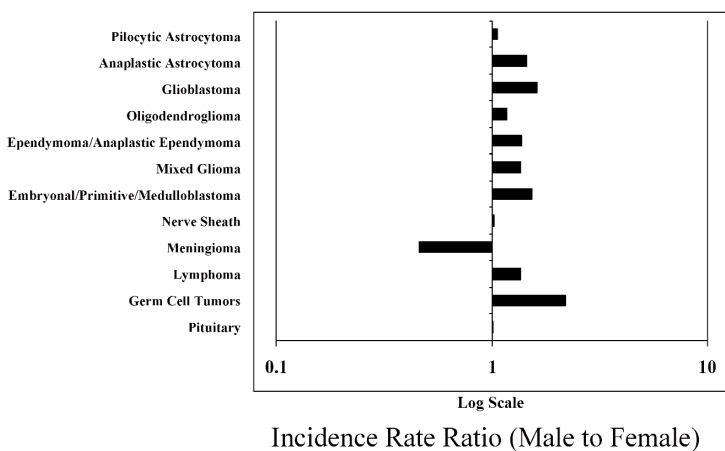
Incidence rates by major histology groupings are provided (Tables 8 - 15). Among major histology groupings, rates were highest for tumors of the neu-

roepithelial tissue (6.4 per 100,000 person-years), followed by tumors of the meninges (4.7 per 100,000 person-years), tumors of the cranial and spinal nerves (1.2 per 100,000 person-years), and tumors of the sellar region (1.0 per 100,000 person-years) (Table 8).

Incidence rates varied by specific histology (Table 8). Rates were highest for meningiomas (4.5 per 100,000

years) than in females (4.9 per 100,000 person-years). Similar patterns were found for individual histologies, with rates higher in males, especially for glioblastomas, embryonal/primitive/medulloblastomas, and germ cell tumors, or comparable between males and females, with the notable exception of meningiomas, which are twice as common in women. Incidence rate ratios (male:female) for selected histologies are shown in Figure 10.

**Figure 10. Patterns by Gender for Selected Histologies
CBTRUS 1998-2002**



Incidence Rates by Gender and Behavior

Incidence rates by histology, gender, and behavior are shown in Table 9A. Rates for all primary malignant brain tumors combined are higher among males (8.7 per 100,000 person-years) than females (6.2 per 100,000 person-years). Rates for all primary non-malignant brain tumors combined are higher among females (8.8 per 100,000 person-years) than males (5.8 per 100,000 person-years).

Incidence Rates by Race

person-years), glioblastomas (3.1 per 100,000 person-years), nerve sheath tumors (1.2 per 100,000 person-years), and pituitary tumors (0.9 per 100,000 person-years).

The incidence rate of gliomas was 5.9 per 100,000 person-years, a major contributor to the magnitude of the neuroepithelial tissue rate.

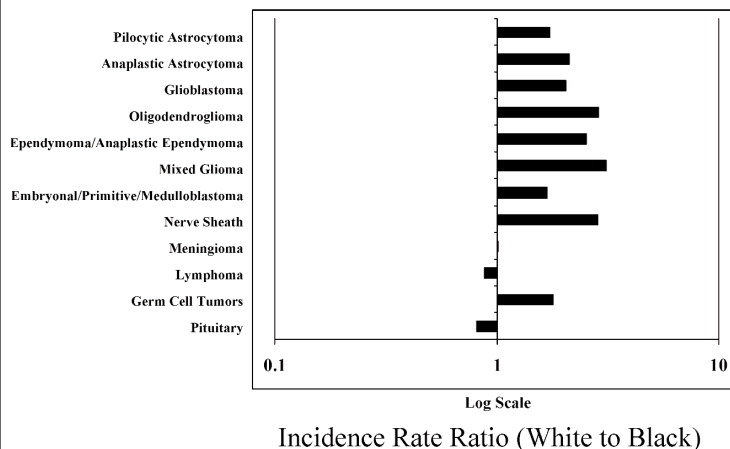
Incidence Rates by Gender

Incidence rates by histology and gender are presented in Table 9. Rates for all primary brain tumors combined are higher among females (15.1 per 100,000 person-years) than males (14.5 per 100,000 person-years). The difference between these rates is statistically significant. Rates for tumors of the neuroepithelial tissue are almost 1.4 times greater in males as compared to females, while tumors of the meninges are 2.1 times greater in females as compared to males. The incidence rate of gliomas is higher in males (7.1 per 100,000 person-

years) than in females (4.9 per 100,000 person-years). Rates for all primary brain tumors combined are higher among whites (15.1 per 100,000 person-years) than blacks (11.0 per 100,000 person-years). The difference between these rates is statistically significant. Rates for most histologies are higher in whites or comparable between whites and

Incidence rates by histology and

**Figure 11. Patterns by Race for Selected Histologies
CBTRUS 1998-2002**



BRAIN TUMOR STATISTICS REPORT AND FIGURES

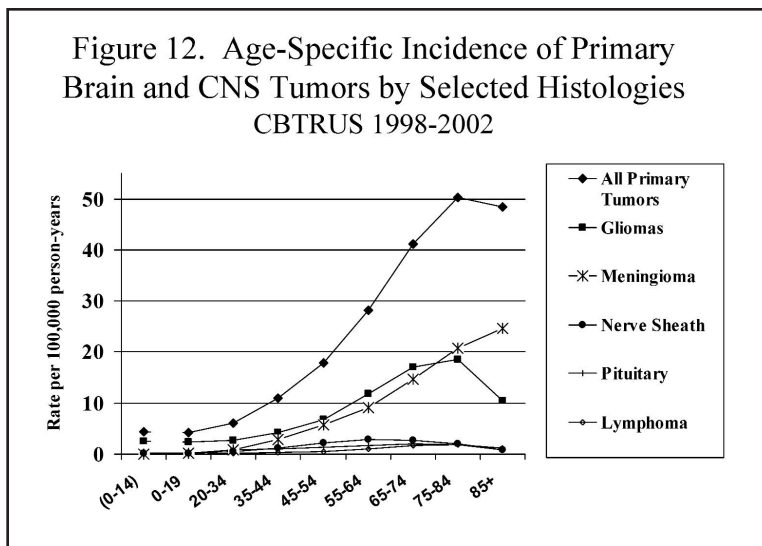
blacks. Rates for mixed gliomas, oligodendrogliomas, nerve sheath tumors, ependymomas, anaplastic astrocytomas, and glioblastomas are more than two times greater in whites than in blacks. In contrast, meningiomas are as common in blacks as in whites. Rates for pituitary tumors and lymphomas are slightly higher among blacks (1.1 per 100,000 person-years and 0.5 per 100,000 person-years, respectively) than whites (0.9 per 100,000 person-years and 0.5 per 100,000 person-years, respectively). Incidence rate ratios (white:black) for selected histologies are shown in Figure 11.

Incidence Rates by Hispanic Origin

Incidence rates by histology, Hispanic Origin, and race are shown in Table 11. Of the 63,698 cases reported from these 16 states, 6,229 cases (10 percent) were in persons of Hispanic origin using the North American Association of Central Cancer Registries Hispanic Identification Algorithm (NHIA) data element to indicate Hispanic ethnicity. NHIA is recorded in the cancer registries upon their utilization of the North American Association of Central Cancer Registries Hispanic Identification Algorithm. The NHIA utilizes a combination of cancer registry data fields (such as birthplace, race, and surnames) to directly and indirectly classify cases as Hispanic or non-Hispanic for analytical purposes.

The overall incidence rate for primary brain and central nervous system tumors among Hispanics is 13.0 per 100,000 person-years and among non-Hispanics is 15.1 per 100,000 person-years (Table 11). The difference between these two rates is statistically significant. White non-Hispanics (15.5 per 100,000 person-years) have higher rates than white-Hispanics (12.9 per 100,000 person-years), black non-Hispanics (11.4 per 100,000 person-years), and black Hispanics (5.4 per 100,000 person-years).

Figure 12. Age-Specific Incidence of Primary Brain and CNS Tumors by Selected Histologies CBTRUS 1998-2002



Incidence Rates by Age

The age-specific rates by histology are presented in Table 12. The incidence for all brain tumors is highest among the 75-84 year olds (50.3 per 100,000 person-years) and lowest among children less than 20 years (4.3 per 100,000 person-years). However, different histologies have different age distributions as shown in Table 12. Note: The 0-14 year age category found in Tables 12, 15, and 20, and in Figures 2, 12, and 15 is a standard age category for childhood cancer used by some cancer surveillance organizations. The incidence of pilocytic astrocytoma, germ cell tumors, and medulloblastoma are higher in the younger age groups and decrease with age. This is in contrast to the rates of meningioma, which increase progressively with age.

Figure 13. Most Common Brain and CNS Tumors by Age CBTRUS 1998-2002

Age (yr)	Most Common Histology	Second Most Common Histology
0-4	Embryonal/primitive/medulloblastoma	Pilocytic astrocytoma
5-9	Pilocytic astrocytoma	Embryonal/primitive/medulloblastoma
10-14	Pilocytic astrocytoma	Embryonal/primitive/medulloblastoma
15-19	Pilocytic astrocytoma	Pituitary
20-34	Pituitary	Meningioma
35-44	Meningioma	Nerve Sheath
45-54	Meningioma	Glioblastoma
55-64	Meningioma	Glioblastoma
65-74	Meningioma	Glioblastoma
75-84	Meningioma	Glioblastoma
85+	Meningioma	Glioblastoma

Most other tumors, such as glioblastoma and pituitary tumors, increase with age until the incidence begins to decline again at the oldest age groups. Age-specific incidence rates for selected histologies are shown in Figure 12. The most common brain and CNS tumors by age at occurrence are shown in Figure 13. The histologic-specific differences in brain and central nervous system tumor distribution by age, gender, race, and Hispanic origin suggest that these tumors have different causes.

Childhood Primary Brain Tumors: Incidence by Histology, Gender, and Age

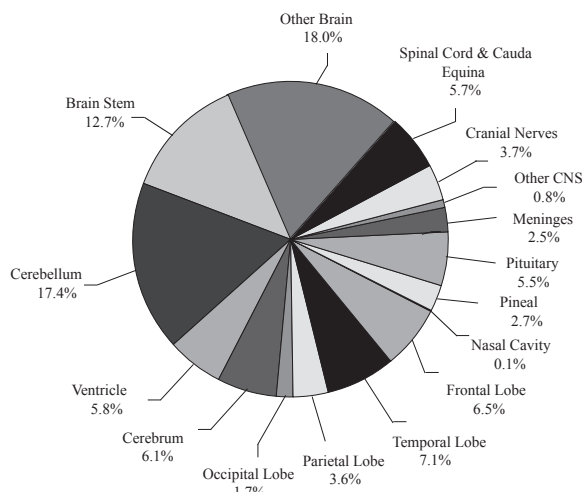
Childhood Brain Tumors

Brain tumors are the second most common malignancy among children, leukemias as a group being the most common.²⁴ Brain tumors are the most common form of solid tumor in children.²⁴ Brain tumors are the leading cause of death from solid tumors in children.²⁴ About 9% of the tumors reported to CBTRUS occurred in persons under the age of 20 years.

Distribution of Tumors

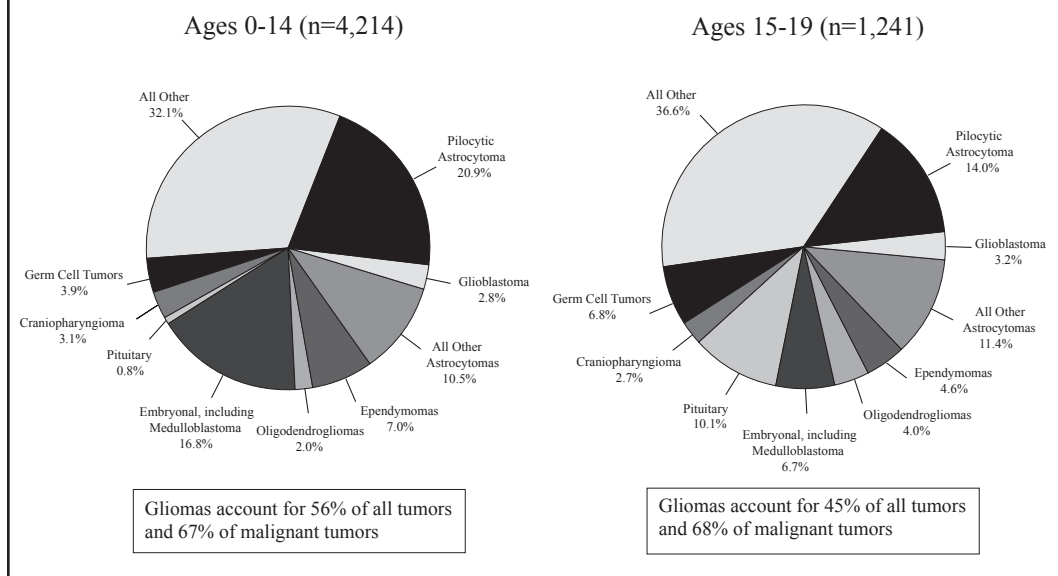
The distribution of tumors by site is shown in Figure 14. The majority of childhood tumors (19%) are located within the frontal, temporal, parietal, and occipital lobes of the brain. Cerebrum, ventricle, cerebellum, and brain stem tumors account for 6%, 6%,

Figure 14. Distribution of All Childhood Primary Brain and CNS Tumors (0-19 yr) by Site
CBTRUS 1998-2002 (n=5,455)



17%, and 13% of all childhood tumors, respectively. Other tumors of the brain account for 18% of all childhood tumors. Tumors of the meninges represent 3% of all childhood tumors reported to CBTRUS. The cranial nerves and the spinal cord/cauda equina account for 4% and 6% of all childhood tumors, respectively. The pituitary and pineal glands account for about 8% of all childhood tumors. Olfactory tumors of the nasal cavity

Figure 15. Distribution of Childhood Primary Brain and CNS Tumors by Histology
CBTRUS 1998-2002



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account and other central nervous system tumors, NOS, each account for less than 1% of childhood tumors reported to CBTRUS.

The most common histologies in the younger age group (ages 0-14 years) include pilocytic astrocytomas and embryonal tumors (medulloblastomas), which account for 21% and 17%, respectively, of all brain tumors in children in this age group (Figure 15). The broad category glioma accounts for 56% of tumors in children less than 15 years of age. The most common histologies in adolescents ages 15-19 years include pilocytic astrocytomas and pituitary tumors, which account for 14% and 10%, respectively, of all brain tumors in that age group (Figure 15). The broad category glioma accounts for 45% of tumors in adolescents ages 15-19 years.

Overall Childhood Incidence Rates by Histology and Gender

The incidence of the most common childhood tumors is shown in Table 13. The overall incidence rate for childhood brain tumors (ages 0-19 years) is 4.3 per 100,000 person-years. Among major histology groupings, rates were highest for tumors of the neuroepithelial tissue (3.3 per 100,000 person-years). Pilocytic astrocytoma (0.8 per 100,000 person-years) and medulloblastoma (0.6 per 100,000 person-years) are the most common individual histologies. Note: SEER includes pilocytic astrocytomas, a tumor of uncertain, not malignant, behavior in their malignant brain tumor data and statistics. CBTRUS has categorized pilocytic astrocytomas in the malignant tumor category to provide continuity between SEER and CBTRUS statistics.

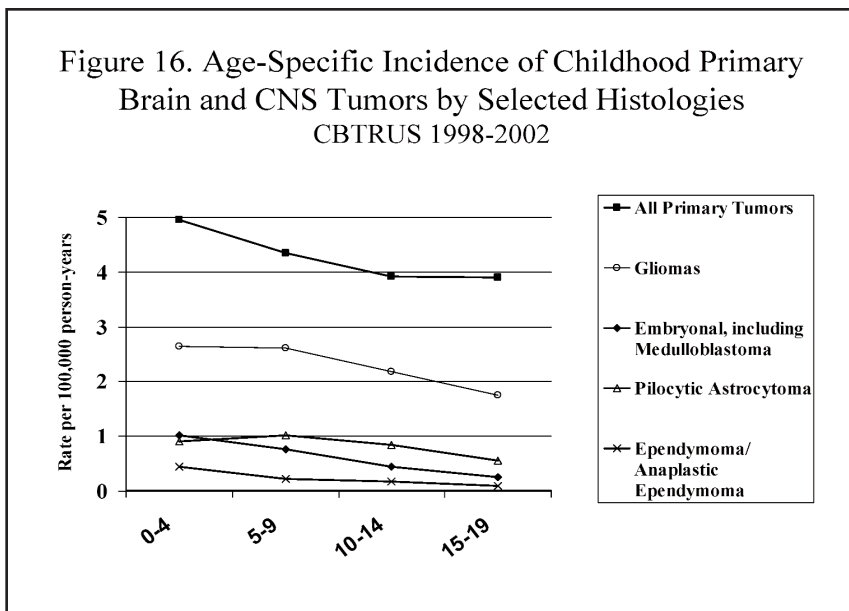
Among the younger population, brain tumors are slightly more common in boys, with tumors of the neuroepithelial slightly more common and germ cell tumors almost twice as common in boys compared to girls (Table 13). Alternatively, the incidence of pituitary tumors is twice as large in females compared to males. All of these differences in rates between boys and girls are statistically significant. The small numbers of cases for some tumors require caution when interpreting and comparing rates.

Childhood Incidence Rates by Race and Gender

Among the younger population (ages 0-19 years) brain tumors are more common in whites (4.5 per 100,000 person-years) than in blacks (2.9 per 100,000 person-years) (Table 14). This difference in rates between the two races is statistically significant. Among both whites and blacks, the rates among boys are slightly higher than the rates among girls (Table 14). The differences in rates between boys and girls are statistically significant for whites but not for blacks. The small numbers of cases for some histologies require caution when interpreting and comparing rates by race and/or gender.

Childhood Incidence Rates by Age

The age-specific rates by histology for children are displayed in Table 15. The incidence for all brain tumors is highest among 0-4 year olds (5.0 per 100,000 person-years) and lowest among 10-14 year olds and 15-19 year olds (3.9 per 100,000 person-years). However, the different histologies have different age distributions as shown in Table 15. The incidence of ependymoma and medulloblastoma in children



decreases with age. The rate of pilocytic astrocytoma peaks among children 5-9 years and then decreases among children 10-19 years. The incidence of germ cell tumors among children increases with age. Age-specific incidence rates for selected histologies are shown in Figure 16. The most common childhood brain and CNS tumors by age at occurrence are shown

in Figure 13. The histologic-specific differences in brain and central nervous system tumor distribution by age, gender, and race suggest that these childhood tumors have different causes.

Primary Brain Tumors: Trends in Incidence

A recent study utilizing ten years of CBTRUS data (1985-1994) provided by six collaborating state registries examined the trends in incidence of primary brain and central nervous system tumors.²⁵ Trends were expressed as average annual percentage change (AAPC). Overall, it was concluded that there was a slight statistically significant increase in brain tumor incidence rates over the study period (AAPC = 0.9%). The result was not statistically significant when brain lymphomas were excluded from the analysis (AAPC = 0.5%).

Increases in the incidence rates for specific histologies were observed: brain lymphomas (AAPC = 11.4%), especially in males over the age of 20; pilocytic astrocytomas in persons less than 20 years of age (AAPC = 13.8%); nerve sheath tumors in males (AAPC = 5.9%), and pituitary tumors in females (AAPC = 5.9%). Increases were also noted for glioblastoma (AAPC = 2.3%); oligodendrogliomas (AAPC = 6.6%); ependymomas (AAPC = 6.9%); and astrocytomas, excluding NOS tumors (AAPC = 5.9%). Decreases were noted for NOS tumors (AAPC = -8.6%), astrocytoma NOS (AAPC = -5.7%), and glioma NOS (AAPC = -5.7%).

It was conjectured that advances in diagnostic technologies and changes in tumor classification and coding were likely to be responsible for the decreases seen in the incidence of NOS subgroups and the corresponding increases in glioma subgroups. It was noted that the increasing incidence of lymphoma was consistent with previously published studies. However, it was posited that the increases in ependymomas, nerve sheath tumors, and pituitary tumors were less likely to be caused by diagnostic advancements and changes in tumor classification.

Primary Malignant Brain Tumor Rates: Incidence, Mortality, Estimated Cases and Deaths, and Survival

Incidence and Mortality Rates for Malignant Brain Tumors by State and Gender

Incidence and mortality rates for primary malignant brain tumors by state were obtained from the most recent NAACCR Cancer Incidence in North America

publication¹² and are shown in Table 16. These rates are adjusted using the 2000 U.S. standard population. The 1998-2002 mortality rates by gender are available for all 50 states and the District of Columbia. Incidence rates for malignant brain tumors were available for most states from the same time period with a few exceptions. Incidence statistics for the United States as a whole includes data from 42 central cancer registries (36 states, 5 metropolitan areas, and the District of Columbia) covering 77% of the United States population.

Estimated Numbers of Cases of All Primary Brain Tumors by State

The estimated numbers of cases of all primary brain tumors and of all malignant brain tumors by state for 2005 are shown in Table 17. The estimated number of cases of malignant and non-malignant tumors by state were calculated using CBTRUS age-specific incidence rates (1998-2002) and population projections for each state. The total number of new cases of primary brain tumors for all 50 states and the District of Columbia in 2005 is estimated to be 43,800. The total number of new cases of primary malignant brain tumors for all 50 states and the District of Columbia in 2005 is estimated to be 21,690.

Because reported state rates for malignant brain tumors are much less variable than the reported rates for benign brain tumors, the estimated number of cases of all brain tumors is less stable than the estimated number of cases of malignant tumors. The age-specific rates used to compute the estimated number of all (non-malignant and malignant) brain tumor cases are based on CBTRUS 1998-2002 data, which has acknowledged variation in case ascertainment of benign tumors by collaborating states. Thus, the estimated cases of all brain tumors presented in Table 17 may be underestimated for states that have more complete reporting of brain tumors and overestimated for states that have less complete reporting of brain tumors.

Estimated Numbers of Deaths for Malignant Brain Tumors by State

The estimated numbers of deaths for primary malignant brain tumors by state for 2005 are shown in Table 17. The estimated number of deaths for malignant tumors were obtained from the American Cancer Society publication, *Cancer Facts & Figures 2005*.¹⁷ The source for these data was the U.S. Mortality Public Use Data Tapes, 1969-2002, from the National Center for Health Statistics. The total number of pri-

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mary malignant brain tumor deaths for all 50 states and the District of Columbia in 2005 is estimated to be 12,760.

Survival Rates for Malignant Brain Tumors by Tumor Location (Site) and Gender

Survival estimates by tumor location (site) and gender are presented in Tables 18. Patients with tumors in the cerebrum, the frontal, temporal, parietal, and occipital lobes of the brain, and other brain have five-year survival rates less than or equal to 23%. Patients with tumors in the cranial nerves, spinal cord/cauda equina, pituitary and pineal glands, nasal cavity, and cerebellum have five-year survival rates equal to or greater than 64%. For most tumor locations, females have slightly better survival, although survival is much higher in females with tumors of the meninges than males. Males have slightly better five-year survival for tumors of the brain stem, cranial nerves, spinal cord/cauda equina, and pineal glands.

Survival Rates for Malignant Brain Tumors by Histology and Age

Survival estimates for malignant brain tumors by histology and age at diagnosis are presented in Tables 19 and 20. The one- through ten-year relative survival rates by histology are shown in Table 19. The estimated five- and ten-year relative survival rates for malignant brain tumors are 29% and 25% respectively. However, there is a large variation in survival estimates between tumor histologies (Table 19). Five-year survival rates exceed 91% for pilocytic astrocytomas but are less than 4% for glioblastomas. Survival generally decreases with older age at diagnosis (Table 20). Children and young adults have better survival for most histologies.

Histology-Specific Summary Information

The information presented in these tables can be synthesized to describe specific histologies. As an example we have chosen the two most common histologies, meningiomas and glioblastomas.

Meningiomas are the most frequently reported tumor and account for more than 30% of tumors reported to CBTRUS (Table 8). Ninety-three percent of meningiomas reported to CBTRUS had a benign behavior code. Meningiomas are more common in older adults (median age at diagnosis is 64 years) (Table 8) and are uncommon in children. The incidence of meningiomas increases with increasing age. The rates for meningiomas increase dramatically after age 65 and continue to be high even among the population aged 85 and older (Table 12). Meningiomas are twice as common in

females as compared to males (Table 9). The incidence in meningiomas is similar between whites and African Americans (Table 10). Only malignant meningiomas are reported in the SEER database and survival estimates were not generated. Information about meningioma survival estimates was previously estimated using data reported to the National Cancer Data Base and showed the overall five-year survival rate for meningioma to be 69%.²⁶ Those individuals with benign meningiomas had an overall five-year survival rate of 70%, whereas those with a malignant meningioma had an overall five-year survival rate of 55%.²⁶

Glioblastomas (GBMs) are the second most frequently reported histology and the most common malignancy. They account for 20% of all primary brain tumors (Table 8). Glioblastomas are more common in older adults (median age at diagnosis is 64 years) (Table 8) and are uncommon in children. Glioblastomas comprise less than 3% of all tumors reported among 0-19 year olds (Table 13). The incidence of glioblastomas increases with increasing age. The rates for glioblastomas are highest in 75 to 84 years olds (Table 12). Glioblastomas are 1.6 times more common in males (Table 9). Glioblastomas are two times higher among whites as compared to blacks (Table 10). The relative survival estimates for glioblastoma are quite low; less than 4% of patients survived five years post diagnosis (Table 19). Glioblastoma survival estimates are somewhat higher for the small number of patients who are diagnosed under age 20 (Table 20).

SUMMARY

These data present an updated summary (1998-2002) of the incidence of all primary malignant and non-malignant brain tumors and incidence, mortality and survival for all primary malignant brain tumors in the United States. We hope that these data are useful to clinicians, researchers, and patient families.

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TABLE 1: CBTRUS BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR HISTOLOGY GROUPINGS, 2005 REVISION^a

HISTOLOGY	ICDO-3^b HISTOLOGY CODE
<u>TUMORS OF NEUROEPITHELIAL TISSUE</u>	
Pilocytic astrocytoma	9421
Diffuse astrocytoma (protoplasmic, fibrillary)	9410, 9420
Anaplastic astrocytoma	9401, 9411
Unique astrocytoma variants	9383, 9384, 9424
Astrocytoma, NOS	9400
Glioblastoma	9440, 9441, 9442/3 ^d
Oligodendroglioma	9450
Anaplastic oligodendroglioma	9451, 9460
Ependymoma/anaplastic ependymoma	9391, 9392, 9393
Ependymoma variants	9394
Mixed glioma	9382
Glioma malignant, NOS	9380
Choroid plexus	9390
Neuroepithelial	9381, 9423, 9430, 9444 ^c
Benign and malignant neuronal/glial, neuronal and mixed	8680, 8681, 8682, 8690, 8693, 9412 ^c , 9413 ^c , 9442/1 ^{c,e} , 9490, 9491, 9492 ^c , 9493 ^c , 9500, 9505, 9506, 9522, 9523
Pineal parenchymal	9360, 9361, 9362
Embryonal/primitive/medulloblastoma	8963, 9363, 9364, 9470, 9471, 9472, 9473, 9474 ^c , 9501, 9502, 9503, 9508 ^c
<u>TUMORS OF CRANIAL AND SPINAL NERVES</u>	
Nerve sheath, benign and malignant	9540, 9541, 9550, 9560, 9561, 9570, 9571 ^c
Other tumors of cranial and spinal nerves	9562
<u>TUMORS OF MENINGES</u>	
Meningioma	9530, 9531, 9532, 9533, 9534, 9537, 9538, 9539
Other mesenchymal, benign and malignant	8324, 8728 ^c , 8800, 8801, 8802, 8803, 8804, 8805 ^c , 8806 ^c , 8810, 8815 ^c , 8824, 8830, 8831, 8850, 8851, 8857, 8861, 8890, 8897, 8900, 8910, 8920, 8990, 9040, 9150, 9180, 9210, 9241, 9260, 9480
Hemangioblastoma	9161, 9535
<u>LYMPHOMAS AND HEMOPOIETIC NEOPLASMS</u>	
Lymphoma	9590, 9591, 9596 ^c , 9650, 9651 ^c , 9652, 9653, 9654, 9655, 9659, 9661, 9662, 9663, 9664, 9665, 9667, 9670, 9671, 9673, 9675, 9680, 9684, 9687, 9690, 9691, 9695, 9698, 9699 ^c , 9701, 9702, 9705, 9714, 9719 ^c , 9727 ^c , 9728 ^c , 9729 ^c , 9731, 9733, 9734 ^c , 9740, 9741, 9750 ^c , 9755 ^c , 9756 ^c , 9757 ^c , 9758 ^c , 9766, 9827, 9861, 9930, 9970
<u>GERM CELL TUMORS AND CYSTS</u>	
Germ cell tumors, cysts and heterotopias	8020, 9060, 9061, 9064, 9065 ^c , 9070, 9071, 9072, 9080, 9081, 9082, 9083, 9084, 9085, 9100
<u>TUMORS OF SELLAR REGION</u>	
Pituitary	8022, 8040, 8140, 8146, 8246, 8260, 8270, 8271, 8272 ^c , 8280, 8281, 8290, 8300, 8310, 8323, 8333, 8334, 9582
Craniopharyngioma	9350, 9351 ^c , 9352 ^c
<u>LOCAL EXTENSIONS FROM REGIONAL TUMORS</u>	
Chordoma/chondrosarcoma	9220, 9231, 9240, 9370, 9371 ^c , 9372 ^c , 9373
<u>UNCLASSIFIED TUMORS</u>	
Hemangioma	9120, 9121, 9122, 9123, 9125, 9130, 9131, 9133, 9140
Neoplasm, unspecified	8000, 8001, 8002, 8003, 8004, 8005 ^c , 8010, 8013, 8021
All other	8720, 9173, 9580, 9751, 9754 ^c

^aThis revision expanded to include all the histologies listed in the standard definition of reportable brain tumors from the Consensus Conference on Brain Tumor Definition.

^bInternational Classification of Diseases for Oncology, Third Edition, 2000. World Health Organization, Geneva, Switzerland.

^cHistology regrouped in the 2004 revision of the CBTRUS histology grouping scheme as compared to the previous version of the CBTRUS histology grouping scheme.

^dMorphology 9442/3 only.

^eMorphology 9442/1 only.

Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; ICDO, International Classification of Diseases for Oncology; NOS, not otherwise specified.

TABLES

TABLE 2: ANNUAL POPULATIONS^a AVERAGED OVER 1998-2002 FOR CBTRUS, 16 STATES COMBINED, BY AGE, GENDER AND RACE^b

Age Group	MALES			FEMALES		
	Total	Whites	Blacks	Total	Whites	Blacks
0-4	3,186,116	2,559,689	456,213	3,043,804	2,434,765	441,713
5-9	3,299,066	2,628,438	497,866	3,147,023	2,497,842	482,034
10-14	3,315,211	2,657,799	485,985	3,159,944	2,523,794	471,984
15-19	3,271,489	2,644,234	454,946	3,088,350	2,481,311	441,213
20-24	3,164,681	2,565,752	414,117	3,012,799	2,403,461	426,975
25-29	3,168,616	2,577,015	386,059	3,096,226	2,465,255	422,895
30-34	3,349,959	2,748,752	404,810	3,319,914	2,669,544	449,801
35-39	3,573,545	2,965,727	423,489	3,592,018	2,927,581	474,776
40-44	3,499,995	2,940,489	395,606	3,560,795	2,943,555	444,329
45-49	3,094,369	2,632,015	326,983	3,202,785	2,679,352	374,494
50-54	2,675,033	2,311,000	255,746	2,808,047	2,385,067	302,125
55-59	2,041,801	1,783,580	183,342	2,192,605	1,881,746	228,118
60-64	1,583,920	1,384,898	142,043	1,754,168	1,507,030	184,454
65-69	1,338,274	1,184,215	113,566	1,555,398	1,351,139	155,562
70-74	1,155,916	1,044,094	84,239	1,467,032	1,300,663	130,057
75-79	887,651	809,716	60,134	1,277,181	1,149,559	103,299
80-84	544,573	501,655	33,324	927,683	844,853	68,718
85+	365,257	334,961	23,802	909,977	831,706	66,604
TOTAL	43,515,472	36,274,029	5,142,269	45,115,749	37,278,221	5,669,149

^aPopulation data source: SEER program website, which receives population estimates from the U.S. Census Bureau.

^bThe average annual population combined for the sixteen states for which rates were calculated by race, gender and age: Arizona, Colorado, Connecticut, Delaware, Idaho, Maine, Massachusetts, Minnesota, Montana, New Mexico, New York, North Carolina, Rhode Island, Texas, Utah, and Virginia.

Abbreviation: SEER, Surveillance, Epidemiology, and End Results.

TABLE 3: ANNUAL POPULATIONS^a AVERAGED OVER 1998-2002 FOR CBTRUS, 16 STATES COMBINED, BY AGE, GENDER, RACE, AND HISPANIC ORIGIN^b

MALES						
AGE GROUP	HISPANIC	WHITE	BLACK	NON-HISPANIC	WHITE	BLACK
		HISPANIC	HISPANIC		NON-HISPANIC	NON-HISPANIC
0-4	782,763	720,497	44,397	2,403,353	1,839,193	411,815
5-9	731,915	668,334	44,324	2,567,151	1,960,103	453,542
10-14	669,313	613,103	38,773	2,645,899	2,044,696	447,211
15-19	679,114	626,389	35,680	2,592,375	2,017,845	419,267
20-24	753,566	698,642	36,832	2,411,115	1,867,111	377,285
25-29	722,335	672,473	33,168	2,446,281	1,904,542	352,891
30-34	659,196	612,798	31,887	2,690,763	2,135,954	372,923
35-39	590,614	548,391	28,775	2,982,931	2,417,335	394,714
40-44	485,676	450,886	23,654	3,014,319	2,489,603	371,952
45-49	372,670	345,122	19,285	2,721,699	2,286,893	307,699
50-54	286,118	265,736	14,447	2,388,914	2,045,264	241,299
55-59	198,383	184,881	9,805	1,843,417	1,598,699	173,537
60-64	148,356	138,494	7,187	1,435,564	1,246,403	134,855
65-69	112,499	105,458	5,229	1,225,775	1,078,758	108,337
70-74	84,891	80,152	3,494	1,071,025	963,942	80,745
75-79	56,300	53,398	2,133	831,350	756,317	58,002
80-84	29,675	28,068	1,177	514,898	473,587	32,147
85+	21,415	20,283	806	343,842	314,678	22,996
TOTAL	7,384,799	6,833,106	381,053	36,130,673	29,440,923	4,761,215

FEMALES						
AGE GROUP	HISPANIC	WHITE	BLACK	NON-HISPANIC	WHITE	BLACK
		HISPANIC	HISPANIC		NON-HISPANIC	NON-HISPANIC
0-4	749,260	689,461	42,353	2,294,543	1,745,304	399,360
5-9	703,004	641,360	43,050	2,444,018	1,856,482	438,984
10-14	641,275	586,518	37,597	2,518,669	1,937,276	434,386
15-19	613,851	563,802	34,193	2,474,499	1,917,509	407,021
20-24	638,178	584,313	38,247	2,374,621	1,819,148	388,727
25-29	634,063	582,361	37,395	2,462,163	1,882,894	385,499
30-34	598,273	549,415	35,630	2,721,641	2,120,130	414,171
35-39	553,152	507,823	32,438	3,038,866	2,419,758	442,337
40-44	472,816	434,525	27,499	3,087,979	2,509,031	416,830
45-49	380,320	349,936	22,109	2,822,466	2,329,416	352,385
50-54	304,273	281,139	17,053	2,503,774	2,103,928	285,072
55-59	221,781	205,808	11,887	1,970,824	1,675,938	216,230
60-64	173,455	161,118	9,408	1,580,713	1,345,912	175,046
65-69	141,845	132,391	7,184	1,413,553	1,218,747	148,378
70-74	115,144	107,889	5,510	1,351,888	1,192,775	124,547
75-79	82,296	77,255	3,925	1,194,885	1,072,304	99,374
80-84	48,836	45,839	2,396	878,847	799,014	66,322
85+	43,367	40,721	2,062	866,610	790,984	64,542
TOTAL	7,115,190	6,541,671	409,938	38,000,559	30,736,550	5,259,212

^aPopulation data source: SEER program website, which receives population estimates from the U.S. Census Bureau.

^bThe average annual population combined for the sixteen states for which rates were calculated by Hispanic origin: Arizona, Colorado, Connecticut, Delaware, Idaho, Maine, Massachusetts, Minnesota, Montana, New Mexico, New York, North Carolina, Rhode Island, Texas, Utah, and Virginia.

Abbreviation: SEER, Surveillance, Epidemiology, and End Results.

TABLES

TABLE 4: 2000 U.S. 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		

TABLE 5: CHARACTERISTICS OF PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMORS^a IN PARTICIPATING REGISTRIES, CBTRUS 1998-2002

STATE	YEARS OF DATA	NO. OF NEWLY DIAGNOSED BRAIN & CNS TUMORS	PERCENT BENIGN TUMORS	PERCENT HISTOLOGICALLY CONFIRMED	2000 POPULATION ^b
Arizona	1998-2002	3,847	51.0	71.3	5,165,765
Colorado	1998-2002	4,301	60.2	62.3	4,326,873
Connecticut	1998-2002	2,429	39.9	84.5	3,411,751
Delaware	1998-2002	406	27.3	83.5	786,398
Idaho	1998-2002	1,093	49.8	78.0	1,299,610
Maine	1998-2002	913	29.4	80.9	1,277,286
Massachusetts	1998-2002	4,399	34.3	84.2	6,362,076
Minnesota	1998-2002	3,824	46.3	97.3	4,933,648
Montana	1998-2002	764	49.6	75.1	903,381
New Mexico	1998-2002	1,164	48.5	76.4	1,821,544
New York	1998-2002	16,557	46.6	72.3	18,997,344
North Carolina	1998-2002	4,577	37.9	84.9	8,077,662
North Dakota	2001-2002	180	46.1	71.1	641,087
Rhode Island	1998-2002	894	45.4	76.3	1,050,665
Texas	1998-2002	13,515	42.6	72.0	20,949,316
Utah	1998-2002	1,677	53.6	77.8	2,243,129
Virginia	1998-2002	3,338	33.8	89.1	7,104,853
West Virginia	2002	278	42.5	67.3	1,807,329
TOTAL		64,156	44.4	76.6	91,159,717

^aSome variation in state counts and rates is due to differences in reporting criteria. Certain states that require the reporting of benign brain tumors may have more complete reporting.

^b2000 population data estimates were obtained from the census data provided to the SEER program.

Abbreviation: CBTRUS, Central Brain Tumor Registry of the United States.

TABLE 6: PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR INCIDENCE RATES^{a,b} BY AGE, STATE, AND BEHAVIOR, AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION, CBTRUS 1998-2002^c

STATE	0-19 YEARS		20+ YEARS		ALL AGES		
	MALIGNANT	BENIGN & UNCERTAIN	MALIGNANT	BENIGN & UNCERTAIN	MALIGNANT	BENIGN & UNCERTAIN	ALL TUMORS
Arizona	2.82	0.78	8.30	11.36	6.73	8.33	15.06
Colorado	2.59	1.55	9.24	19.79	7.33	14.55	21.89
Connecticut	3.32	0.64	9.44	8.04	7.69	5.92	13.61
Delaware	3.44	0.47	8.49	4.20	7.04	3.13	10.17
Idaho	4.24	1.14	10.50	12.22	8.70	9.04	17.75
Maine	3.92	0.75	10.52	6.36	8.63	4.75	13.37
Massachusetts	3.38	0.92	9.89	7.20	8.02	5.40	13.42
Minnesota	3.48	1.56	9.10	11.08	7.48	8.35	15.83
Montana	2.93	0.85	9.82	11.43	7.84	8.39	16.24
New Mexico	2.65	0.80	7.56	9.57	6.14	7.05	13.20
New York	3.49	1.44	9.74	12.40	7.95	9.25	17.20
North Carolina	2.88	0.84	8.07	6.46	6.59	4.85	11.43
North Dakota ^c	3.28	0.86	7.93	9.03	6.60	6.69	13.28
Rhode Island	3.43	1.38	10.18	10.54	8.24	7.91	16.15
Texas	3.19	0.98	9.03	9.63	7.36	7.15	14.51
Utah	3.40	1.50	9.12	14.67	7.48	10.89	18.37
Virginia	2.75	0.56	7.26	4.88	5.96	3.64	9.60
West Virginia ^c	4.64	0.43	8.63	8.60	7.49	6.26	13.74
TOTAL^d	3.20	1.08	9.04	9.99	7.37	7.43	14.80

^aRates are per 100,000 person-years.

^bSome variation in state counts and rates is due to differences in reporting criteria. Certain states that required the reporting of all benign brain and central nervous system tumors may have had more complete reporting.

^cCounts and rates based on 1998-2002 data except for North Dakota (2001-2002) and West Virginia (2002).

^dIncludes data from 16 of the 18 registries listed above; North Dakota and West Virginia are excluded.

Abbreviation: CBTRUS, Central Brain Tumor Registry of the United States.

TABLES

TABLE 7: PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR INCIDENCE RATES^a BY SITE^b AND GENDER, AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION, CBTRUS 1998-2002^c

ICDO CODE	SITE ^b	MALES		FEMALES		TOTAL	
		N	ADJUSTED RATE	N	ADJUSTED RATE	N	ADJUSTED RATE
C71.1-C71.4	Frontal, temporal, parietal, and occipital lobes of the brain	10,218	5.16	9,043	3.91	19,261	4.48
C71.0	Cerebrum	894	0.44	777	0.34	1,671	0.39
C71.5	Ventricle	455	0.21	412	0.18	867	0.20
C71.6	Cerebellum	1,310	0.61	1,196	0.53	2,506	0.57
C71.7	Brain Stem	767	0.35	634	0.28	1,401	0.32
C71.8-C71.9	Other brain	4,944	2.55	4,876	2.07	9,820	2.29
C72.0-C72.1	Spinal cord and cauda equina	1,350	0.64	1,153	0.51	2,503	0.57
C72.2-C72.5	Cranial nerves	1,722	0.84	1,958	0.86	3,680	0.85
C72.8-C72.9	Other nervous system	264	0.13	245	0.11	509	0.12
C70.0-C70.9	Meninges (cerebral and spinal)	4,401	2.36	12,021	5.14	16,425	3.87
C75.1-C75.2	Pituitary	2,184	1.08	2,432	1.07	4,617	1.06
C75.3	Pineal	189	0.08	102	0.05	291	0.07
C30.0 (9522-9523)	Olfactory tumors of the nasal cavity	94	0.05	53	0.02	147	0.03
TOTAL		28,792	14.50	34,902	15.07	63,698	14.80

^aRates are per 100,000 person-years.

^bThe sites referred to in this table are loosely based on the categories and site codes defined in the SEER Site/Histology Validation List.

^cIncludes data from 16 of the 18 registries listed in Table 5; North Dakota and West Virginia are excluded.

Abbreviation: CBTRUS, Central Brain Tumor Registry of the United States.

TABLE 8: DISTRIBUTION AND INCIDENCE RATES^a OF PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMORS BY MAJOR HISTOLOGY GROUPINGS AND HISTOLOGY, AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION, CBTRUS 1998-2002^b

HISTOLOGY	TOTAL N	% OF ALL REPORTED BRAIN TUMORS	MEDIAN AGE AT DIAGNOSIS	ADJUSTED RATE (C.I.)
<u>TUMORS OF NEUROEPITHELIAL TISSUE</u>	27,776	43.6	53	6.42 (6.34-6.49)
Pilocytic astrocytoma	1,465	2.3	12	0.33 (0.31-0.34)
Diffuse astrocytoma (protoplasmic, fibrillary)	428	0.7	46	0.10 (0.09-0.11)
Anaplastic astrocytoma	2,029	3.2	51	0.47 (0.45-0.49)
Unique astrocytoma variants	332	0.5	37	0.08 (0.07-0.08)
Astrocytoma, NOS	1,994	3.1	45	0.46 (0.44-0.48)
Glioblastoma	12,943	20.3	64	3.05 (3.00-3.10)
Oligodendroglioma	1,559	2.5	41	0.35 (0.33-0.37)
Anaplastic oligodendroglioma	781	1.2	48	0.18 (0.17-0.19)
Ependymoma/anaplastic ependymoma	1,126	1.8	39	0.26 (0.24-0.27)
Ependymoma variants	312	0.5	39	0.07 (0.06-0.08)
Mixed glioma	722	1.1	42	0.16 (0.15-0.18)
Glioma malignant, NOS	1,668	2.6	43	0.38 (0.36-0.40)
Choroid plexus	194	0.3	21	0.04 (0.04-0.05)
Neuroepithelial	66	0.1	52	0.02 (0.01-0.02)
Benign and malignant neuronal/glial, neuronal and mixed	944	1.5	26	0.21 (0.20-0.22)
Pineal parenchymal	119	0.2	22	0.03 (0.02-0.03)
Embryonal/primitive/medulloblastoma	1,094	1.7	9	0.24 (0.23-0.26)
<u>TUMORS OF CRANIAL AND SPINAL NERVES</u>	5,094	8.0	52	1.17 (1.14-1.20)
Nerve sheath, benign and malignant	5,092	8.0	52	1.17 (1.14-1.20)
<u>TUMORS OF MENINGES</u>	19,980	31.4	63	4.70 (4.63-4.76)
Meningioma	19,190	30.1	64	4.52 (4.45-4.58)
Other mesenchymal, benign and malignant	250	0.4	44	0.06 (0.05-0.06)
Hemangioblastoma	540	0.9	46	0.12 (0.11-0.13)
<u>LYMPHOMAS AND HEMOPOIETIC NEOPLASMS</u>	1,975	3.1	60	0.46 (0.44-0.48)
Lymphoma	1,975	3.1	60	0.46 (0.44-0.48)
<u>GERM CELL TUMORS AND CYSTS</u>	397	0.6	16	0.09 (0.08-0.10)
Germ cell tumors, cysts and heterotopias	397	0.6	16	0.09 (0.08-0.10)
<u>TUMORS OF SELLAR REGION</u>	4,496	7.1	48	1.03 (1.00-1.06)
Pituitary	4,029	6.3	49	0.92 (0.89-0.95)
Craniopharyngioma	467	0.7	33	0.11 (0.10-0.12)
<u>LOCAL EXTENSIONS FROM REGIONAL TUMORS</u>	116	0.2	48	0.03 (0.02-0.03)
Chordoma/chondrosarcoma	116	0.2	48	0.03 (0.02-0.03)
<u>UNCLASSIFIED TUMORS</u>	3,864	6.1	68	0.91 (0.88-0.94)
Hemangioma	364	0.6	43	0.08 (0.07-0.09)
Neoplasm, unspecified	3,475	5.5	71	0.82 (0.79-0.85)
All other	25	0.0	48	0.01 (0.00-0.01)
TOTAL^c	63,698	100.0	57	14.80 (14.69-14.92)

^aRates are per 100,000 person-years.

^bIncludes data from 16 of the 18 registries listed in Table 5; North Dakota and West Virginia are excluded.

^cRefers to all brain tumors including histologies not presented in this table.

Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NOS, not otherwise specified; CI, 95% confidence interval.

TABLES

TABLE 9: PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR INCIDENCE RATES^a BY MAJOR HISTOLOGY GROUPINGS, HISTOLOGY AND GENDER, AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION, CBTRUS 1998-2002^b

HISTOLOGY	MALES		FEMALES	
	N	ADJUSTED RATE	N	ADJUSTED RATE
<u>TUMORS OF NEUROEPITHELIAL TISSUE</u>	15,527	7.67	12,249	5.35
Pilocytic astrocytoma	764	0.34	701	0.32
Diffuse astrocytoma (protoplasmic, fibrillary)	241	0.11	187	0.08
Anaplastic astrocytoma	1,151	0.56	878	0.38
Unique astrocytoma variants	195	0.09	137	0.06
Astrocytoma, NOS	1,116	0.54	878	0.38
Glioblastoma	7,391	3.86	5,552	2.39
Oligodendroglioma	817	0.38	742	0.33
Anaplastic oligodendroglioma	413	0.20	368	0.16
Ependymoma/anaplastic ependymoma	623	0.29	503	0.22
Ependymoma variants	194	0.09	118	0.05
Mixed glioma	407	0.19	315	0.14
Glioma malignant, NOS	850	0.42	818	0.35
Choroid plexus	91	0.04	103	0.04
Neuroepithelial	41	0.02	25	0.01
Benign and malignant neuronal/gliial, neuronal and mixed	514	0.23	430	0.19
Pineal parenchymal	50	0.02	69	0.03
Embryonal/primitive/medulloblastoma	669	0.29	425	0.19
<u>TUMORS OF CRANIAL AND SPINAL NERVES</u>	2,443	1.19	2,651	1.17
Nerve sheath, benign and malignant	2,442	1.19	2,650	1.17
<u>TUMORS OF MENINGES</u>	5,532	2.95	14,445	6.18
Meningioma	5,112	2.75	14,075	6.01
Other mesenchymal, benign and malignant	124	0.06	126	0.06
Hemangioblastoma	296	0.14	244	0.11
<u>LYMPHOMAS AND HEMOPOIETIC NEOPLASMS</u>	1,062	0.54	913	0.39
Lymphoma	1,062	0.54	913	0.39
<u>GERM CELL TUMORS AND CYSTS</u>	276	0.12	121	0.06
Germ cell tumors, cysts and heterotopias	276	0.12	121	0.06
<u>TUMORS OF SELLAR REGION</u>	2,142	1.05	2,353	1.03
Pituitary	1,904	0.94	2,124	0.93
Craniopharyngioma	238	0.11	229	0.10
<u>LOCAL EXTENSIONS FROM REGIONAL TUMORS</u>	68	0.03	48	0.02
Chordoma/chondrosarcoma	68	0.03	48	0.02
<u>UNCLASSIFIED TUMORS</u>	1,742	0.95	2,122	0.87
Hemangioma	165	0.08	199	0.09
Neoplasm, unspecified	1,563	0.86	1,912	0.78
All other	14	0.01	11	0.00
TOTAL^c	28,792	14.50	34,902	15.07

^aRates are per 100,000 person-years.

^bIncludes data from 16 of the 18 registries listed in Table 5; North Dakota and West Virginia are excluded.

^cRefers to all brain tumors including histologies not presented in this table.

Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NOS, not otherwise specified.

TABLE 9A: PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR (CONSENSUS CONFERENCE DEFINITION; OLFACTORY TUMORS OF THE NASAL CAVITY EXCLUDED) INCIDENCE RATES^a BY MAJOR HISTOLOGY GROUPINGS, HISTOLOGY, GENDER AND BEHAVIOR, AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION, CBTRUS 1998-2002^b

HISTOLOGY	MALIGNANT			
	MALES		FEMALES	
	N	ADJUSTED RATE	N	ADJUSTED RATE
<u>TUMORS OF NEUROEPITHELIAL TISSUE</u>	14,651	7.27	11,579	5.05
Pilocytic astrocytoma	764	0.34	701	0.32
Diffuse astrocytoma (protoplasmic, fibrillary)	241	0.11	187	0.08
Anaplastic astrocytoma	1,151	0.56	878	0.38
Unique astrocytoma variants	52	0.02	53	0.02
Astrocytoma, NOS	1,116	0.54	878	0.38
Glioblastoma	7,391	3.86	5,552	2.39
Oligodendroglioma	817	0.38	742	0.33
Anaplastic oligodendroglioma	413	0.20	368	0.16
Ependymoma/anaplastic ependymoma	623	0.29	503	0.22
Ependymoma variants	-	-	-	-
Mixed glioma	407	0.19	315	0.14
Glioma malignant, NOS	850	0.42	818	0.35
Choroid plexus	16	0.01	14	0.01
Neuroepithelial	39	0.02	25	0.01
Benign and malignant neuronal/glial, neuronal and mixed	65	0.03	65	0.03
Pineal parenchymal	38	0.02	55	0.02
Embryonal/primitive/medulloblastoma	668	0.29	425	0.19
<u>TUMORS OF CRANIAL AND SPINAL NERVES</u>	54	0.03	78	0.03
Nerve sheath, benign and malignant	54	0.03	78	0.03
<u>TUMORS OF MENINGES</u>	386	0.20	673	0.29
Meningioma	334	0.18	617	0.26
Other mesenchymal, benign and malignant	52	0.02	56	0.02
Hemangioblastoma	-	-	-	-
<u>LYMPHOMAS AND HEMOPOIETIC NEOPLASMS</u>	1,062	0.54	913	0.39
Lymphoma	1,062	0.54	913	0.39
<u>GERM CELL TUMORS AND CYSTS</u>	231	0.10	83	0.04
Germ cell tumors, cysts and heterotopias	231	0.10	83	0.04
<u>TUMORS OF SELLAR REGION</u>	21	0.01	28	0.01
Pituitary	21	0.01	28	0.01
Craniopharyngioma	-	-	-	-
<u>LOCAL EXTENSIONS FROM REGIONAL TUMORS</u>	65	0.03	45	0.02
Chordoma/chondrosarcoma	65	0.03	45	0.02
<u>UNCLASSIFIED TUMORS</u>	848	0.48	961	0.39
Hemangioma	-	-	-	-
Neoplasm, unspecified	832	0.47	951	0.38
All other	12	0.01	6	-
TOTAL^c	17,318	8.66	14,360	6.22

TABLES

TABLE 9A: (CONTINUED)

HISTOLOGY	NON-MALIGNANT			
	MALES		FEMALES	
	N	ADJUSTED RATE	N	ADJUSTED RATE
<u>TUMORS OF NEUROEPITHELIAL TISSUE</u>	782	0.35	617	0.27
Pilocytic astrocytoma	-	-	-	-
Diffuse astrocytoma (protoplasmic, fibrillary)	-	-	-	-
Anaplastic astrocytoma	-	-	-	-
Unique astrocytoma variants	143	0.07	84	0.04
Astrocytoma, NOS	-	-	-	-
Glioblastoma	-	-	-	-
Oligodendroglioma	-	-	-	-
Anaplastic oligodendroglioma	-	-	-	-
Ependymoma/anaplastic ependymoma	-	-	-	-
Ependymoma variants	194	0.08	118	0.05
Mixed glioma	-	-	-	-
Glioma malignant, NOS	-	-	-	-
Choroid plexus	75	0.03	89	0.04
Neuroepithelial	-	-	-	-
Benign and malignant neuronal/glial, neuronal and mixed	355	0.16	312	0.14
Pineal parenchymal	12	0.01	14	0.01
Embryonal/primitive/medulloblastoma	-	-	-	-
<u>TUMORS OF CRANIAL AND SPINAL NERVES</u>	2,389	1.16	2,573	1.13
Nerve sheath, benign and malignant	2,388	1.16	2,572	1.13
<u>TUMORS OF MENINGES</u>	5,146	2.75	13,772	5.89
Meningioma	4,778	2.57	13,458	5.75
Other mesenchymal, benign and malignant	72	0.03	70	0.03
Hemangioblastoma	296	0.14	244	0.11
<u>LYMPHOMAS AND HEMOPOIETIC NEOPLASMS</u>	-	-	-	-
Lymphoma	-	-	-	-
<u>GERM CELL TUMORS AND CYSTS</u>	45	0.02	38	0.02
Germ cell tumors, cysts and heterotopias	45	0.02	38	0.02
<u>TUMORS OF SELLAR REGION</u>	2,121	1.04	2,325	1.02
Pituitary	1,883	0.93	2,096	0.92
Craniopharyngioma	238	0.11	229	0.10
<u>LOCAL EXTENSIONS FROM REGIONAL TUMORS</u>	-	-	-	-
Chordoma/chondrosarcoma	-	-	-	-
<u>UNCLASSIFIED TUMORS</u>	894	0.47	1,161	0.48
Hemangioma	161	0.08	195	0.09
Neoplasm, unspecified	731	0.39	961	0.39
All other	-	-	-	-
TOTAL^c	11,380	5.79	20,489	8.82

^aRates are per 100,000 person-years.

^bIncludes data from 16 of the 18 registries listed in Table 5; North Dakota and West Virginia are excluded.

^cRefers to all brain tumors including histologies not presented in this table.

- Counts are not presented when fewer than 6 cases were reported for the specific histology category and rates are not presented when fewer than 10 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; NOS, not otherwise specified.

TABLE 10: PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR INCIDENCE RATES^a BY MAJOR HISTOLOGY GROUPINGS, HISTOLOGY AND RACE, AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION, CBTRUS 1998-2002^b

HISTOLOGY	WHITES		BLACKS	
	N	ADJUSTED RATE	N	ADJUSTED RATE
<u>TUMORS OF NEUROEPITHELIAL TISSUE</u>	25,242	6.84	1,658	3.48
Pilocytic astrocytoma	1,254	0.35	128	0.20
Diffuse astrocytoma (protoplasmic, fibrillary)	392	0.11	22	0.04
Anaplastic astrocytoma	1,869	0.50	112	0.24
Unique astrocytoma variants	289	0.08	29	0.05
Astrocytoma, NOS	1,797	0.49	130	0.27
Glioblastoma	12,040	3.25	651	1.59
Oligodendroglioma	1,415	0.38	68	0.13
Anaplastic oligodendroglioma	705	0.19	44	0.09
Ependymoma/anaplastic ependymoma	1,011	0.27	63	0.12
Ependymoma variants	286	0.08	12	0.02
Mixed glioma	662	0.18	28	0.06
Glioma malignant, NOS	1,439	0.39	152	0.29
Choroid plexus	170	0.05	11	0.02
Neuroepithelial	58	0.02	7	-
Benign and malignant neuronal/glial, neuronal and mixed	814	0.22	86	0.15
Pineal parenchymal	97	0.03	18	0.03
Embryonal/primitive/medulloblastoma	944	0.26	97	0.15
<u>TUMORS OF CRANIAL AND SPINAL NERVES</u>	4,481	1.21	196	0.43
Nerve sheath, benign and malignant	4,480	1.21	195	0.42
<u>TUMORS OF MENINGES</u>	17,158	4.63	1,828	4.58
Meningioma	16,486	4.44	1,762	4.44
Other mesenchymal, benign and malignant	214	0.06	20	0.04
Hemangioblastoma	458	0.12	46	0.09
<u>LYMPHOMAS AND HEMOPOIETIC NEOPLASMS</u>	1,654	0.45	246	0.51
Lymphoma	1,654	0.45	246	0.51
<u>GERM CELL TUMORS AND CYSTS</u>	336	0.09	31	0.05
Germ cell tumors, cysts and heterotopias	336	0.09	31	0.05
<u>TUMORS OF SELLAR REGION</u>	3,547	0.96	544	1.18
Pituitary	3,184	0.86	477	1.06
Craniopharyngioma	363	0.10	67	0.13
<u>LOCAL EXTENSIONS FROM REGIONAL TUMORS</u>	105	0.03	-	-
Chordoma/chondrosarcoma	105	0.03	-	-
<u>UNCLASSIFIED TUMORS</u>	3,355	0.90	318	0.78
Hemangioma	335	0.09	18	0.03
Neoplasm, unspecified	2,996	0.81	300	0.75
All other	24	0.01	-	-
TOTAL^c	55,878	15.10	4,826	11.01

^aRates are per 100,000 person-years.

^bIncludes data from 16 of the 18 registries listed in Table 5; North Dakota and West Virginia are excluded.

^cRefers to all brain tumors including histologies not presented in this table.

- Counts are not presented when fewer than 6 cases were reported for the specific histology category and rates are not presented when fewer than 10 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; NOS, not otherwise specified.

TABLES

TABLE 11: PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR INCIDENCE RATES^a BY MAJOR HISTOLOGY GROUPINGS, HISTOLOGY, RACE, AND HISPANIC ETHNICITY, AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION, CBTRUS 1998-2002, 16 REGISTRIES^b

HISTOLOGY	HISPANICS (OF ANY RACE)		WHITE HISPANICS	
	N	ADJUSTED RATE	N	ADJUSTED RATE
<u>TUMORS OF NEUROEPITHELIAL TISSUE</u>	2,629	4.85	2,460	4.93
Pilocytic astrocytoma	195	0.22	174	0.21
Diffuse astrocytoma	40	0.07	38	0.06
Anaplastic astrocytoma	179	0.33	169	0.34
Unique astrocytoma variants	40	0.06	38	0.06
Astrocytoma, NOS	212	0.36	200	0.37
Glioblastoma	899	2.24	862	2.32
Oligodendroglioma	167	0.28	153	0.28
Anaplastic oligodendroglioma	63	0.12	57	0.12
Ependymoma/anaplastic ependymoma	163	0.23	151	0.23
Ependymoma variants	35	0.06	31	0.06
Mixed glioma	60	0.10	51	0.10
Glioma malignant, NOS	193	0.32	178	0.32
Choroid plexus	40	0.04	39	0.05
Neuroepithelial	6	-	6	-
Benign and malignant neuronal/glial, neuronal and mixed	113	0.14	102	0.14
Pineal parenchymal	16	0.03	14	0.02
Embryonal/primitive/medulloblastoma	208	0.23	197	0.24
<u>TUMORS OF CRANIAL AND SPINAL NERVES</u>	392	0.76	350	0.74
Nerve sheath, benign and malignant	392	0.76	350	0.74
<u>TUMORS OF MENINGES</u>	1,891	4.75	1,732	4.67
Meningioma	1,807	4.61	1,656	4.54
Other mesenchymal, benign and malignant	30	0.05	28	0.05
Hemangioblastoma	54	0.09	48	0.09
<u>LYMPHOMAS AND HEMOPOIETIC NEOPLASMS</u>	272	0.57	246	0.55
Lymphoma	272	0.57	246	0.55
<u>GERM CELL TUMORS</u>	80	0.09	76	0.09
Germ cell tumors, cysts, and heterotopias	80	0.09	76	0.09
<u>TUMORS OF SELLAR REGION</u>	505	0.89	441	0.84
Pituitary	443	0.80	385	0.75
Craniopharyngioma	62	0.09	56	0.09
<u>LOCAL EXTENSIONS FROM REGIONAL TUMORS</u>	21	0.03	21	0.04
Chordoma/chondrosarcoma	21	0.03	21	0.04
<u>UNCLASSIFIED TUMORS</u>	439	1.02	412	1.03
Hemangioma	51	0.08	50	0.08
Neoplasm, unspecified	384	0.94	358	0.94
All other	-	-	-	-
TOTAL^d	6,229	12.96	5,738	12.89

TABLE 11 (CONTINUED)

HISTOLOGY	NON-HISPANICS ^c (OF ANY RACE)		WHITE NON-HISPANICS		BLACK NON-HISPANICS	
	N	ADJUSTED RATE	N	ADJUSTED RATE	N	ADJUSTED RATE
<u>TUMORS OF NEUROEPITHELIAL TISSUE</u>	25,147	6.66	22,782	7.18	1,608	3.60
Pilocytic astrocytoma	1,270	0.36	1,080	0.39	125	0.21
Diffuse astrocytoma	388	0.10	354	0.11	21	0.04
Anaplastic astrocytoma	1,850	0.49	1,700	0.53	109	0.25
Unique astrocytoma variants	292	0.08	251	0.08	29	0.06
Astrocytoma, NOS	1,782	0.47	1,597	0.51	127	0.28
Glioblastoma	12,044	3.13	11,178	3.35	633	1.63
Oligodendroglioma	1,392	0.37	1,262	0.41	65	0.13
Anaplastic oligodendroglioma	718	0.19	648	0.20	41	0.09
Ependymoma/anaplastic ependymoma	963	0.26	860	0.28	60	0.12
Ependymoma variants	277	0.07	255	0.08	11	0.02
Mixed glioma	662	0.17	611	0.20	26	0.06
Glioma malignant, NOS	1,475	0.40	1,261	0.41	148	0.31
Choroid plexus	154	0.04	131	0.04	11	0.02
Neuroepithelial	60	0.02	52	0.02	7	-
Benign and malignant neuronal/glial, neuronal and mixed	831	0.23	712	0.24	83	0.16
Pineal parenchymal	103	0.03	83	0.03	17	0.03
Embryonal/primitive/medulloblastoma	886	0.25	747	0.27	95	0.17
<u>TUMORS OF CRANIAL AND SPINAL NERVES</u>	4,702	1.23	4,131	1.28	190	0.44
Nerve sheath, benign and malignant	4,700	1.23	4,130	1.28	189	0.43
<u>TUMORS OF MENINGES</u>	18,089	4.71	15,426	4.65	1,791	4.71
Meningioma	17,383	4.53	14,830	4.46	1,728	4.58
Other mesenchymal, benign and malignant	220	0.06	186	0.06	19	0.04
Hemangioblastoma	486	0.13	410	0.13	44	0.09
<u>LYMPHOMAS AND HEMOPOIETIC NEOPLASMS</u>	1,703	0.45	1,408	0.43	237	0.52
Lymphoma	1,703	0.45	1,408	0.43	237	0.52
<u>GERM CELL TUMORS</u>	317	0.09	260	0.09	30	0.05
Germ cell tumors, cysts, and heterotopias	317	0.09	260	0.09	30	0.05
<u>TUMORS OF SELLAR REGION</u>	3,991	1.05	3,106	0.98	531	1.23
Pituitary	3,586	0.94	2,799	0.88	466	1.09
Craniopharyngioma	405	0.11	307	0.10	65	0.13
<u>LOCAL EXTENSIONS FROM REGIONAL TUMORS</u>	95	0.03	84	0.03	-	-
Chordoma/chondrosarcoma	95	0.03	84	0.03	-	-
<u>UNCLASSIFIED TUMORS</u>	3,425	0.90	2,943	0.89	312	0.81
Hemangioma	313	0.08	285	0.09	18	0.03
Neoplasm, unspecified	3,091	0.81	2,638	0.79	294	0.77
All other	21	0.01	20	0.01	-	-
TOTAL^d	57,469	15.11	50,140	15.52	4,704	11.36

^aRates are per 100,000 person-years.

^bIncludes data from 16 of the 18 registries listed in Table 5; North Dakota and West Virginia are excluded.

^cHispanic is not mutually exclusive of race.

^dRefers to all brain tumors including histologies not presented in this table.

- Counts are not presented when fewer than 6 cases were reported for the specific histology category and rates are not presented when fewer than 10 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; NOS, not otherwise specified.

TABLES

TABLE 12: SELECTED PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR AGE-SPECIFIC INCIDENCE RATES^a BY AGE AT DIAGNOSIS, CBTRUS 1998-2002^b

HISTOLOGY	AGE AT DIAGNOSIS								
	0-14	0-19	20-34	35-44	45-54	55-64	65-74	75-84	85+
<u>TUMORS OF NEUROEPITHELIAL TISSUE</u>	3.57	3.27	3.05	4.46	6.99	12.02	17.30	18.73	10.48
Pilocytic astrocytoma	0.92	0.83	0.23	0.12	0.11	0.07	0.05	0.05	-
Diffuse astrocytoma	0.05	0.05	0.08	0.10	0.11	0.16	0.23	0.18	-
Anaplastic astrocytoma	0.08	0.09	0.35	0.48	0.61	0.92	1.12	1.09	0.36
Unique astrocytoma variants	0.08	0.08	0.06	0.06	0.09	0.11	0.10	0.06	-
Astrocytoma, NOS	0.25	0.25	0.35	0.46	0.46	0.56	0.93	1.33	0.63
Glioblastoma	0.13	0.13	0.35	1.24	3.59	8.01	12.70	13.45	7.42
Oligodendroglioma	0.07	0.09	0.40	0.61	0.51	0.50	0.33	0.24	-
Anaplastic oligodendroglioma	0.02	0.02	0.14	0.25	0.30	0.34	0.33	0.26	-
Ependymoma/anaplastic ependymoma	0.28	0.24	0.18	0.27	0.35	0.32	0.27	0.27	0.14
Ependymoma variants	0.02	0.04	0.09	0.08	0.09	0.10	0.07	-	-
Mixed glioma	0.02	0.03	0.18	0.25	0.24	0.27	0.20	0.15	-
Glioma malignant, NOS	0.49	0.41	0.18	0.21	0.26	0.35	0.70	1.33	1.49
Embryonal/primitive/medulloblastoma	0.74	0.62	0.17	0.10	0.04	0.06	-	-	-
<u>TUMORS OF CRANIAL AND SPINAL NERVES</u>	0.10	0.12	0.56	1.25	2.17	2.80	2.69	2.11	0.82
Nerve sheath, benign and malignant	0.10	0.12	0.56	1.25	2.16	2.80	2.69	2.10	0.82
<u>TUMORS OF MENINGES</u>	0.13	0.17	0.93	3.07	6.06	9.45	14.97	21.01	24.92
Meningioma	0.07	0.11	0.78	2.85	5.82	9.14	14.65	20.80	24.64
Hemangioblastoma	0.01	0.02	0.12	0.16	0.18	0.23	0.22	0.14	0.16
<u>LYMPHOMAS AND HEMOPOIETIC NEOPLASMS</u>	0.02	0.02	0.17	0.42	0.50	0.94	1.66	1.80	0.82
Lymphoma	0.02	0.02	0.17	0.42	0.50	0.94	1.66	1.80	0.82
<u>GERM CELL TUMORS</u>	0.17	0.20	0.10	0.02	0.03	0.02	-	-	-
Germ cell	0.17	0.20	0.10	0.02	0.03	0.02	-	-	-
<u>TUMORS OF SELLAR REGION</u>	0.17	0.25	0.86	1.12	1.43	1.78	2.24	1.88	1.24
Pituitary	0.03	0.12	0.78	1.04	1.34	1.65	2.08	1.78	1.18
Craniopharyngioma	0.14	0.13	0.08	0.09	0.09	0.13	0.15	0.10	-
<u>LOCAL EXTENSIONS FROM REGIONAL TUMORS</u>	-	0.01	0.01	0.04	0.03	0.04	0.07	0.05	0.03
<u>UNCLASSIFIED TUMORS</u>	0.23	0.24	0.32	0.50	0.67	1.07	2.17	4.75	10.04
TOTAL^c	4.40	4.28	6.01	10.89	17.88	28.11	41.13	50.33	48.34

^aRates are per 100,000 person-years.

^bIncludes data from 16 of the 18 registries listed in Table 5; North Dakota and West Virginia are excluded.

^cRefers to all brain tumors including histologies not presented in this table.

- Rates are not presented when fewer than 10 cases were reported for the specific histology category. The suppressed cases are included in the rates for Totals.

Abbreviations: CBTRUS, Central Brain Tumor Registry of the United States; NOS, not otherwise specified.

TABLE 13: SELECTED CHILDHOOD PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR INCIDENCE RATES^a BY MAJOR HISTOLOGY GROUPINGS, HISTOLOGY AND GENDER (AGES 0-19), AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION, CBTRUS 1998-2002^b

HISTOLOGY	MALES		FEMALES		TOTAL	
	N	ADJUSTED RATE	N	ADJUSTED RATE	N	ADJUSTED RATE
<u>TUMORS OF NEUROEPITHELIAL TISSUE</u>	2,269	3.47	1,899	3.05	4,168	3.26
Pilocytic astrocytoma	551	0.84	505	0.81	1056	0.83
Anaplastic astrocytoma	62	0.10	50	0.08	112	0.09
Astrocytoma, NOS	172	0.26	142	0.23	314	0.25
Glioblastoma	94	0.14	66	0.11	160	0.13
Ependymoma/anaplastic ependymoma	166	0.25	138	0.22	304	0.24
Glioma malignant, NOS	264	0.40	263	0.42	527	0.41
Benign and malignant neuronal/glial, neuronal and mixed	181	0.28	180	0.29	361	0.28
Embryonal/primitive/medulloblastoma	493	0.75	300	0.48	793	0.62
<u>TUMORS OF CRANIAL AND SPINAL NERVES</u>	85	0.13	69	0.11	154	0.12
<u>TUMORS OF MENINGES</u>	111	0.17	105	0.17	216	0.17
<u>LYMPHOMAS AND HEMOPOIETIC NEOPLASMS</u>	17	0.03	12	0.02	29	0.02
<u>GERM CELL TUMORS AND CYSTS</u>	165	0.25	85	0.14	250	0.20
<u>TUMORS OF SELLAR REGION</u>	111	0.17	210	0.34	321	0.25
Pituitary	30	0.05	128	0.21	158	0.12
Craniopharyngioma	81	0.12	82	0.13	163	0.13
<u>LOCAL EXTENSIONS FROM REGIONAL TUMORS</u>	7	-	9	-	16	0.01
<u>UNCLASSIFIED TUMORS</u>	173	0.26	128	0.21	301	0.24
TOTAL^c	2,938	4.49	2,517	4.04	5,455	4.28

^aRates are per 100,000 person-years.

^bIncludes data from 16 of the 18 registries listed in Table 5; North Dakota and West Virginia are excluded.

^cRefers to all childhood brain tumors, including histologies not presented in this table.

- Counts are not presented when fewer than 6 cases were reported for the specific histology category and rates are not presented when fewer than 10 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; NOS, not otherwise specified.

TABLES

TABLE 14: CHILDHOOD PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR INCIDENCE RATES^a BY MAJOR HISTOLOGY GROUPINGS AND RACE (AGES 0-19), AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION, CBTRUS 1998-2002^b

HISTOLOGY GROUPING	WHITES		BLACKS	
	N	ADJUSTED RATE	N	ADJUSTED RATE
Tumors of Neuroepithelial Tissue	3,509	3.43	426	2.28
Tumors of Cranial and Spinal Nerves	130	0.13	9	-
Tumors of the Meninges	175	0.17	21	0.11
Lymphomas and Hemopoietic Neoplasms	25	0.02	-	-
Germ Cell Tumors and Cysts	205	0.20	19	0.10
Tumors of the Sellar Region	246	0.24	37	0.20
Local Extensions from Regional Tumors	14	0.01	-	-
Unclassified Tumors	251	0.25	31	0.17
TOTAL	4,555	4.46	547	2.93
MALES	2,464	4.70	296	3.12
FEMALES	2,091	4.20	251	2.73

^aRates are per 100,000 person-years.

^bIncludes data from 16 of the 18 registries listed in Table 5; North Dakota and West Virginia are excluded.

- Counts are not presented when fewer than 6 cases were reported for the specific histology category and rates are not presented when fewer than 10 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; NOS, not otherwise specified.

TABLE 15: SELECTED CHILDHOOD PRIMARY (MALIGNANT AND NON-MALIGNANT) BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR AGE-SPECIFIC INCIDENCE RATES^a (AGES 0-19), BY AGE AT DIAGNOSIS, CBTRUS 1998-2002^b

HISTOLOGY	Age at Diagnosis								0-19		0-14	
	0-4		5-9		10-14		15-19		N	RATE	N	RATE
TUMORS OF	1,323	4.25	1,161	3.60	937	2.89	747	2.35	4,168	3.27	3,421	3.57
NEUROEPITHELIAL TISSUE												
Piloicytic astrocytoma	281	0.90	328	1.02	273	0.84	174	0.55	1,056	0.83	882	0.92
Anaplastic astrocytoma	19	0.06	32	0.10	25	0.08	36	0.11	112	0.09	76	0.08
Astrocytoma, NOS	82	0.26	86	0.27	73	0.23	73	0.23	314	0.25	241	0.25
Glioblastoma	30	0.10	43	0.13	47	0.15	40	0.13	160	0.13	120	0.13
Ependymoma/anaplastic ependymoma	141	0.45	72	0.22	59	0.18	32	0.10	304	0.24	272	0.28
Glioma malignant, NOS	186	0.60	184	0.57	98	0.30	59	0.19	527	0.41	468	0.49
Benign and malignant neuronal/glial, neuronal and mixed	121	0.39	56	0.17	83	0.26	101	0.32	361	0.28	260	0.27
Embryonal/primitive/medulloblastoma	318	1.02	247	0.77	145	0.45	83	0.26	793	0.62	710	0.74
TUMORS OF CRANIAL AND SPINAL NERVES	25	0.08	30	0.09	36	0.11	63	0.20	154	0.12	91	0.10
TUMORS OF MENINGES	34	0.11	36	0.11	51	0.16	95	0.30	216	0.17	121	0.13
LYMPHOMAS AND HEMOPOIETIC NEOPLASMS	6	-	-	-	9	-	11	0.03	29	0.02	18	0.02
GERM CELL TUMORS	35	0.11	45	0.14	86	0.27	84	0.26	250	0.20	166	0.17
TUMORS OF SELLAR REGION	30	0.10	62	0.19	71	0.22	158	0.50	321	0.25	163	0.17
Pituitary	-	-	7	-	25	0.08	125	0.39	158	0.12	33	0.03
Craniopharyngioma	29	0.09	55	0.17	46	0.14	33	0.10	163	0.13	130	0.14
LOCAL EXTENSIONS FROM REGIONAL TUMORS	-	-	-	-	-	-	7	-	16	0.01	9	-
UNCLASSIFIED TUMORS	91	0.29	59	0.18	75	0.23	76	0.24	301	0.24	225	0.23
TOTAL^c	1,546	4.96	1,400	4.34	1,268	3.92	1,241	3.90	5,455	4.28	4,214	4.40

^aRates are per 100,000 person-years.

^bIncludes data from 16 of the 18 registries listed in Table 5; North Dakota and West Virginia are excluded.

^cRefers to all childhood brain tumors, including histologies not presented in this table.

- Counts are not presented when fewer than 6 cases were reported for the specific histology category and rates are not presented when fewer than 10 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; NOS, not otherwise specified.

TABLES

TABLE 16: PRIMARY MALIGNANT BRAIN AND OTHER NERVOUS SYSTEM TUMOR INCIDENCE AND MORTALITY RATES^a BY STATE, AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION^b

STATE	INCIDENCE					MORTALITY				
	YEARS	MALES		FEMALES		YEARS	MALES		FEMALES	
		N	RATE	N	RATE		N	RATE	N	RATE
Alabama	1998-02	779	7.6	682	5.5	1998-02	569	5.7	504	3.9
Alaska	1998-02	97	7.2	70	5.6	1998-02	51	4.5	40	3.4
Arizona	1998-02	890	7.3	724	5.4	1998-02	601	5.0	481	3.5
Arkansas	1998-02	448	7.0	398	5.4	1998-02	419	6.6	366	4.6
California	1998-02	5,352	7.2	4,296	5.1	1998-02	3,926	5.6	3,092	3.7
Colorado	1998-02	779	8.2	583	5.6	1998-02	456	5.2	378	3.7
Connecticut	1998-02	705	8.7	560	5.9	1998-02	431	5.4	337	3.3
Delaware	1998-02	133	7.3	129	6.1	1998-02	94	5.2	88	4.0
District of Columbia	1998-02	92	7.2	72	4.9	1998-02	58	5.0	40	2.5
Florida	1998-02	3,330	7.9	2,742	5.6	1998-02	2,435	5.6	1,882	3.6
Georgia	1998-02	1,272	7.3	1,040	5.2	1998-02	814	5.0	625	3.2
Hawaii	1998-02	155	5.2	124	3.9	1998-02	100	3.4	70	2.1
Idaho	1998-02	305	10.1	197	6.2	1998-02	199	6.9	131	4.2
Illinois	1998-02	2,043	7.3	1,768	5.4	1998-02	1,390	5.2	1,134	3.4
Indiana	1998-02	1,056	7.6	934	5.8	1998-02	780	5.8	669	4.0
Iowa	1998-02	588	8.3	504	6.1	1998-02	454	6.4	368	4.2
Kansas	1998-02	-	-	-	-	1998-02	378	6.2	322	4.3
Kentucky	1998-02	704	7.5	634	5.9	1998-02	545	6.0	437	3.9
Louisiana	1998-02	692	7.2	574	4.9	1998-02	516	5.5	431	3.7
Maine	1998-02	302	9.5	238	6.6	1998-02	199	6.2	172	4.5
Maryland	1998-02	904	7.6	761	5.4	1998-02	589	5.1	458	3.2
Massachusetts	1998-02	1,264	8.6	1,115	6.2	1998-02	829	5.7	653	3.5
Michigan	1998-02	1,941	8.5	1,532	5.8	1998-02	1,317	5.9	1,022	3.8
Minnesota	1998-02	963	8.4	704	5.6	1998-02	705	6.4	515	4.0
Mississippi	1998-02	-	-	-	-	1998-02	425	7.1	340	4.4
Missouri	1998-02	1,082	8.2	923	5.9	1998-02	736	5.7	653	4.0
Montana	1998-02	181	8.0	159	6.5	1998-02	120	5.2	114	4.5
Nebraska	1998-02	351	8.7	257	5.4	1998-02	238	6.0	218	4.5
Nevada	1998-02	363	7.6	255	5.2	1998-02	218	4.7	151	3.1
New Hampshire	1998-02	232	8.0	194	6.0	1998-02	191	6.7	132	4.0
New Jersey	1998-02	1,605	8.2	1,380	5.9	1998-02	913	4.7	777	3.2
New Mexico	1998-02	280	6.7	217	4.7	1998-02	180	4.4	139	3.0
New York	1998-02	3,623	8.3	3,225	6.1	1998-02	1,974	4.6	1,712	3.1
North Carolina	1998-02	1,356	7.4	1,154	5.4	1998-02	979	5.6	851	3.9
North Dakota	1998-02	109	7.0	88	5.1	1998-02	99	6.3	96	5.3
Ohio	1998-02	2,063	7.8	1,744	5.5	1998-02	1,500	5.8	1,190	3.7
Oklahoma	1998-02	662	8.2	566	6.1	1998-02	468	5.9	375	3.9
Oregon	1998-02	724	8.8	513	5.6	1998-02	534	6.5	408	4.3
Pennsylvania	1998-02	2,384	7.9	2,097	5.8	1998-02	1,589	5.2	1,395	3.6
Rhode Island	1998-02	209	8.4	194	6.4	1998-02	159	6.4	140	4.3
South Carolina	1998-02	641	7.0	546	5.1	1998-02	526	6.0	442	4.0
South Dakota	2001-02	60	8.1	25	3.0	1998-02	130	7.2	114	5.1
Tennessee	1998-02	-	-	-	-	1998-02	838	6.5	681	4.3
Texas	1998-02	3,479	7.8	2,892	5.7	1998-02	2,376	5.8	1,902	3.9
Utah	1998-02	377	8.5	285	5.8	1998-02	236	5.9	167	3.8
Vermont	1998-02	-	-	-	-	1998-02	82	5.6	56	3.3
Virginia	1998-02	1,075	6.6	827	4.5	1998-02	760	4.9	618	3.3
Washington	1998-02	1,234	9.1	970	6.5	1998-02	922	7.1	699	4.6
West Virginia	1998-02	351	7.7	301	5.7	1998-02	241	5.2	204	3.6
Wisconsin	1998-02	1,083	8.6	891	6.1	1998-02	737	5.9	601	4.0
Wyoming	1998-02	114	9.6	59	4.8	1998-02	61	5.2	48	3.8
United States	1998-02	39,799 ^c	7.9 ^c	33,025 ^c	5.6 ^c	1998-02	35,087	5.6	28,438	3.7

^aRates are per 100,000 population.

^bSource: Cancer Incidence in North America, 1998-2002. Volumes One, Two, and Three. North American Association of Central Cancer Registries, Inc., April 2005.

^cIncludes data from 42 central registries (36 states, 5 metropolitan areas, and the District of Columbia) covering approximately 77% of the total United States population.

- Not available

TABLE 17: PRIMARY BRAIN AND OTHER NERVOUS SYSTEM TUMORS, ESTIMATED NUMBER OF CASES^{a,b} BY STATE, 2005; PRIMARY MALIGNANT BRAIN AND OTHER NERVOUS SYSTEM TUMORS, ESTIMATED NUMBER OF CASES^{a,b} AND DEATHS^{b,c} BY STATE, 2005

STATE	YEAR	All Brain Tumors		
		ESTIMATED CASES	ESTIMATED CASES	ESTIMATED DEATHS
Alabama	2005	720	360	210
Alaska	2005	80	40	-
Arizona	2005	810	400	240
Arkansas	2005	450	220	160
California	2005	4,700	2,330	1,460
Colorado	2005	670	330	180
Connecticut	2005	530	260	140
Delaware	2005	120	60	-
District of Columbia	2005	80	40	-
Florida	2005	2,890	1,410	930
Georgia	2005	1,190	590	300
Hawaii	2005	200	100	-
Idaho	2005	220	110	70
Illinois	2005	1,830	900	480
Indiana	2005	950	470	320
Iowa	2005	480	230	160
Kansas	2005	420	210	130
Kentucky	2005	640	320	160
Louisiana	2005	670	330	190
Maine	2005	210	100	80
Maryland	2005	810	400	200
Massachusetts	2005	980	480	280
Michigan	2005	1,480	730	450
Minnesota	2005	760	370	250
Mississippi	2005	440	210	170
Missouri	2005	900	440	260
Montana	2005	160	80	50
Nebraska	2005	270	130	90
Nevada	2005	330	160	90
New Hampshire	2005	190	90	70
New Jersey	2005	1,300	640	320
New Mexico	2005	290	140	70
New York	2005	2,780	1,370	720
North Carolina	2005	1,290	630	340
North Dakota	2005	110	50	-
Ohio	2005	1,790	880	530
Oklahoma	2005	560	270	170
Oregon	2005	590	290	190
Pennsylvania	2005	2,030	990	520
Rhode Island	2005	160	80	50
South Carolina	2005	630	310	180
South Dakota	2005	130	60	50
Tennessee	2005	930	450	320
Texas	2005	3,010	1,500	910
Utah	2005	310	160	90
Vermont	2005	100	50	-
Virginia	2005	1,100	540	270
Washington	2005	960	470	350
West Virginia	2005	320	150	90
Wisconsin	2005	850	420	260
Wyoming	2005	90	40	-
United States	2005	43,800	21,690	12,760

^aSource: CBTRUS, 1998-2002 data.

^bRounded to the nearest 10.

^cSource: Cancer Facts & Figures 2005. American Cancer Society, 2005.

- Estimate is less than 50 deaths.

TABLES

TABLE 18: FIVE-YEAR RELATIVE SURVIVAL RATES^a FOR MALIGNANT BRAIN AND CENTRAL NERVOUS SYSTEM TUMORS BY SITE^b AND GENDER, SEER 1973-2002

ICDO CODE	SITE ^{b,c}	MALES		FEMALES		TOTAL	
		N	5-YR	N	5-YR	N	5-YR
C71.1-C71.4	Frontal, temporal, parietal, and occipital lobes of the brain	11,738	22.2	8,707	24.1	20,445	23.0
C71.0	Cerebrum	1,331	19.9	1,036	22.6	2,367	21.1
C71.5	Ventricle	442	49.6	313	51.6	755	50.4
C71.6	Cerebellum	1,439	63.0	1,048	68.6	2,487	65.3
C71.7	Brain stem	887	40.4	786	39.0	1,673	39.7
C71.8-C71.9	Other brain	6,073	17.7	4,642	20.7	10,715	19.0
C72.0-C72.1	Spinal cord and cauda equina	694	72.2	532	70.3	1,226	71.4
C72.2-C72.5	Cranial nerves	175	85.4	164	83.6	339	84.5
C72.8-C72.9	Other nervous system	271	26.3	154	38.8	425	30.7
C70.0-C70.9	Meninges (cerebral and spinal)	308	49.5	344	64.7	652	57.5
C75.1-C75.2	Pituitary	65	77.5	82	81.0	147	79.2
C75.3	Pineal	270	65.6	72	57.5	342	64.0
C30.0 (9522:9523)	Olfactory tumors of the nasal cavity	80	71.9	70	78.7	150	76.1

^aThe 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.

^bThe sites referred to in this table are loosely based on the categories and site codes defined in the SEER Site/Histology Validation List.

^cIn contrast to survival estimates reported in previous editions of the CBTRUS statistical report, brain lymphomas are included.

Abbreviation: SEER, Surveillance, Epidemiology, and End Results.

TABLE 19: ONE-, TWO-, THREE-, FOUR-, FIVE-, AND TEN-YEAR RELATIVE SURVIVAL RATES^{a,b} FOR SELECTED MALIGNANT BRAIN AND CENTRAL NERVOUS SYSTEM TUMORS^c, SEER 1973-2002

HISTOLOGY	NO. OF CASES	1-YR	2-YR	3-YR	4-YR	5-YR	10-YR
Pilocytic astrocytoma	1,198	95.7	94.2	93.3	91.9	91.3	89.3
Diffuse astrocytoma	727	73.9	61.8	55.2	50.6	46.9	38.7
Anaplastic astrocytoma	2,294	60.3	44.0	37.1	32.6	29.4	22.2
Astrocytoma, NOS	7,277	59.8	47.3	42.6	39.7	37.1	31.1
Glioblastoma	15,793	29.3	8.7	5.1	3.8	3.3	2.3
Oligodendroglioma	1,868	89.7	83.4	79.0	74.2	70.5	53.9
Anaplastic oligodendroglioma	380	76.4	59.0	53.9	46.5	40.1	30.1
Ependymoma/anaplastic ependymoma	1,225	87.6	81.4	75.4	72.7	70.6	62.5
Mixed glioma	799	84.7	73.3	66.6	60.5	57.1	44.6
Glioma malignant, NOS	2,687	49.7	37.3	34.3	32.2	30.6	27.0
Neuroepithelial	242	60.5	49.1	43.8	41.2	40.3	33.7
Malignant neuronal/glia, neuronal and mixed	318	83.4	71.6	67.2	63.6	62.5	54.9
Embryonal/primitive/medulloblastoma	1,452	80.6	71.0	64.8	59.4	55.7	47.1
Lymphoma	2,499	36.6	26.8	22.1	19.3	16.9	11.4
TOTAL: ALL BRAIN AND CNS^{c,d}	41,723	51.5	37.3	33.2	30.8	29.1	25.3

^aThe 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.

^bRates are an estimate of the percentage of patients alive at one, two, three, four, five, and ten years, respectively.

^cIn contrast to survival estimates reported in previous editions of the CBTRUS statistical report, brain lymphomas, olfactory tumors of the nasal cavity, and malignant tumors of the pituitary and pineal glands are included.

^dIncludes histologies not listed in this table.

Abbreviations: SEER, Surveillance, Epidemiology, and End Results; NOS, not otherwise specified.

TABLE 20: ONE-, TWO-, THREE-, FOUR-, FIVE, AND TEN-YEAR RELATIVE SURVIVAL RATES^{a,b} FOR SELECTED MALIGNANT BRAIN AND CENTRAL NERVOUS SYSTEM TUMORS^c BY AGE GROUPS, SEER 1973-2002

HISTOLOGY	AGE GROUP	# CASES	1-YR	2-YR	3-YR	4-YR	5-YR	10-YR
Pilocytic astrocytoma	0-14	700	97.5	96.7	96.3	94.9	94.3	92.7
	0-19	839	97.3	96.7	96.2	94.9	94.2	93.0
	20-44	269	93.9	91.4	89.6	88.2	87.8	83.1
	45-54	49	91.7	87.2	81.9	79.3	76.5	63.0
	55-64	18	d	d	d	d	d	d
	65-74	16	d	d	d	d	d	d
	75+	7	d	d	d	d	d	d
	Total	1,198						
Diffuse astrocytoma	0-14	111	92.7	85.0	81.9	81.9	80.9	79.8
	0-19	139	92.7	86.6	83.4	83.4	82.6	81.9
	20-44	295	89.9	81.9	73.2	63.6	57.0	39.2
	45-54	94	72.4	51.4	41.8	39.4	36.9	20.4
	55-64	87	46.3	21.7	15.9	13.7	10.1	7.7
	65-74	83	30.5	16.7	d	d	d	d
	75+	29	28.2	d	d	d	d	d
	Total	727						
Anaplastic astrocytoma	0-14	132	72.2	57.4	52.3	48.7	48.7	44.8
	0-19	176	75.6	59.0	54.6	50.7	50.7	45.0
	20-44	880	85.0	71.4	62.0	54.2	47.9	32.2
	45-54	368	64.3	44.0	32.8	27.3	25.7	18.9
	55-64	330	44.3	19.4	13.3	10.1	5.3	3.0
	65-74	353	24.4	6.4	3.8	3.2	3.2	d
	75+	187	13.4	4.1	2.2	1.6	d	d
	Total	2,294						
Astrocytoma, NOS	0-14	891	87.4	82.2	80.0	78.3	77.8	74.4
	0-19	1,162	87.7	81.8	79.1	77.6	76.6	73.2
	20-44	2,162	86.8	76.0	68.7	61.8	55.0	38.4
	45-54	968	62.9	41.3	33.4	29.4	27.0	18.0
	55-64	1,185	40.0	20.0	15.0	12.7	11.0	6.7
	65-74	1,191	22.3	9.1	6.2	5.6	5.0	2.5
	75+	609	12.8	5.8	4.5	4.1	3.8	d
	Total	7,277						
Glioblastoma	0-14	181	47.5	24.4	20.0	18.8	17.5	14.6
	0-19	271	50.9	27.9	21.5	19.8	19.0	15.6
	20-44	1,869	60.0	29.8	20.7	16.0	13.3	8.7
	45-54	2,632	42.2	11.6	5.8	3.8	3.3	1.6
	55-64	4,075	31.3	6.0	2.6	1.6	1.3	0.5
	65-74	4,307	16.8	2.7	1.0	0.5	0.4	0.1
	75+	2,639	8.1	1.4	0.7	0.5	0.5	0.3
	Total	15,793						
Oligodendroglioma	0-14	116	93.9	91.0	90.1	89.1	88.0	81.2
	0-19	186	93.5	88.8	87.0	86.3	85.7	81.4
	20-44	957	95.8	92.3	88.5	84.4	80.8	62.8
	45-54	335	91.2	83.7	77.5	71.3	66.3	40.0
	55-64	223	81.8	67.1	58.6	48.5	44.7	28.1
	65-74	121	62.3	50.9	50.4	42.0	36.1	11.4
	75+	46	45.9	33.3	20.4	d	d	d
	Total	1,868						

TABLES

TABLE 20 (CONTINUED)

HISTOLOGY	AGE GROUP	# CASES	1-YR	2-YR	3-YR	4-YR	5-YR	10-YR
Anaplastic oligodendroglioma	0-14	8	d	d	d	d	d	d
	0-19	11	d	d	d	d	d	d
	20-44	153	92.0	76.5	71.5	62.7	55.8	39.0
	45-54	84	83.0	62.8	59.4	48.5	46.1	39.3
	55-64	65	65.3	51.2	41.3	32.6	22.5	d
	65-74	43	43.0	29.5	27.8	25.5	14.3	d
	75+	24	36.0	4.9	d	d	d	d
	Total	380						
Ependymoma/ anaplastic ependymoma	0-14	384	85.2	71.2	61.6	55.0	51.0	45.3
	0-19	429	86.3	73.6	64.1	58.2	54.7	47.2
	20-44	423	91.7	89.9	86.3	85.3	85.2	78.9
	45-54	160	91.3	86.8	80.9	79.6	76.4	69.8
	55-64	123	81.8	77.5	74.6	73.6	68.6	54.4
	65-74	71	77.9	75.5	71.0	69.6	69.6	40.6
	75+	19	66.9	d	d	d	d	d
	Total	1,225						
Mixed glioma	0-14	80	88.5	80.6	76.5	71.0	69.7	63.8
	0-19	112	87.3	80.8	77.9	73.0	72.0	66.7
	20-44	396	92.9	84.7	79.4	72.8	68.4	50.3
	45-54	132	80.7	65.8	55.2	48.6	43.4	33.8
	55-64	91	77.7	51.9	39.2	34.3	31.8	16.0
	65-74	54	52.8	37.6	27.4	18.9	16.8	7.3
	75+	14	d	d	d	d	d	d
	Total	799						
Glioma malignant, NOS	0-14	619	68.8	50.3	46.8	46.0	44.7	41.8
	0-19	699	70.2	53.1	49.5	48.6	47.3	43.5
	20-44	487	81.1	68.6	62.9	56.9	51.9	37.7
	45-54	258	55.8	38.6	32.0	30.8	29.4	21.1
	55-64	336	42.2	26.0	21.7	19.2	16.9	12.0
	65-74	440	23.9	12.7	11.6	8.3	7.4	5.2
	75+	467	10.5	6.9	6.0	4.3	3.4	3.1
	Total	2,687						
Neuroepithelial	0-14	47	85.2	74.5	67.9	63.6	59.2	57.1
	0-19	63	87.4	77.7	72.8	69.5	66.2	64.6
	20-44	68	77.8	65.6	59.4	54.6	53.1	33.8
	45-54	34	53.3	32.8	24.1	21.2	d	d
	55-64	31	36.1	20.0	d	d	d	d
	65-74	31	20.0	13.8	d	d	d	d
	75+	15	d	d	d	d	d	d
	Total	242						
Malignant neuronal/glioma, neuronal and mixed	0-14	110	74.7	63.5	57.6	54.5	54.5	52.2
	0-19	125	75.2	65.3	58.4	54.9	53.0	51.0
	20-44	67	94.0	79.8	76.7	71.7	70.0	61.6
	45-54	49	88.0	86.3	84.3	76.7	74.1	52.7
	55-64	46	87.9	66.0	64.4	62.5	62.5	54.2
	65-74	16	d	d	d	d	d	d
	75+	15	d	d	d	d	d	d
	Total	318						

TABLE 20 (CONTINUED)

HISTOLOGY	AGE GROUP	# CASES	1-YR	2-YR	3-YR	4-YR	5-YR	10-YR
Embryonal/primitive/ medulloblastoma	0-14	956	78.8	68.5	62.9	57.3	54.8	48.0
	0-19	1,060	80.0	69.9	64.3	58.7	55.7	48.4
	20-44	326	85.9	76.6	68.1	62.4	57.0	44.4
	45-54	39	79.6	71.8	71.8	69.6	60.3	d
	55-64	16	d	d	d	d	d	d
	65-74	5	d	d	d	d	d	d
	75+	6	d	d	d	d	d	d
	Total	1,452						
Lymphoma	0-14	19	d	d	d	d	d	d
	0-19	36	69.1	62.8	59.4	52.5	d	d
	20-44	931	22.8	16.4	14.2	12.9	11.5	9.9
	45-54	374	42.7	34.8	31.5	29.0	26.6	15.5
	55-64	383	54.1	41.6	32.5	27.9	23.0	12.9
	65-74	476	45.0	30.4	23.2	18.3	15.3	8.6
	75+	299	33.4	20.4	15.6	12.9	11.3	3.9
	Total	2,499						
TOTAL: ALL BRAIN AND CNS^{c,e}	0-14	4,759	81.3	71.7	67.7	64.8	63.3	59.3
	0-19	5,883	82.5	73.2	69.2	66.4	64.8	60.5
	20-44	9,830	76.7	63.8	57.3	52.2	47.9	36.2
	45-54	5,888	56.4	34.2	27.8	24.7	23.1	16.0
	55-64	7,405	40.5	18.8	14.3	12.3	10.7	7.0
	65-74	7,701	24.6	11.3	8.7	7.4	6.6	4.0
	75+	5,016	14.9	7.7	6.1	5.3	4.8	3.5
	Total	41,723						

^aThe 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.

^bRates are an estimate of the percentage of patients alive at one, two, three, four, five, and ten years, respectively.

^cIn contrast to survival estimates reported in previous editions of the CBTRUS statistical report, brain lymphomas, olfactory tumors of the nasal cavity, and malignant tumors of the pituitary and pineal glands are included.

^dToo few cases to estimate.

^eIncludes histologies not listed in this table.

Abbreviations: SEER, Surveillance, Epidemiology, and End Results; NOS, not otherwise specified.

PROCEDURE FOR REQUESTING ADDITIONAL DATA

CBTRUS serves as a resource for gathering and disseminating current epidemiological data on all primary brain tumors. CBTRUS data are available to assist in research projects that intend to describe incidence and survival patterns of brain tumor cases, to evaluate diagnosis and treatment, and to conduct etiologic studies.

The CBTRUS incidence database consists of epidemiologic data on all brain tumors, malignant and non-malignant, consolidated from sixteen population-based cancer registries. These data include cases newly diagnosed between 1998 and 2002 with ICDO codes C70.0–C70.9, C71.0–C71.9, C72.0–C72.9, C75.1– C75.3, and C30.0 (9522-9523). In addition, CBTRUS will assist in accessing mortality, survival and treatment information using other databases.

This Report (1998-2002 data), including tables of descriptive brain tumor statistics, is available on the world-wide web at <http://www.cbtrus.org>.

To obtain more information regarding CBTRUS and related databases, please contact the Central Brain Tumor Registry of the United States. To obtain additional data, please complete the application form on the following page.

DATA REQUEST FORM

CENTRAL BRAIN TUMOR REGISTRY OF THE UNITED STATES
APPLICATION FOR DATA ACCESS

1. TITLE OF PROJECT:

2. PRINCIPAL INVESTIGATOR/ PROGRAM DIRECTOR: (Attach Current Resume)
NAME DEGREE(S) SSN

3. POSITION TITLE:

4. DEPARTMENT, SERVICE, LABORATORY OR EQUIVALENT:

5. TELEPHONE: FAX:

6. E-MAIL ADDRESS:

7. NAME AND ADDRESS OF APPLICANT ORGANIZATION:

8. TYPE OF ORGANIZATION (circle one):

PUBLIC PRIVATE NOT-FOR-PROFIT FOR PROFIT

9. SOURCE OF FUNDING (if different from #7 above):

10. PROJECT DESCRIPTION: State the applicant's broad, long-term objectives and specific aims. Describe concisely the research design and methods for achieving these goals. (Attach additional pages if necessary.)

11. DATES OF ENTIRE PROPOSED PROJECT:

FROM: TO:

12. PERFORMANCE SITES: (ORGANIZATIONS AND ADDRESSES)

13. FORMAT OF DATA: (Diskette; Computer printout; Other, Specify)

14. SIGNATURE OF PRINCIPAL INVESTIGATOR:



PUBLISHED

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NOTES

THE CENTRAL BRAIN TUMOR REGISTRY OF THE US (CBTRUS)



- CBTRUS is a not-for-profit 501(c)3 corporation committed to collecting and disseminating high quality incidence and survival data on all primary brain tumors.
- CBTRUS analyzes the largest aggregation of databases on primary brain tumors from population-based registries in the United States participating in the *Surveillance, Epidemiology, and End Results* (SEER) program of the *National Cancer Institute* and the *National Program of Cancer Registries* (NPCR) of the *Centers for Disease Control*.
- CBTRUS serves as consultant on brain tumor data classification, coding and collection to national and international organizations including the *International Agency for Research on Cancer* of the *World Health Organization* and the *National Coordinating Council for Cancer Surveillance* in the United States.
- CBTRUS analyzes and disseminates brain tumor information from the *National Cancer Data Base* (NCDB) of the *American College of Surgeons Commission on Cancer* with their permission.
- CBTRUS provides a resource for the neuroscience community that does not exist elsewhere and is recognized by the Joint Section on Tumors of the *Congress of Neurological Surgeons / American Association of Neurological Surgeons*.
- CBTRUS is guided by experts in the field of brain tumor research.
- CBTRUS presents data in histologic groupings with improved clinical relevance that were previously unavailable.
- CBTRUS conducts specialized data analysis in response to specific questions.
- CBTRUS investigates patterns of brain tumor incidence including trends over time and patterns by geographical area.
- CBTRUS can assist in planning studies of brain tumors by providing:
 - sources of collaboration to obtain cases for case control studies
 - sources of collaboration for rare tumor studies
 - estimates of expected cases
- CBTRUS provides an incidence standard against which other data can be compared, including
 - hospital case series
 - physician/physician group case series
 - cluster investigations
- CBTRUS encourages all cancer registries to collect data on all primary brain tumors.
- CBTRUS promotes awareness of the disease of brain tumors through presentation of descriptive statistics.



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*Additional copies of this report can be obtained by contacting
the Central Brain Tumor Registry of the United States.*