



# Brain & Other Central Nervous System Cancer In Ohio, 2001-2005

## This Report on Brain & Other Central Nervous System Cancer Contains:

- Incidence and Mortality Rates in Ohio and the US
- Incidence Rates by Age Group and Gender
- Incidence and Mortality Rates by Race
- Trends in Incidence and Mortality
- Incidence Rates by Histology
- Trends in Glioma Incidence
- Glioma Incidence by County
- Survival Probability and Factors Affecting Survival
- Risk and Protective Factors
- Signs and Symptoms
- Clinical Trials
- Sources of Data and Additional Information

## Brain & Other Central Nervous System Cancer Incidence and Mortality

Cancers of the brain and other central nervous system (CNS) made up 1.4 percent of the incident (newly diagnosed) cancers reported to the Ohio Cancer Incidence Surveillance System (OCISS) from 2001 to 2005 (Table 1). The average annual, age-adjusted brain and other CNS cancer incidence rate during this time period was 6.7 cases per 100,000 persons, or an average of 799 cases per year (N). The average annual age-adjusted U.S. (SEER<sup>1</sup>) incidence rate of 6.5 cases per 100,000 persons for this same time period was about 3 percent less than the rate for Ohio. Completeness of reporting brain and other CNS cancer in Ohio is estimated to be 100 percent for 2001-2005. The 2001-2005 U.S. (NCHS<sup>2</sup>) age-adjusted brain and other CNS cancer mortality rate of 4.5 deaths per 100,000 persons was slightly greater than the Ohio mortality rate of 4.4 per 100,000 persons.

This report highlights a number of different types of brain and other CNS tumors: invasive tumors; non-invasive (benign) tumors; and specific histologic (tissue) types. Invasive tumors are the main focus of this report, and all incidence and mortality rates include invasive tumors only, unless otherwise stated. As of 2004, non-invasive brain and other CNS tumors, the most common of which is meningioma, are required to be reported to the OCISS. The histologic types presented include glioma, the most common type, as well as histologies common to children, adolescents and young adults.

**Table 1: Leading Sites/Types and Brain & Other CNS Cancer: Average Annual Number (N), Percent and Age-adjusted Rates per 100,000 Persons of Invasive Cancer Cases and Cancer Deaths in Ohio with Comparison to the US (SEER and NCHS), 2001-2005<sup>1,2</sup>**

Incidence	N	%	Ohio Rate	U.S. Rate	Mortality	N	%	Ohio Rate	U.S. Rate
<b>All Sites/Types</b>	<b>56,415</b>		<b>465.1</b>	<b>467.4</b>	<b>All Sites/Types</b>	<b>24,845</b>		<b>203.3</b>	<b>189.8</b>
Lung and Bronchus	9,127	16.2%	75.0	63.9	Lung and Bronchus	7,354	29.6%	60.3	54.1
Breast (Female)*	8,063	14.3%	121.9	126.1	Colon and Rectum	2,524	10.2%	20.6	18.8
Prostate*	7,706	13.7%	145.7	169.4	Breast (Female)*	1,900	7.6%	27.5	25.0
Colon and Rectum	6,456	11.4%	52.9	50.6	Pancreas	1,289	5.2%	10.5	10.6
Bladder	2,655	4.7%	21.7	21.2	Prostate*	1,262	5.1%	27.8	27.2
Non-Hodgkin's Lymphoma	2,313	4.1%	19.1	19.5	Non-Hodgkin's Lymphoma	956	3.8%	7.8	7.3
•					•				
•					•				
<b>Brain &amp; Other CNS</b>	<b>799</b>	<b>1.4%</b>	<b>6.7</b>	<b>6.5</b>	<b>Brain &amp; Other CNS</b>	<b>537</b>	<b>2.2%</b>	<b>4.5</b>	<b>4.4</b>

Source: Ohio Cancer Incidence Surveillance System, Chronic Disease and Behavioral Epidemiology Section and the Vital Statistics Program, Ohio Department of Health, 2008.

[1] SEER: Surveillance, Epidemiology and End Results Program, National Cancer Institute, 2008.

[2] NCHS: National Center for Health Statistics, 2008.

\*The rates of female breast and prostate cancer are gender specific (i.e., the population denominator is females or males only).

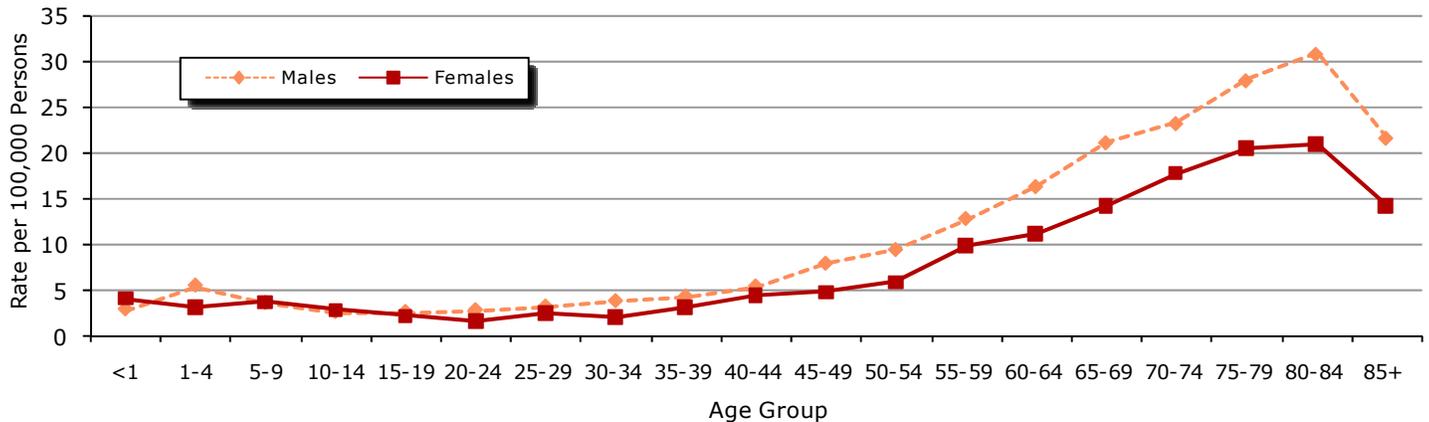
## Brain & Other CNS Cancer Cases and Rates by Age at Diagnosis

Table 2: Brain & Other CNS Cancer: Average Annual Number of Cases (N), Incidence Rates per 100,000 Persons and Cumulative Percentages (Cum%), by Age Group and Gender in Ohio, 2001-2005

Age Group	Males			Females			Total		
	N	Rate	Cum%	N	Rate	Cum%	N	Rate	Cum%
< 1	2	2.9	0.5%	3	4.1	0.8%	5	3.5	0.7%
1-4	17	5.5	4.3%	9	3.2	3.4%	26	4.4	3.9%
5-9	14	3.6	7.6%	14	3.7	7.2%	28	3.7	7.4%
10-14	11	2.6	10.1%	11	2.8	10.3%	22	2.7	10.2%
15-19	11	2.6	12.6%	9	2.2	12.7%	20	2.4	12.7%
20-24	11	2.8	15.2%	6	1.6	14.5%	17	2.2	14.8%
25-29	11	3.2	17.8%	9	2.5	16.9%	20	2.8	17.4%
30-34	15	3.8	21.1%	8	2.1	19.0%	23	3.0	20.2%
35-39	17	4.3	25.1%	13	3.1	22.5%	30	3.7	23.9%
40-44	24	5.4	30.7%	20	4.4	28.0%	44	4.9	29.5%
45-49	34	7.9	38.7%	22	4.8	33.9%	56	6.3	36.5%
50-54	36	9.4	47.1%	24	5.9	40.4%	60	7.6	44.0%
55-59	39	12.8	56.2%	32	9.9	49.2%	71	11.3	53.0%
60-64	38	16.3	64.9%	29	11.2	57.1%	67	13.6	61.3%
65-69	39	21.1	74.0%	31	14.2	65.6%	71	17.4	70.2%
70-74	37	23.2	82.6%	36	17.8	75.6%	74	20.2	79.4%
75-79	37	27.9	91.1%	39	20.5	86.2%	76	23.5	88.9%
80-84	26	30.8	97.2%	31	21.0	94.6%	57	24.6	96.0%
85+	12	21.6	100.0%	20	14.2	100.0%	32	16.3	100.0%

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2008.

Figure 1: Brain & Other CNS Cancer: Average Annual Age-specific Incidence Rates per 100,000 Persons, by Gender in Ohio, 2001-2005

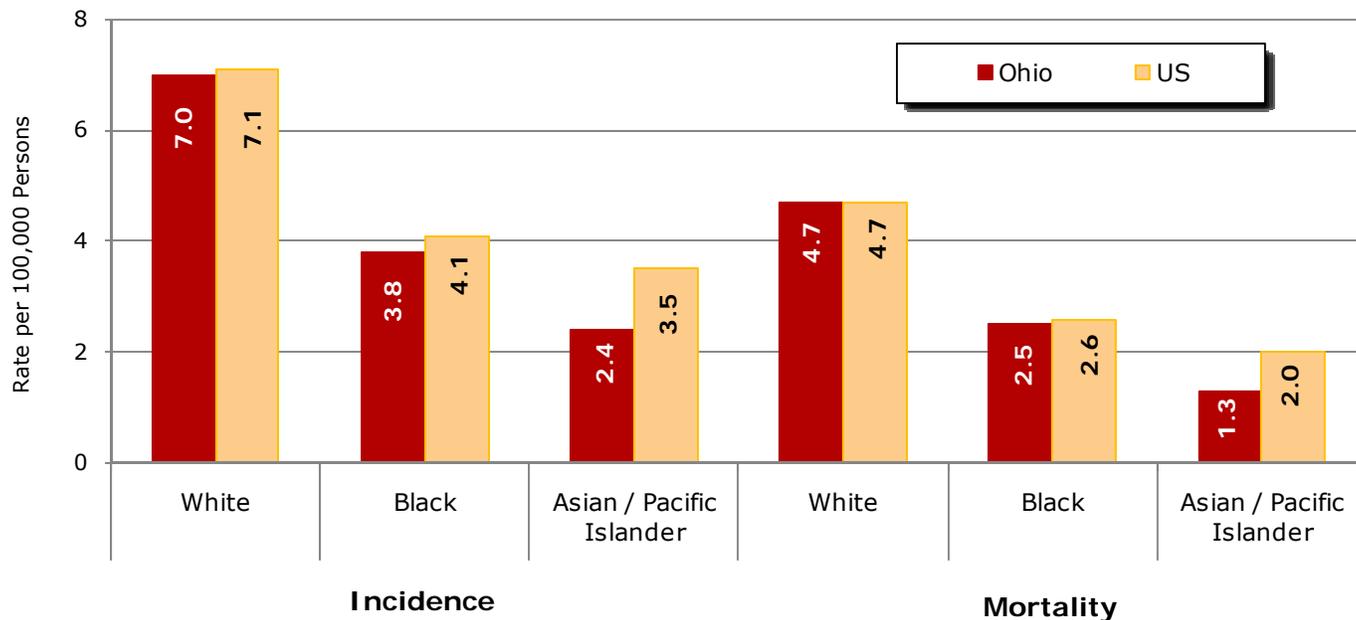


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2008.

Table 2 and Figure 1 show 2001-2005 average annual age-specific incidence rates for brain and other CNS cancer by gender. The median age at diagnosis of brain and other CNS cancer occurred in the 55-59 age group for males and in the 60-64 age group for females. For age groups 45-49 and older, males had higher incidence rates than females. Among males, incidence rates increased with advancing age group from 15-19 to 80-84, then declined among males 85 and older. Among females, incidence rates increased with advancing age group from 30-34 to 80-84 and then declined in the oldest age group. For males and females under 40 years of age, the highest incidence rates occurred among children 1-4 and less than 1, respectively.

## Brain & Other CNS Cancer Incidence and Mortality in Ohio Compared to the United States

Figure 2: Brain & Other CNS Cancer: Average Annual Age-adjusted Incidence and Mortality Rates per 100,000 Persons, by Race in Ohio with Comparison to the US (SEER and NCHS), 2001-2005<sup>1,2</sup>



Source: Ohio Cancer Incidence Surveillance System, Chronic Disease and Behavioral Epidemiology Section and the Vital Statistics Program, Ohio Department of Health, 2008.

[1] SEER: Surveillance, Epidemiology and End Results Program, National Cancer Institute, 2008.

[2] NCHS: National Center for Health Statistics, 2008.

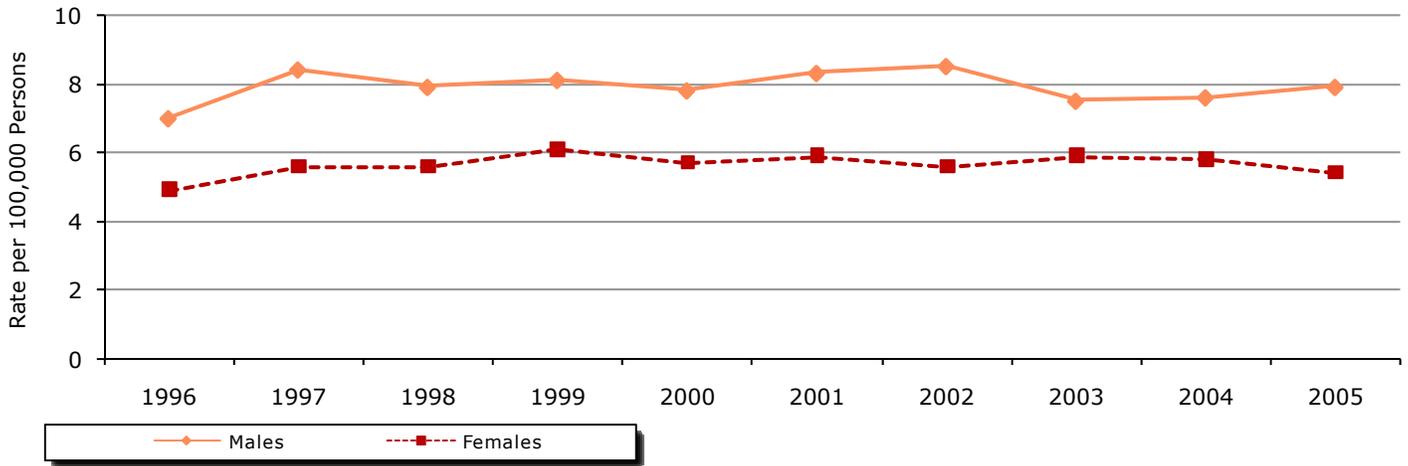
Figure 2 shows the 2001-2005 brain and other CNS cancer incidence rates for whites were considerably higher than those of blacks and Asian/Pacific Islanders in both Ohio and the United States. These race differences are not fully understood but may result, at least in part, from differences in risk factors. The brain and other CNS cancer incidence rates for each of the three race groups were greater in the United States compared to Ohio, with the greatest difference (46 percent) among Asian/Pacific Islanders. Similar to incidence, the brain and other CNS cancer mortality rates for whites were considerably higher than those of blacks and Asian/Pacific Islanders in both Ohio and the United States. The mortality rates for brain and other CNS cancer among whites and blacks were similar for Ohio and the United States; whereas, the rate for Asian/Pacific Islanders was about 54 percent higher in the United States, compared to Ohio.

### Did You Know?

The Central Brain Tumor Registry of the United States (CBTRUS) collects information about malignant and benign brain tumors from 19 participating central cancer registries in the United States. The CBTRUS, online at <http://www.CBTRUS.org>, is an excellent source of information about brain tumor incidence, mortality and survival, as well as factors affecting brain tumor variation (*e.g.* gender, race and age).

## Brain & Other CNS Cancer Incidence and Mortality Trends

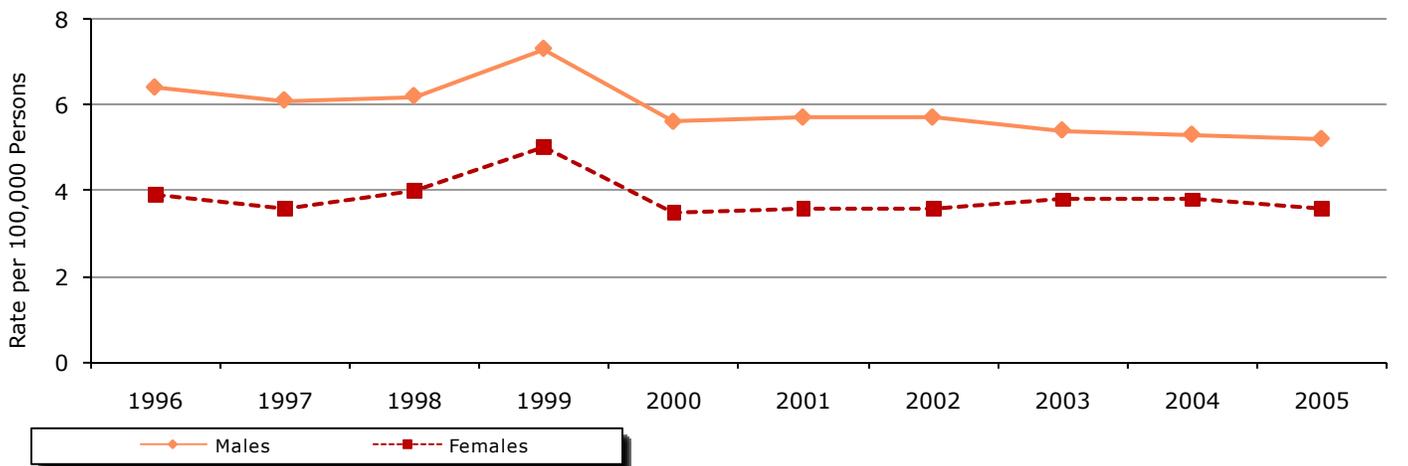
**Figure 3: Brain & Other CNS Cancer: Trends in Age-adjusted Incidence Rates per 100,000 Persons, by Gender and Year of Diagnosis in Ohio, 1996-2005**



Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2008.

Figure 3 shows incidence rates of brain and other CNS cancer in Ohio according to year of diagnosis (1996 to 2005) by gender. Incidence rates among males were greater than those among females for each year. Between 1996 and 2005, brain and other CNS cancer incidence rates among males and females were variable but increased by approximately 13 and 10 percent, respectively. This increase is not fully understood, but may result from increased use of neuroimaging techniques to diagnose brain tumors.

**Figure 4: Brain & Other CNS Cancer: Trends in Age-adjusted Mortality Rates per 100,000 Persons, by Gender and Year of Death in Ohio, 1996-2005**



Source: Chronic Disease and Behavioral Epidemiology Section and the Vital Statistics Program, Ohio Department of Health, 2008.

Figure 4 shows trends in mortality rates of brain and other CNS cancer according to year of death (1996 to 2005) by gender. For each year of comparison, the rate for males was at least 39 percent higher than the rate for females. Comparing 1996 to 2005, brain and other CNS cancer mortality rates decreased approximately 19 and 8 percent among males and females, respectively.

## Brain & Other CNS Cancer Incidence by Histology

Table 3: Brain Tumors: Average Annual Number of Cases (N) and Age-adjusted Incidence Rates per 100,000 Persons, by Histology and Gender in Ohio, 2001-2005

Histology	ICDO-3 Histology Code	Males		Females	
		N	Rate	N	Rate
<b>Glioma</b>	9380-9489	403	7.4	328	5.2
Astrocytoma	9421, 9410, 9420, 9401, 9411, 9383, 9384, 9424, 9400, 9440, 9441, 9442/3	304	5.6	246	3.8
Oligodendroglioma <sup>1</sup>	9450, 9451, 9460	30	0.5	25	0.4
Ependymoma <sup>2</sup>	9391, 9392, 9393	13	0.2	12	0.2
<b>Meningioma<sup>3</sup> (benign only)</b>	9530, 9531, 9532, 9533, 9534, 9537, 9538, 9539	115	2.1	347	5.1

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2008.

[1] Category contains both oligodendroglioma and anaplastic oligodendroglioma.

[2] Category contains both ependymoma and anaplastic ependymoma.

[3] Benign meningiomas were not required to be reported until 2004. Average annual counts and rates are for 2004-2005 only.

Histology refers to the type of cells making up a tumor. The vast majority (85 to 90 percent) of brain and other CNS tumors are brain tumors, which are characterized by a large degree of histologic heterogeneity (See page 6 for a figure presenting the major regions of the brain and other CNS). Brain tumors vary considerably by histology and are classified into the following major histologic groupings: 1.) tumors of neuroepithelial tissue (glioma), including astrocytoma, anaplastic astrocytoma, glioblastoma, oligodendroglioma and ependymoma; 2.) tumors of meninges, including meningioma and hemangioblastoma; and 3.) rarer brain tumors, including germ cell tumors and tumors of the sellar region (*i.e.*, pituitary tumors and craniopharyngioma).

In the United States, approximately 75 percent of all primary brain tumors are classified as glioma (the most common type) or meningioma. Glioma brain tumors arise from glial tissue and represent a large class of tumors with many histologic variations. The three major types of gliomas are astrocytoma, oligodendroglioma and ependymoma. Astrocytomas arise from astrocytes primarily in the cerebrum, cerebellum or brain stem and often spread quickly. Astrocytomas are further classified according to grade, which refers to the degree of cellular differentiation. Grade IV astrocytomas, or glioblastomas, are the highest grade (least differentiated) and have exceptionally poor prognoses. Oligodendrogliomas arise from oligodendrocytes, cells that make the fatty substance that protects the nerves, and usually do not spread into surrounding brain tissue. Ependymomas, which arise from ependymal cells that line the ventricles or the central canal of the spinal cord, usually do not spread to normal brain tissue and are associated with higher survival probability. Meningiomas are tumors of the meninges, the tissue surrounding the brain. Meningiomas make up a sizable proportion of brain tumors and represent a unique histologic grouping of tumors that are characterized by good prognoses. The vast majority (approximately 97 percent) of meningiomas are not invasive, thus they are not included in the incidence rates presented elsewhere in this report.

Table 3 shows average annual numbers and age-adjusted incidence rates of brain tumors by major histologic grouping. In 2001-2005, males in both Ohio and the United States had a higher incidence rate of glioma brain tumors, as well as the most common histologic subtype — astrocytoma, compared to females. Females in both Ohio and the United States in 2004-2005 had incidence rates of benign meningiomas that were more than double that of males. The reason for this gender difference is not fully understood but may result from a complex set of factors related to hormone levels and exposures.

## Brain & Other CNS Cancer in Children

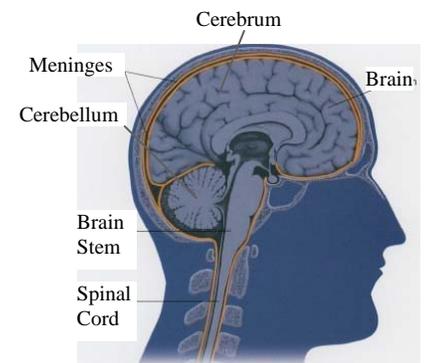
Table 4: Brain & Other CNS Cancer: Average Annual Number of Cases (N) and Age-adjusted Incidence Rates per 100,000 Persons, by Gender and Histology among Children, Adolescents and Young Adults (ages 0-24) in Ohio, 2001-2005

Histology	ICDO-3 Histology Code	Males		Females	
		N	Rate	N	Rate
<b>All Brain &amp; Other CNS</b>		<b>66</b>	<b>3.3</b>	<b>53</b>	<b>2.8</b>
Pilocytic Astrocytoma	9421	15	0.7	12	0.6
Ependymoma/Anaplastic Ependymoma	9391, 9392, 9393	4	0.2	4	0.2
Benign and Malignant Neuronal/Glial, Neuronal and Mixed	8680, 8681, 8682, 8690, 8693, 9412, 9413, 9442, 9490, 9491, 9492, 9493, 9500, 9505, 9506, 9522, 9523	2	0.1	1	0.1
Embryonal/Primitive/Medulloblastoma	8963, 9363, 9364, 9470, 9471, 9472, 9473, 9474, 9501, 9502, 9503, 9508	13	0.6	9	0.5
Germ Cell Tumors	8020, 9060, 9061, 9064, 9065, 9070, 9071, 9072, 9080, 9081, 9082, 9083, 9084, 9085, 9100	1	0.1	<1	*

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2008.

\* Rates may be unstable and are not presented when the case count for 2001-2005 is less than five (i.e., N<1).

Brain and other CNS is one of three sites/types of cancer commonly affecting children, adolescents and young adults. According to the Central Brain Tumor Registry of the United States (CBTRUS), four histologic types of brain and other CNS tumors have a median age at diagnosis less than 25. These are: pilocytic astrocytoma (median age of 12); embryonal/primitive/medulloblastoma tumors (median age of 9); germ cell tumors (median age of 16); and benign and malignant neuronal/glial, neuronal and mixed tumors (median age of 24). These younger ages at diagnosis contribute to the greater potential for more years of productive life lost.

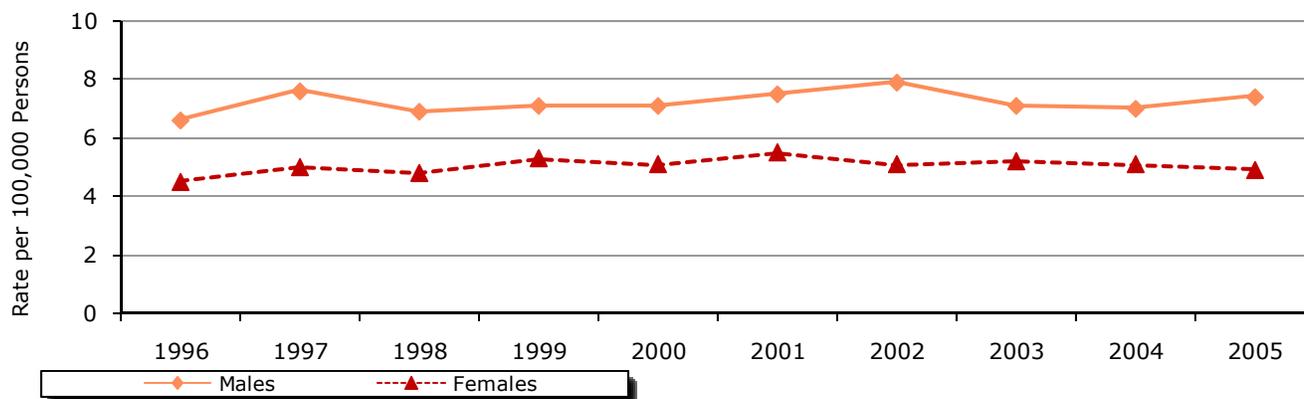


The 2001-2005 brain and other CNS cancer incidence rates among individuals 0 to 24 in Ohio are shown in Table 4 by gender and histologic groupings common to children, adolescents and young adults. The incidence rate for all brain and other CNS tumors in this age group was approximately 18 percent higher among males, compared to females. This probably results from increased risk of glioma brain tumors among males.

The most common histologic grouping among children, adolescents and young adults was pilocytic astrocytoma, a lower-grade astrocytoma and one of the most common histologic subtypes among children, followed by embryonal/primitive/medulloblastoma tumors, which usually develop during childhood from poorly developed 'primitive' cells in the cerebellum area of the brain. Incidence rates in Ohio for these two histologic groups were similar among males and females and comparable to the rates observed in the United States. In contrast, there were very few children, adolescents and young adults in Ohio diagnosed with ependymoma and anaplastic ependymoma; benign and malignant neuronal/glial, neuronal and mixed tumors; and germ cell tumors. Further, there were only slight gender differences in the incidence rates of these less common tumors.

## Gliomas by Gender and Year

Figure 5: Gliomas: Age-adjusted Incidence Rates per 100,000 Persons, by Gender and Year of Diagnosis in Ohio, 1996-2005



Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2008.

Figure 5 presents age-adjusted glioma incidence rates in Ohio by gender and year of diagnosis (1996-2005). For each year, males had a higher age-adjusted glioma incidence rate, compared to females, which is similar to the trend for the United States. From 1996 to 2005, the glioma incidence rate was variable but increased approximately 12 percent among males and 9 percent among females. Increased use of neuroimaging techniques to diagnose brain and other CNS tumors probably accounts for at least some of this increase. An accompanying increase in age-adjusted glioma mortality rates has not been reported for the United States.

### Did You Know?

To date, no study has demonstrated conclusive evidence for an association between long-term cell phone use and increased glioma risk. However, it is important to continue studying this possible association because the number of long-term cell phone users is increasing and the methods for assessing cell phone exposures are improving.

## Glioma Cases and Rates by County of Residence

Figure 6 presents 2001-2005 average annual, age-adjusted glioma incidence rates by county of residence, and Figure 7 displays the pattern of incidence after the county rates are smoothed—a process in which rates are adjusted to consider the rates of neighboring geographical areas (*i.e.*, counties). Smoothing techniques are used to illustrate the concept that disease patterns do not abruptly change at county boundaries. County-specific glioma incidence rates in Ohio ranged from 2.5 to 9.2 per 100,000 residents in 2001-2005 (Figure 6). Figure 7 reveals moderate geographical variability in incidence rates across the state, with a pattern of higher incidence rates in the southeast region of the state.





## Brain & Other CNS Cancer Survival & Factors Affecting Survival

The probability of surviving brain and other CNS cancer depends largely on the histology, the location of the tumor within the brain or area of the CNS and age at diagnosis. The U.S. (SEER) five-year survival probability for individuals diagnosed with brain and other CNS cancer in 1996-2004 was 35.5 percent. Five-year survival probabilities were higher for blacks (39.6 percent), compared to whites (34.7 percent). This race difference is probably attributed to the fact that risk of glioma (associated with poorer prognoses, compared to other histologic groupings) is higher among whites. Females also have a higher five-year survival probability (38.1 percent), compared to males (33.3 percent). This gender difference is probably also attributed to the fact that males have a higher glioma risk.

Because some tumor types grow more quickly than others, there is tremendous variation in survival probabilities according to histologic type. Glioblastoma, the highest grade (Grade IV) glioma has the lowest five-year survival probability at 3.4 percent. Lower-grade tumors, generally, have higher survival probabilities. For example, pilocytic astrocytoma, a Grade I tumor more common among children, adolescents and young adults, has a five-year survival probability of 92.0 percent. In general, survival probability is inversely related to age for each histologic type of brain and other CNS cancer. For example, among individuals 0 to 19 at diagnosis, two-year glioblastoma survival probability is 28.5 percent, while it is only 1.3 percent among those 75 and older. The mechanisms for the strong and consistent inverse association between age and survival are poorly understood and deserve further exploration.

Meningiomas are slower-growing tumors and have a greater survival probability. However, there are currently no estimates of U.S. population-based survival probabilities for meningioma because benign brain tumors were not required to be reported to the SEER program until 2004. It has been estimated that five-year survival probability for meningioma is approximately 70 percent, and, similar to invasive brain tumors, age at diagnosis is strongly related to survival.

The two-year survival probability for invasive brain tumors increased from 28.6 percent in 1975 to 38.2 percent in 2004. Much of this increase occurred among patients younger than 65 years of age who were diagnosed with lower-grade tumors. The increase in survival may be an artifact of improved ascertainment of nonaggressive brain tumor subtypes rather than improved clinical management. There has been little change in the survival probability for patients diagnosed with glioblastoma.

### Did You Know?

In the past two decades, there has been very little improvement in the relative survival probability among adults ages 20 years and older diagnosed with a primary malignant brain tumor. The two-year relative survival probability was 30.2 percent in 1984 and 31.9 percent among those diagnosed in 2004.

## Risk and Protective Factors for Brain & Other CNS Cancer

Very few brain and other CNS tumors can be explained by the presence of confirmed risk factors or the absence of protective factors. Further, only one confirmed risk factor (high-dose ionizing radiation) is modifiable. Brain and other CNS cancer risk and protective factors include the following:

- **Age** — Risk of brain tumors increases with advancing age. More than half of all brain and other CNS tumors are diagnosed after 50 years of age. However, brain and other CNS is one of few cancer sites/types common to children, adolescents and young adults.
- **Gender** — Males have a higher risk of glioma and germ cell tumors, while females have a higher risk of meningioma.
- **Race** — Risk of glioma and germ cell tumors are greater among whites, compared to blacks. Meningioma risk is not as strongly associated with race.
- **Ethnicity** — Non-Hispanics have a higher glioma risk, compared to Hispanics.
- **High-dose Ionizing Radiation** — Exposure to ionizing radiation such as that used in the treatment of tinea capitis (ringworm) or leukemia during childhood increases risk of brain tumors, including meningioma and glioma.
- **Diseases/Syndromes Associated with Rare Mutations** — Some genetic diseases or syndromes increase the risk of brain and other CNS cancer. These include: tuberous sclerosis complex, neurofibromatosis types 1 and 2, nevoid basal cell carcinoma syndrome, syndromes related to adenomatous polyps and Li-Fraumeni cancer family syndrome.
- **Estrogen/Reproductive/Menstrual Factors** — Factors related to estrogen (including estrogen replacement therapy), reproduction (e.g. not having children) and menstrual factors (e.g. age at menarche and menopause) increase meningioma risk.
- **Family History** — Family history of glioma and meningioma increase risk of glioma and meningioma, respectively. Familial aggregation of brain tumors has been demonstrated but not yet explained.
- **History of Varicella-zoster (VZV) Infection/Anti-VZV IgG** — *May* increase glioma risk.
- **Cell Phone Use** — *May* increase risk of acoustic neuroma.
- **Head Injury** — *May* increase risk of intravascular brain tumors.
- **History of Allergies and Asthma and Elevated Immunoglobulin** — *May* decrease glioma risk.

## Brain and Other CNS Cancer Signs and Symptoms

Early signs and symptoms of brain and other CNS cancer vary greatly. Brain tumor signs and symptoms depend largely on the tumor size, location and rate of growth. Brain tumor symptoms are often caused by tissue damage; by pressure on the brain as the tumor grows within the limited space in the skull; by edema (in which fluid collects around the tumor); and by hydrocephalus, which occurs when the tumor blocks the flow of cerebrospinal fluid and causes a buildup in the ventricles. Slow-growing brain tumors may not produce symptoms for a long period of time. The most frequently reported brain tumor symptoms include:

- headaches, especially those that become more severe and those that are worse in the morning and ease during the day
- seizures or convulsions
- unexplained nausea or vomiting
- weakness or loss of feeling in the arms or legs
- stumbling or lack of coordination and balance in walking
- abnormal eye movements or changes in vision, including blurred vision and lack of peripheral vision
- drowsiness
- confusion
- changes in personality or memory
- changes in speech
- hormonal problems

Each of these symptoms may be caused by other diseases or conditions; thus, anyone experiencing these symptoms should talk with their physician.

## **Clinical Trials Information**

Clinical trials test many types of treatments including new drugs, surgical procedures, radiation therapy and combinations of these. The goal of conducting clinical trials is to find better ways to treat cancer. To obtain information concerning clinical trials for brain and other CNS cancer, an individual should talk with their physician or visit one of the following Web sites:

- **National Cancer Institute:**  
<http://www.cancer.gov/clinicaltrials>
- **American Cancer Society:**  
[http://www.cancer.org/docroot/ETO/ETO\\_6.asp?sitearea=ETO](http://www.cancer.org/docroot/ETO/ETO_6.asp?sitearea=ETO)
- **The Ohio State University Comprehensive Cancer Center—Arthur G. James Cancer Hospital and Richard J. Solove Research Institute:**  
<http://www.jamesline.com/trials>
- **The Cleveland Clinic:**  
[http://my.clevelandclinic.org/research/clinical\\_trials/default.aspx?topic=i-1201895266747-1737647530](http://my.clevelandclinic.org/research/clinical_trials/default.aspx?topic=i-1201895266747-1737647530)
- **Case Western Reserve University Comprehensive Cancer Center:**  
<http://henge.case.edu/sip/SIPControlServlet>
- **University of Cincinnati:**  
<http://uccancercenter.uc.edu/research/clinicaltrials>
- **Toledo Community Hospital Oncology Program:**  
<http://www.tchop.com>
- **Dayton Clinical Oncology Program:**  
<http://www.med.wright.edu/dcop>
- **Columbus Community Clinical Oncology Program:**  
<http://www.columbusccop.org>

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## **Sources of Data and Additional Information**

- **Ohio Cancer Incidence Surveillance System:**  
[http://www.odh.ohio.gov/odhPrograms/dis/ociss/ci\\_surv1.aspx](http://www.odh.ohio.gov/odhPrograms/dis/ociss/ci_surv1.aspx)
- **National Cancer Institute:**  
<http://www.cancer.gov/cancertopics/types/brain>
- **American Cancer Society:**  
[http://www.cancer.org/docroot/CRI/CRI\\_2\\_3x.asp?dt=3](http://www.cancer.org/docroot/CRI/CRI_2_3x.asp?dt=3)

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### **Technical Notes:**

- [1] Brain & other CNS cancer cases were defined as follows: International Classification of Diseases for Oncology, Third Edition (ICD-O-3), codes C700-C729, excluding histology types 9530-9539 & 9590-9989. Brain & other CNS cancer deaths were defined as follows: International Statistical Classification of Diseases and Related Health Problems, Tenth Edition (ICD-10), codes C700-C729.
  - [2] The 2001-2005 rates were calculated using vintage 2006 postcensal estimates for July 1, 2001-2005 (U.S. Census Bureau, 2007). Rates are direct age-adjusted to the U.S. 2000 standard population.
  - [3] N = Average number of cases per year rounded to the nearest integer.
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# Ohio Cancer Incidence Surveillance System (OCISS)

Ohio Department of Health

and

The Ohio State University Comprehensive Cancer Center —  
Arthur G. James Cancer Hospital and  
Richard J. Solove Research Institute

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To address comments and information requests:

Ohio Cancer Incidence Surveillance System

Ohio Department of Health

246 North High Street

Columbus, OH 43215

Phone: (614) 752-2689

Fax: (614) 644-1909

E-mail: [ociss@odh.ohio.gov](mailto:ociss@odh.ohio.gov)

