

DESCRIPTION OF BRAIN AND CENTRAL NERVOUS SYSTEM TUMORS ON THE NATIONAL CANCER DATA BASE, 2004-2011

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BACKGROUND: We utilized the National Cancer Data Base (NCDB) to conduct a descriptive epidemiologic study of brain and central nervous system (CNS) tumors for diagnosis years 2004-2011. This time period coincides with the implementation of Public Law 107-206, *The Benign Tumor Cancer Registries Amendment Act* mandating the collection of benign and borderline malignancy tumors.

METHODS: Brain and CNS tumors were defined as ICD-O-3 primary site codes, C70.0-C72.9, C75.1-C75.3. Histologic subtypes were classified according to the 2007 World Health Organization Classification of Tumours of the Central Nervous System (WHO)¹ using ICD-O-3 histology and behavior codes and grouped in accordance with the WHO grading scheme. The classification scheme involves histological grading that provides a means to predict prognostic outcomes. Only single and first primaries were analyzed.

RESULTS:

- ❖ WHO grade IV histologies were the most frequently represented accounting for more than 40% cases followed by WHO grades I (14%), II (12%) and III (8%). Almost 25% histology/behavior combinations could not be graded within the 2007 WHO scheme. (Figure 1.)
- ❖ Table 1 shows a total of 173,925 tumors registered on the NCDB. 158,393 tumors (91%) were single or first primaries of which 84% were identified by histology and behavior in accordance with the WHO major group classification scheme. Astrocytic tumors accounted for almost two-thirds of classified tumors.
- ❖ Selected histologies by WHO grade are presented in Table 2. Pilocytic astrocytoma, Diffuse astrocytoma, Anaplastic astrocytoma, and Glioblastoma were observed to be the most frequent within WHO Grades I, II, III, and IV, respectively.
- ❖ Figure 2 shows tumor distributions by primary site. Over half occurred in brain lobes.
- ❖ Overall, frequencies for males were greater than females; white race was observed for almost 90% cases; non-Hispanics accounted for 85% cases. The pediatric, 0-19 years of age, had the lowest representation (11%) among age groups. (Figure 3.)
- ❖ Socioeconomic status (SES) indicators reflected somewhat higher SES classifications for residential census tract median income and percent not high school graduates. Private insurance was the primary payer for more than half of cases with only 5% uninsured. Three-fourths of cases resided in major metropolitan areas. (Figure 4.)
- ❖ First course treatment patterns are displayed in Tables 3a and 3b. An inverse relationship was apparent between Surgery Only and WHO grade. Almost half of WHO grade IV cases received all three treatment modalities. More than 40% cases younger than 45 years receive Surgery Only and almost 40% cases ages 75 years and older did not receiving any initial treatment.

CONCLUSION: Our study is the first to report NCDB hospital tumor registry data for benign and borderline malignancy in addition to malignant tumors after implementation of Public Law 107-206. The NCDB offers much to the understanding of brain and CNS tumor epidemiology.

Table 1. Brain and CNS Tumors by Major WHO Group, 2004-2011

	Count	Percent
Astrocytic tumors	86,011	64.7
Oligodendroglial/Oligoastrocytic tumors	11,090	8.3
Ependymal tumours	7,904	5.9
Choroid plexus tumours	864	0.7
Other neuroepithelial tumours	116	0.1
Neuronal and mixed neuronal-glia tumours	3,772	2.8
Tumours of the pineal region	24	0.0
Embryonal tumours	4,363	3.3
Tumours of the cranial and paraspinal nerves	2,937	2.2
Meningeal tumours	7,414	5.6
Mesenchymal tumours	2,797	2.1
Primary melanocytic lesions	134	0.1
Other neoplasms related to the meninges	3,083	2.3
Lymphomas and haematopoietic neoplasms	929	0.7
Germ cell tumours	700	0.5
Tumours of the sellar region	730	0.5
Total NCDB WHO Classified	132,868	100.0
Total NCDB Single and First Primaries	158,393	
Total NCDB Brain and CNS Tumors	173,925	

Figure 1. WHO Grade Distribution

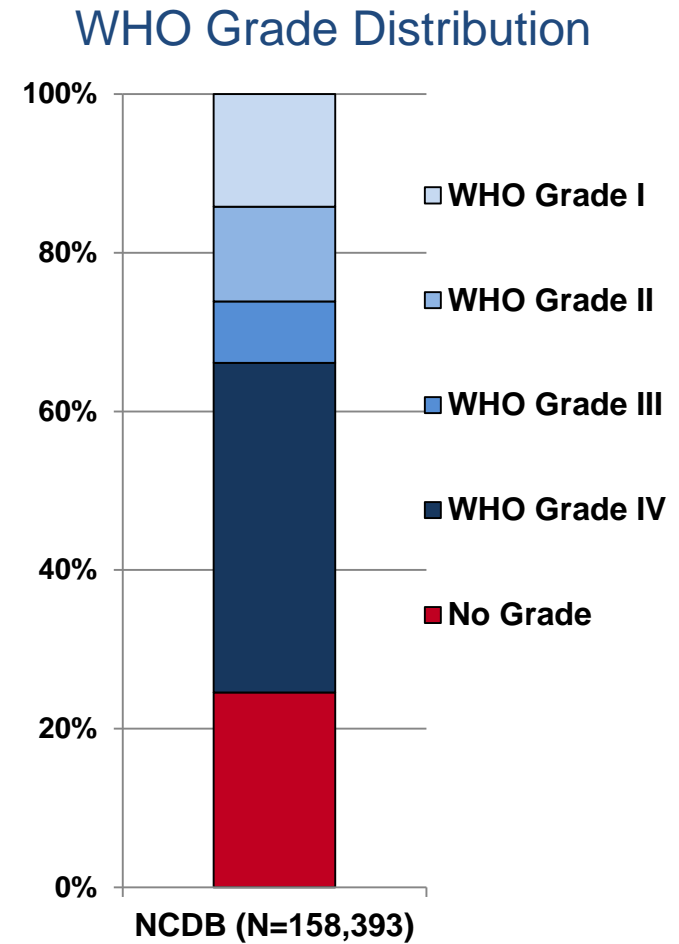
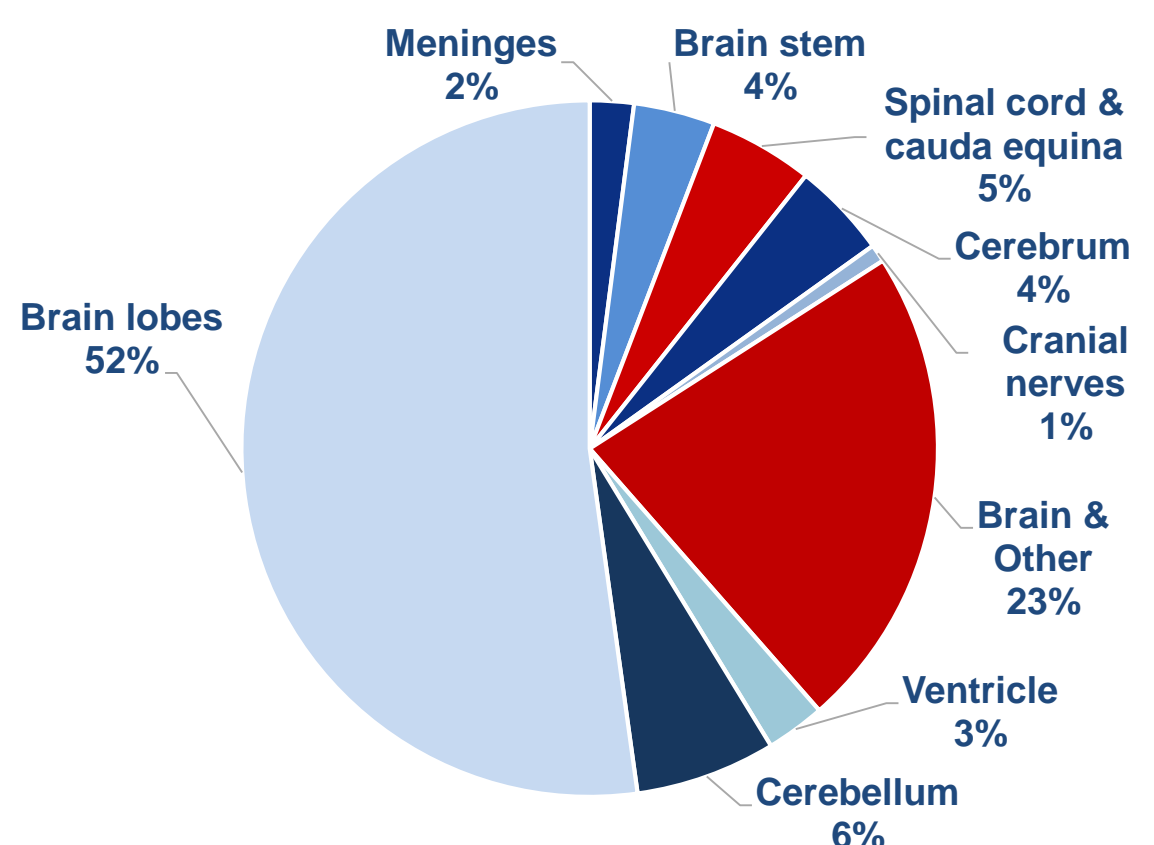


Figure 2. Distribution by Primary Site



REFERENCE

¹Louis DN, Ohgaki H, Wiestler OD, Cavenee WK, Burger PC, Jouvet A, Scheithauer BW, Kleihues P. The 2007 WHO Classification of Tumours of the Central Nervous System. *Acta Neuropathol* (2007) 114: 97-109.

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Table 2. Selected Histologies by WHO Grade

WHO Grade I	ICD-O-3	Count
Pilocytic astrocytoma	9421/3	5,206
Meningioma	9530/0	4,276
Haemangioblastoma	9161/1	3,083
Schwannoma	9560/0	2,790
Myxopapillary ependymoma	9394/1	1,850
Ganglioglioma	9505/1	1,726
Subependymoma	9383/1	1,039
Dysembryoplastic neuroepithelial tumour	9413/0	673
Choroid plexus papilloma	9390/0	672
Craniopharyngioma	9350/1	436
Subependymal giant cell astrocytoma	9384/1	256
Paraganglioma	8680/1	238
Desmoplastic infantile astrocytoma ganglioglioma	9412/1	77
Neurofibroma	9540/0	33

WHO Grade II	ICD-O-3	Count
Diffuse astrocytoma	9400/3	7,853
Oligodendroglioma	9450/3	5,111
Ependymoma	9391/3	4,103
Central neurocytoma	9506/1	615
Pleomorphic xanthoastrocytoma	9424/3	504
Meningioma – Atypical	9539/1	303
Haemangiopericytoma	9150/1	294
Atypical choroid plexus papilloma	9390/1	65
Chordoid glioma of 3rd ventricle	9444/1	35

WHO Grade III	ICD-O-3	Count
Anaplastic astrocytoma	9401/3	7,236
Anaplastic oligodendroglioma	9451/3	2,095
Meningioma – Anaplastic (malignant)	9530/3	1,662
Anaplastic ependymoma	9392/3	752
Anaplastic haemangiopericytoma	9150/3	230
Anaplastic ganglioglioma	9505/3	185
Choroid plexus carcinoma	9390/3	127

WHO Grade IV	ICD-O-3	Count
Glioblastoma	9440/3	59,888
Medulloblastoma	9470/3	2,954
Gliosarcoma	9442/3	1,255
CNS primitive neuroectodermal tumour	9473/3	755
Giant cell glioblastoma	9441/3	532
Atypical teratoid/rhabdoid tumour	9508/3	378

Figure 3. Demographic Characteristics

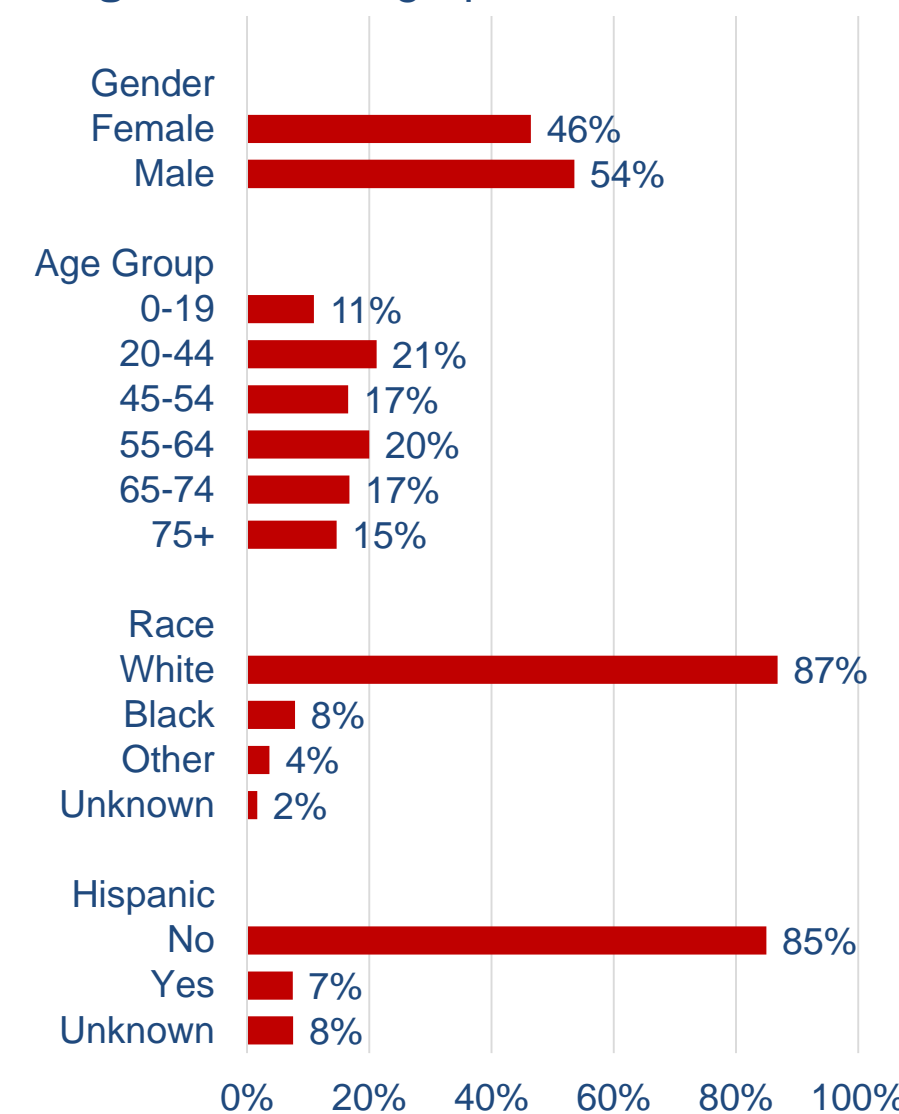


Figure 4. Selected SES Indicators

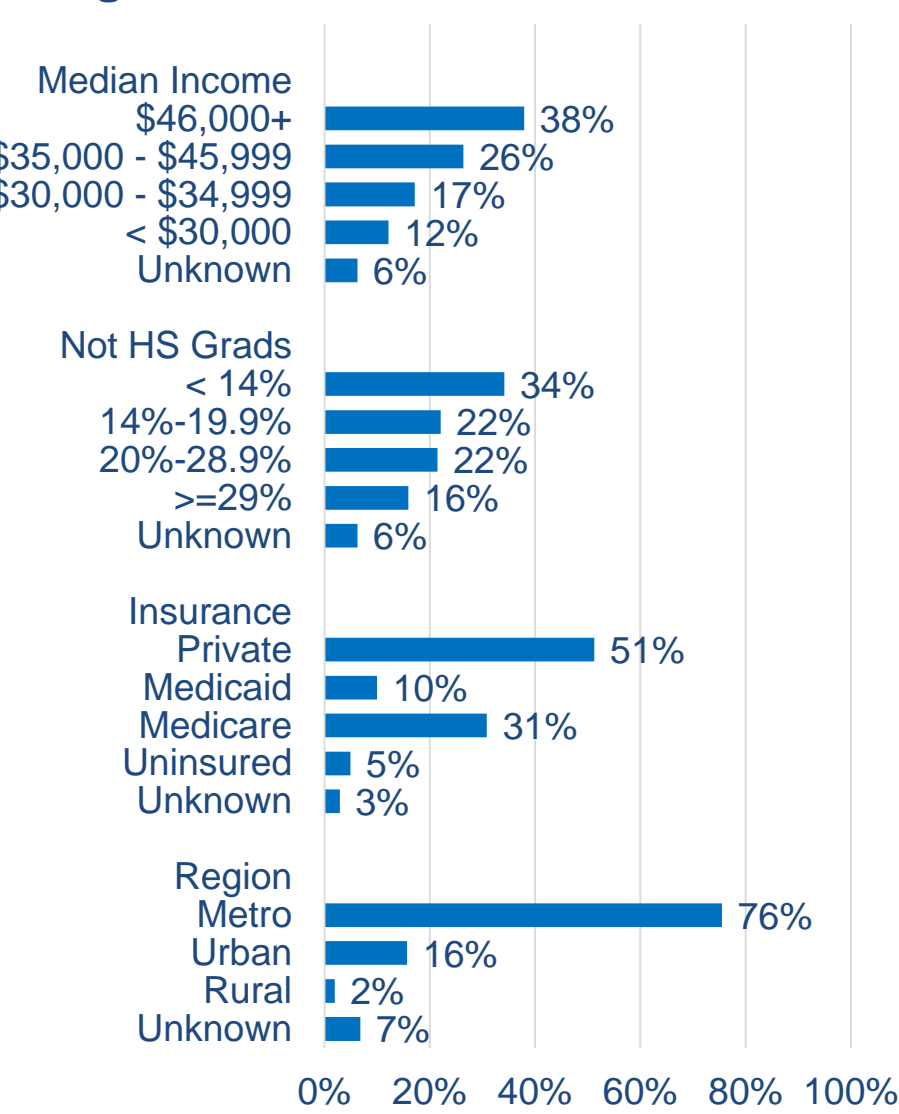


Table 3a. Description of Initial Treatment Modalities by WHO Grade

WHO Grade	Grade I N=22,518	Grade II N=18,883	Grade III N=12,287	Grade IV N=65,762	Unknown N=38,943	Total N=158,393
None	16.1	10.5	8.1	9.8	31.8	16.1
Surgery Only	71.9	46.0	19.2	16.0	23.8	29.7
Radiation Only	3.8	5.5	4.5	3.3	7.3	4.7
Chemo Only	0.8	2.2	1.0	0.6	7.7	2.6
Surgery & Radiation	4.6	14.4	14.0	7.6	5.8	8.0
Surgery & Chemo	1.5	4.5	4.2	3.4	5.0	3.7
Radiation & Chemo	0.2	5.8	14.8	10.2	7.4	7.9
All 3 Modalities	0.4	10.4	33.4	48.6	9.7	26.4

Table 3b. Description of Initial Treatment Modalities by Age Group

Age Group	0-19 N=17,344	20-44 N=33,542	45-54 N=26,181	55-64 N=31,662	65-74 N=26,477	75+ N=23,187
None	12.6	11.6	11.1	12.0	15.7	36.5
Surgery Only	41.8	42.2	29.0	23.0	22.4	20.9
Radiation Only	3.7	3.6	3.6	4.0	5.2	8.6
Chemo Only	4.0	1.7	2.3	2.6	3.3	2.4
Surgery & Radiation	7.3	9.6	8.3	7.6	7.7	6.9
Surgery & Chemo	7.8	3.3	3.4	3.2	3.5	2.5
Radiation & Chemo	5.8	5.5	8.3	10.1	10.5	6.7
All 3 Modalities	16.3	21.6	33.2	36.6	30.8	14.3