

BREAKING DOWN BRAIN CANCER

Brain cancer comprises only 2% of cancers, but is notoriously difficult to treat. Understanding the location of such tumours, as well as the underlying genetics, will help to tackle this devastating disease. By Julie Gould; infographic by Alisdair Macdonald.

ON THE BRAIN

The highest percentage of all brain tumours that originate in the brain and central nervous system (CNS) are benign growths that occur in the meninges¹, a structure consisting of three layers of protective tissue that surround the cerebral cortex. Most malignant primary brain tumours, however, occur in the cerebral cortex¹ — with the highest percentage developing in the frontal lobe*.

30%

Other regions
Physicians strive to report the exact locations of brain tumours. However, such growths can sometimes extend into several areas of the brain, or their locations might not be recorded for various reasons.

Frontal lobe

The frontal lobe constitutes almost two-fifths of the human brain. It has a role in modulating many brain functions, including voluntary movement, fluency of speech and expression of emotion. People with a tumour in this area often experience seizures as an initial symptom.

Parietal lobe

The parietal lobe has differing roles in the left and right hemispheres of the brain. Tumours in the left lobe often affect a person's speech, and those in the right lobe can affect perception of the physical location of body parts and understanding of geographical location.

Ventricle

The ventricles are hollow parts of the brain that are filled with cerebrospinal fluid. Conventionally, intraventricular tumours are treated initially by draining excess cerebrospinal fluid using a shunt, which helps to relieve pressure in the brain.

Occipital lobe

The occipital lobe is the smallest lobe of the cerebral cortex. It plays a part in processing visual information. Tumours in this lobe can cause loss of vision, visual disturbances and hallucinations.

Temporal lobe

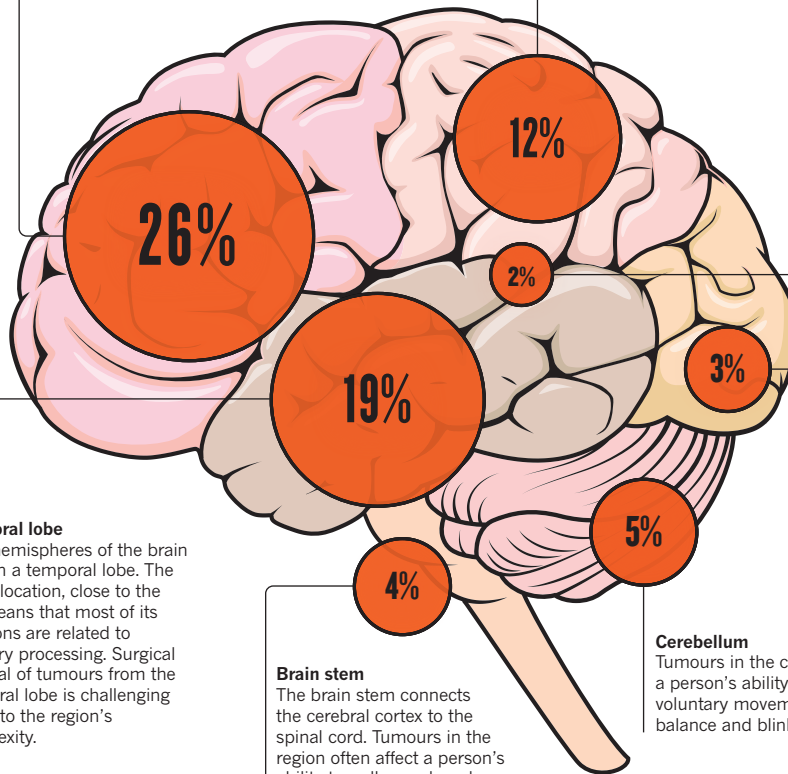
Both hemispheres of the brain contain a temporal lobe. The lobe's location, close to the ear, means that most of its functions are related to auditory processing. Surgical removal of tumours from the temporal lobe is challenging owing to the region's complexity.

Brain stem

The brain stem connects the cerebral cortex to the spinal cord. Tumours in the region often affect a person's ability to walk, speak and swallow, as well as their facial tension and vision.

Cerebellum

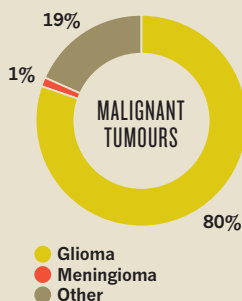
Tumours in the cerebellum affect a person's ability to coordinate voluntary movements such as balance and blinking.



*Percentages do not add up to 100% because of rounding.

LOCAL THREAT

The most common malignant primary brain tumour is a type of astrocytoma (a tumour that forms from glial cells) known as glioblastoma multiforme¹. Glioma, a group of tumours that includes astrocytoma, comprises 27% of all tumours, and 80% of malignant tumours¹.

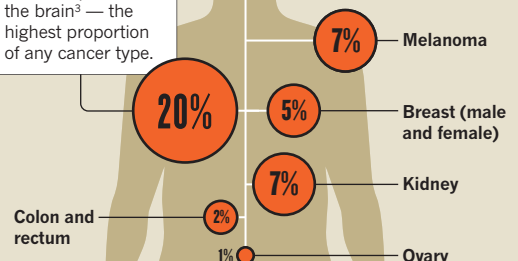


FARTHER AFIELD

Up to 30% of people with primary cancers in parts of the body other than the brain will develop brain metastases². At least twice as many cases of secondary brain cancer as malignant primary brain cancer are diagnosed each year².

Lung and bronchus

Around 20% of lung cancers spread to the brain³ — the highest proportion of any cancer type.



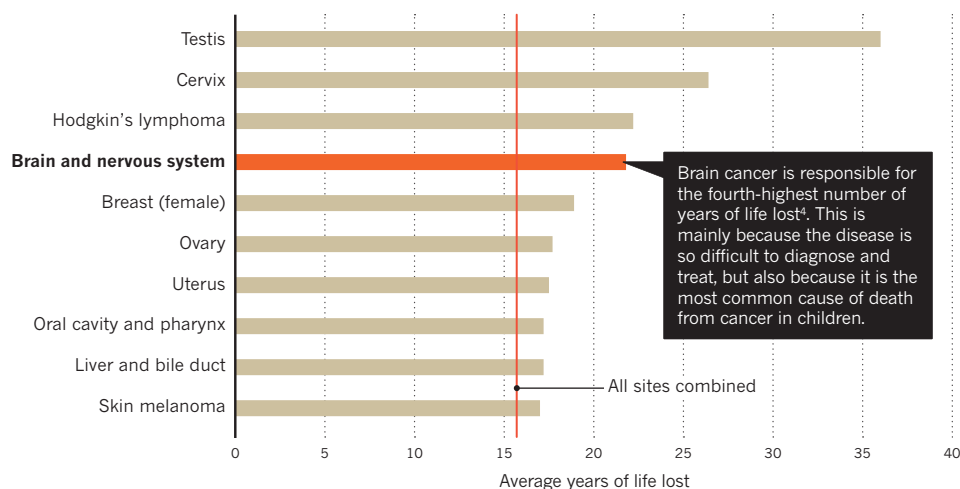
DATA: Q. OSTROM/REF. 1.; BRAIN: ALEXANDER_P/Shutterstock

BRAIN DRAIN

Primary brain tumours are treated using a multipronged approach that can involve surgery, radiotherapy or chemotherapy. Yet the long-term outlook and survival rates of people with such malignancies remains poor.

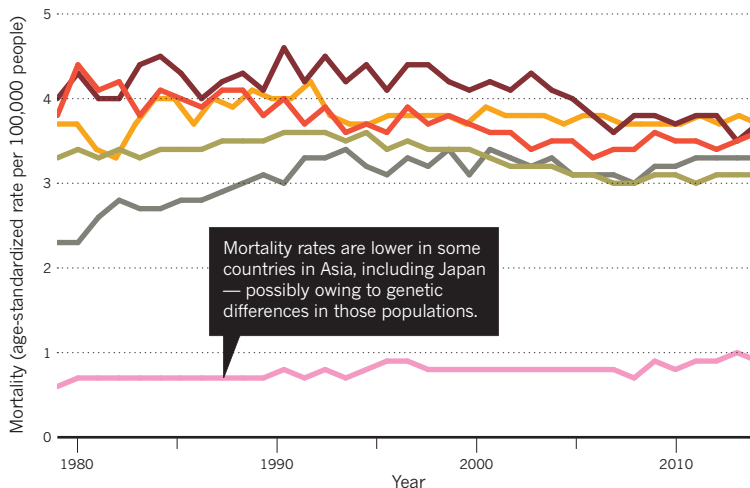
LOST TIME

The average years of life lost is a good measure of the extent to which life is cut short by various cancers. This is the sum difference in years between the ages at which people with a particular condition died and the ages to which they would otherwise have lived, divided by the total number who died.



LEVEL-HEADED

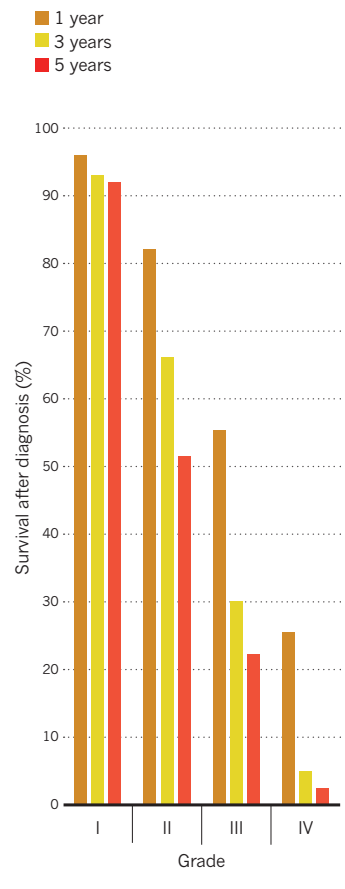
Despite improvements in detection and treatment, the number of deaths from brain cancer has remained unchanged in the past three decades.



J. FERLAY/IARC

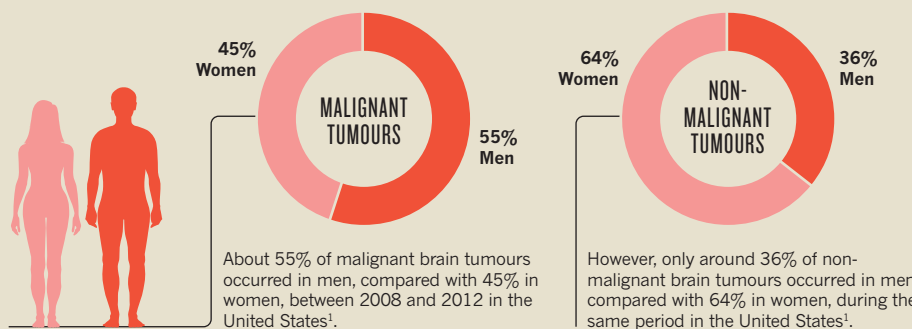
AGAINST THE CLOCK

Brain tumours are classified using a grading system that ranks them from least (grade I) to most (grade IV) aggressive. Early diagnosis is linked to better survival times⁵.



MIND THE GAP

There are differences in the incidences of brain cancer in men and women, regardless of the age of those affected. Researchers are unsure why this might be.



Sources: 1. Ostrom, Q. T. et al. *Neuro Oncol.* **17** (suppl.), iv1–iv62 (2015). 2. National Brain Tumor Society (NBTS). *Quick Brain Tumor Facts* go.nature.com/2ok3z1r (NBTS, 2018). 3. Davis, F. G., Dolecek, T. A., McCarthy, B. J. & Villano, J. L. *Neuro Oncol.* **14**, 1171–1177 (2012). 4. US National Cancer Institute (NCI). *Person-Years of Life Lost Cancer Trends Progress Report: Average Years of Life Lost* (NCI, 2018). 5. UK National Cancer Intelligence Network (NCIN). *NCIN Data Briefing Astrocytic Brain Tumours: Survival Rates in England* (NCIN, 2013).