

How to Use this Factsheet

This risk factor summary was developed to serve as a general fact sheet. It is an overview and should not be considered exhaustive. For more information on other possible risk factors and health effects being researched, please see the References section.

A risk factor is anything that increases a person's chance of developing cancer. Some risk factors can be controlled while others cannot. Risk factors can include *hereditary conditions, medical conditions or treatments, infections, lifestyle factors, or environmental exposures*. Although risk factors can influence the development of cancer, most do not directly cause cancer. An individual's risk for developing cancer may change over time due to many factors, and it is likely that multiple risk factors influence the development of most cancers. Knowing the risk factors that apply to specific concerns and discussing them with your health care provider can help to make more informed lifestyle and health care decisions.

For those cancer types with environmentally-related risk factors, an important factor in evaluating cancer risk is the route of exposure. This is particularly relevant when considering exposures to chemicals in the environment. For example, a particular chemical may have the potential to cause cancer if it is inhaled, but that same chemical may not increase the risk of cancer through skin contact. In addition, the dose and duration of time one might be exposed to an environmental agent is important in considering whether an adverse health effect could occur.

Gene-environment interactions are another important area of cancer research. An individual's risk of developing cancer may depend on a complex interaction between their genetic makeup and exposure to an environmental agent (for example, a virus or a chemical contaminant). This may explain why some individuals have a fairly low risk of developing cancer as a result of an environmental factor or exposure, while others may be more vulnerable.

Key Statistics

The American Cancer Society estimates 22,850 individuals will be diagnosed with malignant (cancerous) tumors of the brain or other nervous system (ONS) in the U.S. in 2015: 12,900 men and 9,950 women. These numbers would likely be much higher if non-malignant (non-cancerous) tumors were also included.³ In Massachusetts, incidence rates of brain and ONS cancers have generally remained steady from 2007 to 2011 among adults and children combined.^{8,9} Nationally, brain and ONS cancers are considered to be the second most common cancers in children.⁴ After a peak in childhood (generally under 10 years of age), the risk of brain and ONS cancers increases with age between 25 and 75 years.^{2, 7, 8, 10, 13}

Types of Brain and Other Nervous System Cancers

The term "cancer" is used to describe a variety of diseases associated with abnormal cell and tissue growth. Cancers are classified by the location in the body where the disease originated (the primary site) and the tissue or cell type of the cancer (histology).

Brain and ONS tumors can be either malignant or non-malignant, and in either case can be life threatening, although malignant tumors generally present greater concerns. In addition, the brain is a site where both primary and secondary malignant tumors can arise; secondary brain tumors generally originate elsewhere in the body and then metastasize, or spread, to the brain. Primary brain and ONS tumors consist of two main types: gliomas and meningiomas. Gliomas are a general classification of tumors that include a variety of types, named for the cells from which they arise: astrocytomas, oligodendrogliomas, and ependymomas. When considering only malignant brain and ONS tumors, approximately 80% are gliomas.⁷ Meningiomas, the most common ONS tumor in adults, arise from the meninges, which are tissues that surround the outer part of the spinal cord and brain. They account for 35% of all (malignant and non-malignant) primary brain and ONS tumors reported in adults.^{6, 7} Men are generally more likely to develop gliomas than women, while women are more likely to develop meningiomas.^{7, 10} Furthermore, the incidence of gliomas is higher in white individuals compared to black individuals. On the other hand, the incidence of meningiomas is higher in black individuals compared to whites.⁷ In addition to these main subtypes, there are a number of rare brain and ONS tumors.

Established Risk Factors

Most brain and ONS cancers develop for no apparent reason and are not associated with specific risk factors.

Hereditary Conditions

Rare cases of brain and ONS cancer run in some families. Brain tumors in some persons are associated with hereditary syndromes such as neurofibromatosis types I and II, Li-Fraumeni syndrome, and tuberous sclerosis. Neurofibromatosis type I (von Recklinghausen disease) is the most common inherited cause of brain or spinal cord tumors. Von Hippel-Lindau disease is associated with an inherited tendency to develop blood vessel tumors of the cerebellum.³ Overall, inherited syndromes that predispose individuals to brain tumors appear to be present in fewer than 5% of brain tumor patients.^{6, 10}

Environmental Exposures

The most established risk factor for brain and ONS tumors (either non-malignant or malignant) is high-dose exposure to ionizing radiation (i.e., x-rays and gamma rays). Most radiation-induced brain and ONS tumors are caused by radiation to the head from the treatment of other cancers. These brain tumors usually develop around 10 to 15 years after the radiation.³

Possible Risk Factors

Medical Conditions

Head injury has long been suspected to be a possible risk factor for later development of brain and ONS tumors and continues to be studied by scientists. Of those studies that have found a positive association, head trauma was most strongly linked to the development of meningiomas compared to other types of brain and ONS tumors. Overall, additional research is necessary before a definitive link can be established.^{6, 10, 0}

Lifestyle Factors

The association between the development of brain and ONS cancers and N-nitroso compounds has been heavily researched. These compounds and their precursors, such as nitrite, are ubiquitous in our environment and have been found in tobacco smoke, cosmetics, automobile interiors, and cured meats. Several studies have concluded that an increased risk of pediatric brain tumors is associated with high levels of nitrite intake from maternal cured meat consumption during pregnancy. However, these studies have been criticized as many years have often passed between the mother's pregnancy and her interview, making recall less accurate.^{6, 10, 0}

Environmental Exposures

Occupational exposure to radiation or certain chemicals may be associated with increased risk of brain cancer. Workers in the nuclear industry exposed to ionizing radiation may have an increased risk. Workers in plastics manufacturing exposed to chemicals like vinyl chloride or acrylonitrile may also be at higher risk.^{6, 10}

Other Risk Factors That Have Been Investigated

With cellular phones becoming increasingly common, there is growing concern over a link between their use and brain and ONS tumors. Cell phones emit radiofrequency radiation, a form of energy on the electromagnetic spectrum between FM radio waves and those used in microwave ovens. They do not emit ionizing radiation, which has been shown to damage DNA and has the ability to cause cancer. Several recent studies have found no excess risk between cell phone use and brain and ONS tumors. However, no studies have investigated the latent effects of long-term heavy use of cell phones due to their relatively recent widespread usage.⁴

Many studies have been conducted to investigate links between brain and ONS cancers and environmental factors, including: residential power line exposure; viruses and infections; aspartame (a sugar substitute), and pesticides. To date, however, there is no strong evidence to link these factors to brain tumors.^{3, 0}

Brain and Other Nervous System Cancers in Children

Risk Factor Information for Brain and Other Nervous System Cancers

Brain and ONS tumors are the second most common cancers in children and account for over 20% of malignant tumors diagnosed among children less than 20 years of age. More than 4,000 brain and ONS tumors are diagnosed each year in children under the age of 20, with about 25% of these considered non-malignant tumors. About 35% of all childhood brain tumors are astrocytomas and 20% are primitive neuroectodermal tumors (PNET). Medulloblastomas are PNETs that develop in the cerebellum whereas pineoblastomas are PNETs that develop in the pineal gland.^{4, 5} The incidence rate of brain and ONS cancers in children has not changed significantly in recent years.⁹ In general, boys are at a slightly higher risk than girls for developing brain and ONS cancers. The vast majority of brain and ONS cancers in children occurs for no apparent reason and is not associated with any specific risk factors.⁴

For More Information / References

Much of the information contained in this summary has been taken directly from the following sources. This material is provided for informational purposes only and should not be considered as medical advice. Persons with questions regarding a specific medical problem or condition should consult their physician.

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