

# Impact of Environmental Chemicals on Childhood Cancer

This focus sheet is to inform policy makers, government agencies, and disease prevention programs about the potential contribution of environmental chemicals to childhood cancer.

## A Leading Cause of Death in Children

Childhood cancers account for about 2 percent of all cancer cases in the U.S. However, except for injuries, it is the most common cause of death in children from 1 to 14 years of age.<sup>1</sup>

## What puts children at risk?

Most cancers are thought to begin with a change to the DNA of a cell, causing it to divide out of control. Many different types of DNA changes can lead to cancer<sup>1</sup>, and there is evidence that these changes may be caused by a variety of factors, including chemicals, radiation, and viruses.<sup>2,3</sup> However, the exact causes of specific cases of cancer are usually difficult to determine.<sup>2</sup> Only a small percentage of childhood cancers appear to arise from damaged DNA that is directly inherited from the parents. Therefore, most cancers are thought to be due to complex interactions between genes and the environment sometime after conception.<sup>3</sup>

The National Toxicology Program in the U.S. and the International Agency for Research on Cancer in Europe have developed lists of carcinogens (chemicals that can cause cancer<sup>4,5</sup>). Each agency has identified dozens of chemicals classified as known human carcinogens as well as more than 175 that are reasonably likely to be carcinogenic, based on the findings of scientific studies. While most of these chemicals have not specifically been shown to cause cancer in children, they have properties that suggest they could contribute to cancer at any age. These chemicals are used to make household products and are found in the home environment. Children are exposed to a combination of many of these chemicals. Some studies suggest that children's exposure to household pesticides or occupational pesticide exposure for the pregnant mother may increase the risk of childhood leukemia.<sup>6,7</sup>

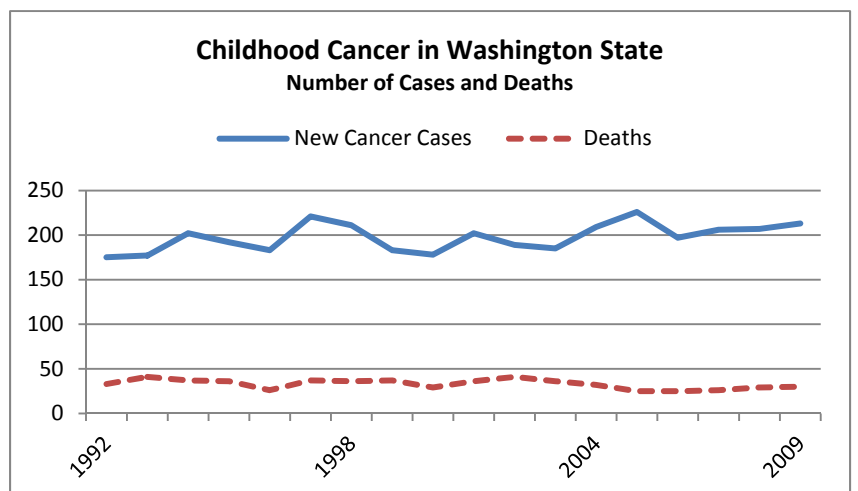
## How many children get cancer?

From 1992 through 2009 in Washington State, about 200 new cancer cases per year have been reported in children less than 15 years old and an average of 33 children per year died of cancer (see the chart to the right).<sup>9</sup> While there has been no significant increase in age adjusted incidence rates (rates per 100,000 children) over that time period, the age adjusted mortality rates have declined.<sup>9</sup> Incidence and mortality rates of pediatric cancer in Washington are similar to the U.S. as a whole.<sup>9,10</sup>

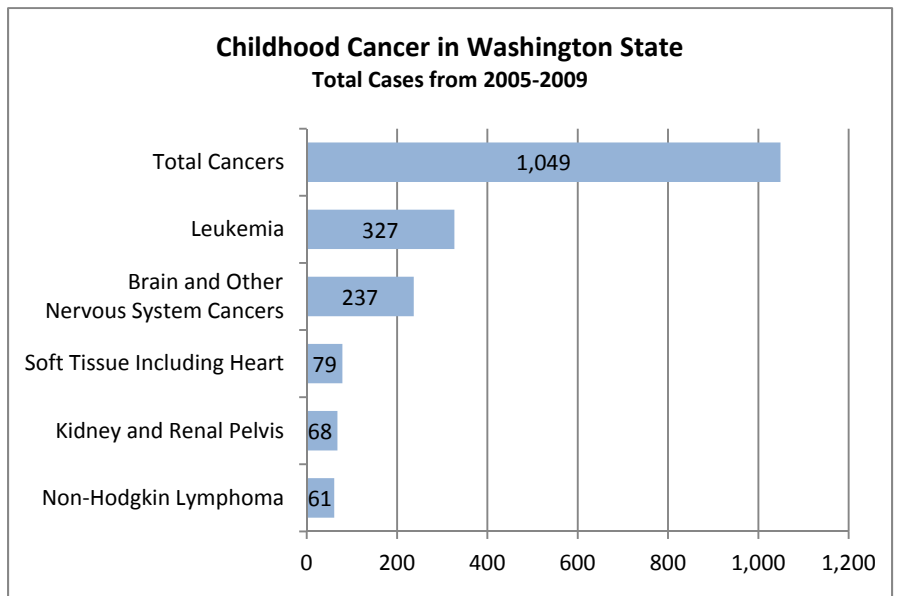
### What is cancer?

Cancer is a group of more than 100 diseases where abnormal cells divide without control. The human body is made of trillions of cells that divide, grow, mature, and die in an organized and controlled manner. Sometimes the control system fails, and cells continually divide and fail to die according to the normal process. Over time, when the mass of abnormal cells becomes large enough, it can become malignant (invade nearby tissues), and metastasize (spread to different parts of the body).<sup>2</sup> These growing masses of abnormal cells can cause illness and death by damaging healthy tissues and interfering with normal body functions.

**Consequences for survivors** – Children who survive cancer can face serious health problems as adults. They have a significantly greater risk of developing congestive heart failure, stroke, coronary artery disease, kidney failure, a second cancer, and other illnesses than their siblings who did not have cancer.<sup>8</sup>



This chart shows the number of cases of the five most common childhood cancers in Washington, as well as the total number of cases, from 2005 to 2009.<sup>9</sup>



## Costs

In 2009, U.S. hospital costs related to pediatric cancer were about \$1.9 billion. This is about 11 percent of costs for all childhood hospital stays, excluding normal post-birth newborn care. Medicaid paid for 37 percent of hospitalizations where childhood cancer was the primary diagnosis. The average cost for these hospitalizations was 5 times higher than for other conditions, (\$40,400 per stay versus \$8,100).<sup>11</sup>

## Summary

Although childhood cancer is rare, it is the leading cause of death by disease in children between 1 and 14 years old. Childhood cancer is also expensive to treat, and puts those that survive at risk of serious illnesses later in life. Exposure to carcinogens in the environment is thought to play an important role in the development of many cancers. Efforts to reduce the use of these chemicals and to better control their release into the environment can improve children's health and lower the burden of disease.

### Some Known Human Carcinogens that are Found in Many Homes<sup>5,6</sup>

- Tobacco smoke.
- Arsenic (drinking water, treated wood).
- Benzene (vehicle exhaust, tobacco smoke).
- Formaldehyde (furniture, cosmetics, tobacco smoke).
- Radon (natural sources).

## For More Information

- Washington Tracking Network – Cancer: [https://fortress.wa.gov/doh/wtn/WTNPortal/Content/Tier1\\_SharedLandingPage.aspx?Topic=6&Subtopic](https://fortress.wa.gov/doh/wtn/WTNPortal/Content/Tier1_SharedLandingPage.aspx?Topic=6&Subtopic)
- Cancer in Children, CDC: [www.cdc.gov/features/dscancerinchildren/](http://www.cdc.gov/features/dscancerinchildren/)
- 12th Report on Carcinogens, US National Toxicology Program, 2011: <http://ntp.niehs.nih.gov/?objectid=03C9AF75-E1BF-FF40-DBA9EC0928DF8B15>
- Monographs on the Evaluation of Carcinogenic Risks to Humans, International Agency for Research on Cancer, World Health Organization: <http://monographs.iarc.fr/ENG/Monographs/vol100F/index.php>

## References

- <sup>1</sup>Davidoff, AM. (2010) *Semin Pediatr Surg* 19: 225-233.
- <sup>2</sup>National Cancer Institute. *What is cancer?* [www.cancer.gov/cancertopics/cancerlibrary/what-is-cancer](http://www.cancer.gov/cancertopics/cancerlibrary/what-is-cancer)
- <sup>3</sup>Anand, P et al. (2008) *Pharm Res* 25: 2097-2116.
- <sup>4</sup>National Toxicology Program. *12th Report on Carcinogens*. <http://ntp.niehs.nih.gov/ntp/roc/twelfth/roc12.pdf>
- <sup>5</sup>International Agency for Research on Cancer. <http://monographs.iarc.fr/ENG/Classification/>
- <sup>6</sup>Turner, MC et al. (2010) *Environ Health Perspect* 118: 33-41.
- <sup>7</sup>Wigle, DT et al. (2009) *Environ Health Perspect* 117: 1505-1513.
- <sup>8</sup>Oeffinger, KC et al. (2006) *N Engl J Med* 355: 1572-1582.
- <sup>9</sup>Washington State Cancer Incidence Data: Washington State Department of Health, Washington State Cancer Registry – Incidence data for diagnosis years 1992 to 2009 released on December 2011.
- <sup>10</sup>National Cancer Institute. *SEER Cancer Statistics Review 1975-2009*. [http://seer.cancer.gov/csr/1975\\_2009\\_pops09/results\\_merged/sect\\_28\\_childhood\\_cancer.pdf](http://seer.cancer.gov/csr/1975_2009_pops09/results_merged/sect_28_childhood_cancer.pdf)
- <sup>11</sup>Anhang Price, R. (2012) *Pediatric Cancer Hospitalizations, 2009*. [www.hcup-us.ahrq.gov/reports/statbriefs/sb132.pdf](http://www.hcup-us.ahrq.gov/reports/statbriefs/sb132.pdf)