

# Cancer and Cancer Clusters

---

July 2007

## **What is a cancer cluster?**

A cancer cluster is an unusually high number of cancers occurring during a specific time period among people who live or work together. The impression that a cancer cluster exists usually begins when a family member or someone's co-worker, neighbor, or friend is diagnosed with cancer. This close contact with cancer often brings an awareness of others who have cancer and a desire to answer the question, "Why?" It is not uncommon for people to suspect that the cancer cause is a chemical in the environment. The following information might answer some of your questions related to cancer and cancer clusters.

## **Cancer is more common than most people realize.**

Each year, cancer causes about one-quarter of deaths in both Washington and the United States. According to the National Cancer Institute, if rates of cancer remain the same as they were from 2002-2004, about four out of 10 children born today will eventually have cancer.<sup>1</sup> Given these statistics, it is not surprising to know several people in a neighborhood or workplace who have cancer.

## **Cancer is not one disease.**

Cancer is a group of more than 100 diseases characterized by uncontrolled growth and spread of abnormal cells. Different types of cancer have different causes, different rates of occurrence, and different chances for survival. What turns a breast cell into breast cancer is not what turns a white blood cell into leukemia. Therefore, we cannot assume all the different types of cancer in a neighborhood or worksite share a common cause.

## **The risk of having cancer increases with age.**

While cancer occurs in people of all ages, cancer rates rise sharply among people over 45 years old. When a community or neighborhood consists primarily of people over the age of 45, we would expect more cancer than in a neighborhood of diverse ages. We would expect even more cancer if most people were over the age of 60.

*“Cancer is likely to be caused by a combination of factors . . . acting together over many years.”*

*“The lag between possible exposures and development of cancer often makes it difficult to track what caused the cancer.”*

## **Cancer has many different causes.**

Cancer is likely to be caused by a combination of factors – what cancer biologists call “multiple hits” – acting together over many years. These factors include aspects of how we live (called lifestyle factors), genetics, and exposure to cancer causing agents (called “carcinogens”). There are many types of carcinogens including some types of viruses and medicines, as well as chemicals. Each of these factors can modify the other factors in ways that are poorly understood. To further complicate matters, individual characteristics, such as an individual’s age when exposed to a carcinogen, can play a role and most of us are exposed to many carcinogens everyday. Different factors or combinations of factors can cause the same type of cancer among people in a cancer cluster. For example, one person’s breast cancer might be related to genetic factors acting in combination with taking hormone pills prescribed by a doctor. Another person’s breast cancer might be caused by genetic factors in combination with exposure to chemicals during puberty.

Nonetheless, the American Cancer Society estimates that about 30% of cancer could be prevented by eliminating tobacco use and another 35% could be prevented by reducing obesity, increasing physical activity and eating a healthier diet.<sup>2</sup> Other lifestyle factors which increase the risk for cancer include heavy alcohol use, unsafe sexual practices, and exposure to the sun. The American Cancer Society estimates that exposure to chemicals in workplaces accounts for about 4% of cancer and exposure to pollutants in non-work setting accounts for about 2%.<sup>2</sup> Others argue it is not possible to estimate the amount of cancer caused by exposure to chemicals at work or in our communities. This is partly because there is so much about cancer that we do not know and partly because it takes “multiple hits” for a cell to become cancerous.<sup>3</sup>

## **Cancers today are usually related to events that happened many years ago.**

Cancer does not develop immediately after contact with a carcinogen. Instead, there are generally years, if not decades, between exposure to a carcinogen and a diagnosis of cancer. The lag between possible exposures and development of cancer often makes it difficult to track what caused the cancer. Even if a chemical in the environment caused the cancer, the chemicals in the environment today can be very different from those in the environment many years ago when the causal exposure occurred. In a mobile society like ours, people with cancer who live or work close together might not have been there long enough for a carcinogen in the community or the workplace to have caused their cancer.

## Cancer clusters can occur by chance.

Even if there are more people with one type of cancer in a community than might be expected, we cannot assume the cancers were caused by exposure to a chemical in the environment. The cluster might have occurred simply by chance. There are some principles to keep in mind when thinking about clusters.

- People have a tendency to see patterns in random events. For example, in a coin toss, people assume that a sequence of 6 “heads” in a row is somehow less random than “head-tail-head-head-tail-tail.” But in reality, both sequences are equally likely.
- People tend to isolate a cluster from its context. This is known as the “Texas Sharpshooter Fallacy.” The Texas sharpshooter shoots at the side of a barn and then draws a bull’s-eye around the bullet holes. In the same way, we might notice a number of cancer cases, then draw our population base around the smallest area possible, neglecting to remember that the cancer cases actually came from a much larger population.

To decide whether the number of people with cancer in a reported cluster is higher than elsewhere, epidemiologists calculate an “expected” number of cases. The expected number is based on rates of cancer found elsewhere, such as in the state as a whole, and the numbers and ages of people in the community with the reported cluster. Using one or more statistical tests, epidemiologists then compare the expected number to the number of people with cancer in the community. They usually make statistical comparisons at a 95% confidence level. With a 95% confidence level, five of 100 comparisons may be statistically significant by chance alone. Thus, if we look at 100 communities, by chance alone, we might find that the number of people with cancer is higher than expected in two or three communities and lower than expected in another two or three communities. Considering the number of types of cancer and the almost infinite manner in which one can define communities, even when a statistical test shows that the number of people with cancer in a community is statistically significantly high, this finding can be due to chance and not to a real hazard in the community.

*“... if we look at 100 communities, by chance alone, we might find that the number of people with cancer is higher than expected in two or three communities ...”*

## How does the Washington State Department of Health investigate potential cancer clusters?

Because it is so difficult to tell a true cancer cluster from a cluster imposter, the Washington State Department of Health has developed a protocol to assure that the level of investigation is compatible with the potential public health threat. Oftentimes, large studies, such as those conducted in medical or university settings, are more fruitful in determining the causes of cancer than studies involving a relatively small number of people in a neighborhood or workplace cluster.

### Additional sources of information.

The following documents and websites provide additional information on the causes of cancer and cancer clusters. The internet citations were current as of July 2007.

- Department of Health and Human Services (2003) *Cancer and the Environment*. National Institutes of Health. <http://www.niehs.nih.gov/oc/factsheets/cancer-environment.pdf>
- Gawande, A (1999). The Cancer Cluster Myth. The New Yorker, February 8, 1999. [http://www.mcombs.utexas.edu/faculty/jonathan.koehler/docs/sta309h/Cancer\\_Cluster\\_1999.pdf](http://www.mcombs.utexas.edu/faculty/jonathan.koehler/docs/sta309h/Cancer_Cluster_1999.pdf)
- The National Cancer Institute, <http://www.nci.nih.gov>
- The American Cancer Society, <http://www.cancer.org>

<sup>1</sup> National Cancer Institute. *SEER Cancer Statistics Review, 1975-2004*. <http://seer.cancer.gov/statfacts/html>, Accessed June 24, 2007.

<sup>2</sup> American Cancer Society. *Cancer Facts & Figures 2007*. Atlanta: American Cancer Society; 2007. <http://www.cancer.org/downloads/STT/CAFF2007PWSecured.pdf>, Accessed June 24, 2007.

<sup>3</sup> Clapp R, Howe G and Lefevre MJ. (2005) *Environmental and Occupational Causes of Cancer: A Review of Recent Scientific Literature*. Lowell Center for Sustainable Production, University of Massachusetts, Lowell MA.