

Cancer Clusters in the Community

Suspected cancer clusters may be reported to Cancer Care Ontario (CCO) when concerned citizens observe an apparent excess of cancer among neighbours, co-workers or family members. These concerns are also referred to local Public Health Units or the Ontario Ministry of Labour, two agencies with legal mandates for investigating apparent occupational or environmental health hazards. This Fact Sheet examines some of the issues relating to the validity of reported cancer clusters.

'Cluster' definition:

A cancer cluster is said to occur when a greater than expected number of cases of one particular type of cancer, or a set of related cancers, occur within a particular group of people in an established period of time.

Cancer Clusters are rare:

Certain conditions, although not mandatory, help support the need for further scientific investigation of a potential cancer cluster. These include:

- 1) A large number of cases of one form of cancer, rather than several different types of cancer.
- 2) A rare type of cancer, rather than common types.
- 3) An increased number of cancers in an age group not normally affected by that form of cancer.

Again, these conditions are not mandatory but, if met, do support the need for further investigation. Suspected cancer clusters, however, rarely meet these criteria. Rather, the large majority of calls/requests we receive about clusters end with the caller/requester understanding that their concern was indeed not a valid cancer cluster.

Cancer cluster investigations typically result in no new information about the causes of cancer:

After 22 years and 108 investigations, the U.S. Centers for Disease Control stopped conducting cancer cluster investigations in 1990 due to the complete lack of meaningful findings such investigations produced (i.e. no causative agents for the cancers were determined). Why cancer cluster investigations yield little in terms of identifying a common cause is explained next.

Cancer is more common than most people realize:

According to *Canadian Cancer Statistics 2009*, a document available from the Canadian Cancer Society, an estimated 171,000 cases of cancer

will be diagnosed in Canada this year, and 75,300 Canadians will die from it. Cancer is now the leading cause of death of Canadians. In terms of probability over a lifetime, about four in 10 men and women will be diagnosed with some form of cancer. Given the widespread occurrence of cancer in Canada and in all other countries, it is therefore understandable how several people can be diagnosed in the same area over a short period of time without causing an elevated rate for that area.

The strongest risk factor for cancer is age:

Cancer is mostly a disease of older Canadians, with 70 per cent of new diagnoses and 82 per cent of cancer deaths occurring in people 60 years of age and older. The chances of developing cancer are generally much lower for younger people.

Most cancers take years or decades to develop:

Studying clusters of infectious diseases or sudden 'outbreaks' of illnesses is simpler than studying clusters of diseases with longer development, or latency periods, such as cancer. Unlike viral infections such as the common cold or the flu, most cancers in adults develop over a period of decades, thereby making an accurate assessment of what caused the cancer difficult.

Steps involved in addressing cancer cluster concerns:

1. Public education: The first step involved in addressing a reported cancer cluster is to identify the basis for concern. Most often, the cancer cluster is suspected to be due to an environmental pollutant or effluent from local industry. For example, in a series of 141 reports of cancer clusters in the U.S., 37 per cent originated from public concerns about suspected environmental or occupational causes. Most scientists studying environmental pollution think that only a small fraction of cancers are likely caused by manmade toxic substances in the environment. However, there are many reasons for controlling the release of environmental pollutants regardless of their association with cancer risk. Epidemiologic research over the last several decades has helped to identify that lifestyle factors such as cigarette smoking, diet, alcohol consumption, reproductive factors, obesity, sun exposure, and inactivity are major contributors to the development of cancer in humans. It has been estimated that more than two-thirds of cancers, might be prevented through lifestyle modification alone.

2. The Ontario Cancer Registry aids in confirming cancer diagnosis: One of the next steps involved in addressing a potential cancer cluster may be to confirm cancer diagnoses. This confirmation also allows investigators to verify what type of cancer occurred in each patient. It is important to understand that cancer is not a single disease that simply manifests in different areas of the body. Rather, cancer is better described as a disease process where a group of cells gain, through the accumulation of genetic abnormalities or mutations, a growth advantage over other cells in the same organ (e.g. the lung in the case of lung cancer) or system of the body (e.g. white blood cells in the case of leukemias).

As well, this accumulation of genetic mutations usually takes years or even decades to occur. With each different type of cancer (e.g. lung cancer compared to leukemia) there exists a different set of genetic changes and usually a different set of causes.

This explains why the cancers in a suspected cluster need to be of the same, or in some cases at least very similar, type. Further, although many associations between cancer-causing agents (carcinogens) and certain types of cancer have been identified (e.g. smoking and lung cancer) there are many cancers for which their causes are still poorly understood. This point illustrates one of the most difficult elements of addressing a cancer cluster: the difficulty of establishing a clear cause and effect relationship between a suspected carcinogen and the cancer patients in that area.

3. The Ontario Cancer Registry aids in making comparisons: With access to the Ontario Cancer Registry, the Health Unit is able to compare cancer rates in the various Ontario counties according to several defining features such as age and year of diagnosis and site of the cancer. Unfortunately, additional characteristics of cancer patients, like ethnicity, occupation and

lifestyle, are not reported to the OCR. But investigators are still able to compare the number of persons observed (i.e. diagnosed) with a particular cancer in a geographic area to what was expected from provincial averages for an area of the same size and age distribution. Although public concern about the number of observed cancer cases is usually the reason that public agencies are contacted, these concerns are often quickly resolved when an investigation reports back that the cancer rate in an area of concern is not different than the Ontario average. As well, even when a higher (or lower) rate of a particular cancer is found, this investigator usually helps to interpret the incidence of cancer in that area in the local context. For example, although an area might have a statistically significant increased rate of cancer, it might still be quite similar to the rates for several other communities lacking similar concern. Alternately, the apparent increase could be due solely to random or chance variation.

The comparison of cancer rates between the area of concern and the province as a whole highlights two other common problems with cluster investigations:

- 1) The problem of multiple comparisons; that is, the more often statistical comparisons are made, the more likely a chance finding will occur: and
- 2) The problem associated with defining a realistic geographic area for comparison.

Some cancer cluster investigations have been attributed to the 'Texas Sharpshooter Fallacy' (imagine a sharpshooter shooting his gun at a barn door aimlessly and then drawing a target around the bullets afterward).

For more information, contact Anne Marie Holt, Epidemiologist, at the Haliburton, Kawartha, Pine Ridge District Health Unit at (905) 885-9100, ext. 215.

Random Data Show Natural Clustering

Most clusters actually occur by chance

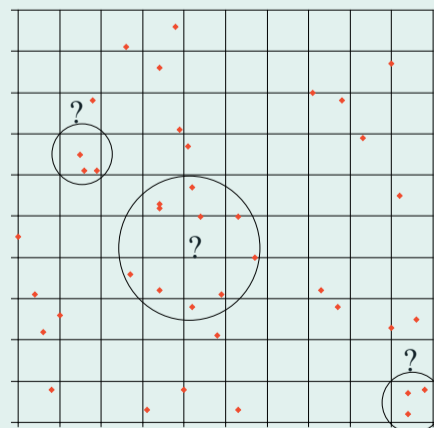
- probability theory predicts that there should be a large number of naturally occurring clusters that simply occur by chance

Delineation of a reported cluster is usually quite subjective Texas Sharpshooter Phenomenon

"The identification of a cluster and its source population is all too often like the Texas sharpshooter who first fires his bullet and only then draws the target around him."

from KJ Rothman, 1990

Cancer Care Ontario, Division of Preventive Oncology, May 2002



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