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CANCER CLUSTERS

Cancer is a common disease. In most cases potential 'clusters', or groups of cancers in one place, are found to be a normal occurrence, with no identifiable environmental cause. Around 236,000 people in NSW diagnosed between 1980 and 2004 are presently living with cancer. In NSW, one in two men and one in three women will be diagnosed with cancer in their lifetime. Advances in early detection and treatment mean that most cancer patients are surviving longer or are cured.

The commonality of cancer means that many workplaces will include groups of people who have survived cancer or who are diagnosed with cancer. Such groups are not necessarily clusters.

This Cancer Institute NSW Position Statement provides information to the NSW community about 'cancer clusters', including the definition of a cluster, the investigation of a cluster and the learning from cluster investigations in the past.

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DEFINITION OF A CANCER CLUSTER

- A "Cancer Cluster" is defined as a greater than expected number of cancer cases that occurs within a group of people, a geographical area, or over a period of time.
- Cancer clusters may be suspected when people report that several family members, friends, neighbours or co-workers have been diagnosed with the same or related cancer.
- However, what appears to be a cluster may merely reflect the expected number of cancer cases within a group of people or a geographic area. It is important to consider the following when a cancer cluster is suspected.
 1. Cancer is an uncontrolled growth and spread of abnormal cells anywhere in the body, it is not caused by injuries, nor is it contagious. It cannot be passed on from one person to the next like a cold or flu.
 2. Cancer is a common disease affecting one in 2 men and one in 3 women in their lifetime.
 3. Cancer is not a single disease but a group of related but different diseases. Each type of cancer has known or suspected risk factors associated with it.
 4. More than ten years can take place between exposure to a substance that causes cancer and a diagnosis of cancer, which makes it difficult to determine the cause of that cancer.
 5. An apparent cluster is most likely to be genuine if the cases consist of one type of cancer, a rare type of cancer or a cancer that is not usually found in an age group.^{1,2}

WHEN SHOULD A CLUSTER BE INVESTIGATED?

In a review of 22 years of cancer cluster investigations the criteria used for proceeding with a cluster study were:

1. The number of cases exceeded the crude expected number by a factor of 2 or with a probability of 0.05;
2. The cases were of one type of cancer;
3. A specific population could be defined;
4. A specific time frame for the occurrence of cases could be set; and
5. A specific exposure was known or suspected. ³

HOW IS A SUSPECTED CLUSTER INVESTIGATED?

A suspected cancer cluster may be reported to a State Health Department or a state cancer registry. When a potential cluster is first reported, the investigating agency gathers information and follows a basic procedure. Investigators are likely to do the following:

- Determine if the cases are of the same type of cancer e.g. bladder, breast.
- Define the number of cases for the time period (number of new cases diagnosed for a specified period).
- Define the geographical area and verify that the cases belong to the population (e.g. verify residence).
- Seek information about each person with cancer in the potential cluster: name, address, telephone number, sex, race, age and occupation as well as the length of time living in an area.
- Compare the cases in the sub population with the reference population:
 - Check if there have been changes in how cases are diagnosed over the time period of interest;
 - Adjust for differences in age and sex;
 - Calculate the probability that chance may account for the findings for a single comparison;
 - A statistically significant finding means that the probability that the observed numbers of cases could have happened by chance alone is 5% or less;
 - However, there is a further test called multiple comparisons that modifies the probability statistic, or p value, by comparing with other similar sized communities, "when a cluster is reported from one community, it implies that comparisons have taken place in many similar communities about which we do not hear because no clusters were found". ⁴
 - Another method that can be used to recognising the presence of a cluster is the scan statistic test. This test looks at a defined time period and then compares the number of cases that occur within equal intervals with a set of tables, to determine the likelihood of these cases occurring by chance. ⁵

HOW MANY CANCER CASES WOULD BE EXPECTED IN A WORK ENVIRONMENT?

One simple way to understand how to calculate how many new cancers would be expected in a workplace in one year would be to consider the rate per 100,000 for cancer in the whole population for that year. For example the rate of cancer (all types) in males aged 50-54 years in NSW in 2004 was 576 cases per 100,000 population or 0.00576. If there were 200 males aged 50-54 years working in an office then $0.00576 \times 200 = 1.15$ or one new cancer would be expected in a year in a male aged between 50 and 54 years of age. If these same 200 males had been working in the same office for 10 years then 12 new cases of cancer would be expected from this group. However, the reality is the workplace is like the general community with people of all ages and risk profiles.

WHAT IS AN ENVIRONMENTAL ASSESSMENT?

An environmental assessment includes an assessment and mapping of potential sources of occupational and environmental chemicals associated with a particular cancer.

- The assessment will consider established guideline values for safe exposure based on what is reported in the literature.
- Review the scientific literature to establish whether the reported cancer has been linked to the suspected exposure.

WHAT HAVE WE LEARNT FROM CLUSTERS IN THE PAST?

Most reports of suspected cancer clusters are not shown to be true clusters. Many reported clusters do not have enough cases for a conclusion to be reached. At other times an excess of cases can exist without an explanation for it.¹

The United States Centre for Disease Control investigated 108 cancer clusters, mostly involving leukaemia, over the years from 1961 to 1981. No clear cause was found for any cluster.⁶ In a review of the results of 61 workplace cancer cluster investigations done by the US National Institute for Occupational Safety and Health between 1978 and 1984,⁷ the authors concluded that "Most of the clusters ... had no plausible occupational etiology". Forty five percent of the initial requests for investigation of clusters in the workplace alleged five or fewer cases. Only 7% had 10 or more cases and 36% did not specify how many cases there were. The anatomical sites most commonly mentioned were lung, gastrointestinal and breast. This is not surprising given that these cancers are high volume cancers within the general community.

Known or suspected human carcinogens were identified in 43% of the 61 investigations. The most frequently identified substances were asbestos, formaldehyde, benzene and polychlorinated biphenyls. However, "In almost all cases, only the presence of the carcinogen was determined, with no demonstrable relationship between the extent of exposure and risk of disease among individuals comprising the cluster".

Three methods were primarily used in an occupational setting for evaluating whether there was a cluster. These were, the standardised incidence ratio (observed cases/expected cases); standardised mortality ratio (observed deaths/expected deaths); and case documentation. An alternative method is to look at the number of person years at risk and look at the numbers of observed and expected cases found during that time period.

The primary public health purpose of investigating reports of excessive cancer is to identify and control the cause. One argument may be that without an identifiable environmental exposure, even with a statistical excess, little purpose is served by further investigation. An alternative view is that there may be an occupational risk factor not associated with a building or it might demonstrate the absence of cancer excess.

Some clusters, however, identified by the community have led to the identification of an underlying etiological cause, when they have constituted the appearance of a new disease for example clear cell vaginal cancer in young women and diethylstilbesterol⁸, liver angiosarcoma among vinyl chloride workers⁹, phocomelia (missing limbs) and thalidomide¹⁰.

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About the Cancer Institute NSW:

The Cancer Institute NSW is Australia's first State-wide Government cancer control agency. It was established in July 2003 through the Cancer Institute NSW Act 2003 to help further reduce the impact of cancer. The Cancer Institute NSW is responsible for reducing cancer incidence, increasing cancer survival, improving the quality of life for cancer patients and their carers and providing expert advice on cancer.