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Navy and Marine Corps Public Health Center

Appendix O Cancer Clusters and Risk Communication

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Table of Contents

Cancer Cluster and Risk Communication	1
Cancer Clusters and Public Perceptions.....	1
Definition of a Cluster.....	1
Where can people get more information about cancer clusters?.....	4
Selected References.....	5



Cancer Cluster and Risk Communication

Cancer Clusters and Public Perceptions

According to the Centers for Disease Control and Prevention (CDC), cancer is the second leading cause of death in the US, with one in four deaths attributable to some form of cancer.

Approximately one in two men and one in three women will have some form of cancer in their lifetime. Because cancer is so common, cases might appear to occur with alarming frequency within a community even when the number of cases is within the expected rate for the population. As the US population ages, and as cancer survival rates continue to improve, in any given community, many residents will have had some type of cancer, thus adding to the perception of an excess of cancer cases in a community. Multiple factors affect the likelihood of developing cancer, including age, genetic factors, and such lifestyle behaviors as diet and smoking. Also, a statistically significant excess of cancer cases can occur within a given population without a discernible cause and might be a chance occurrence.

Definition of a Cluster

Information below is from: CDC. Cancer clusters. Atlanta, GA: US Department of Health and Human Services, CDC; 2012. Available at <http://www.cdc.gov/nceh/clusters/about.htm>.

The CDC defines a cancer cluster as a greater than expected number of cancer cases that occurs within a group of people in a geographic area over a defined period of time. This definition can be broken down as follows:

- a greater than expected number: Whether the number of observed cases is greater than one typically would observe in a similar setting (e.g., in a cohort of a similar population size and within demographic characteristics) depends on a comparison with the incidence of cancer cases seen normally in the population at issue or in a similar community.
- of cancer cases: The cancer cases are all of the same type. In rare situations, multiple cancer types may be considered when a known exposure (e.g., radiation or a specific chemical) is linked to more than one cancer type or when more than one contaminant or exposure type has been identified.
- that occurs within a group of people: The population in which the cancer cases are occurring is defined by its demographic factors (e.g., race/ethnicity, age, and sex).
- in a geographic area: The geographic boundaries drawn for inclusion of cancer cases and for calculating the expected rate of cancer diagnoses from available data are defined carefully. It is possible to "create" or "obscure" a cluster inadvertently by selection of a specific area.



- over a period of time: The time period chosen for analysis will affect both the total cases observed and the calculation of the expected incidence of cancer in the population.

Characteristics of Cancer and Clusters

Information below is from the CDC. Morbidity and Mortality Weekly Report (MMWR):

Investigating Suspected Cancer Clusters and Responding to Community Concerns: Guidelines from CDC and the Council of State and Territorial Epidemiologists Guidelines; September 27, 2013 / 62(RR08); 1-14. Available at

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6208a1.htm>:

- The National Cancer Institute of the National Institutes of Health defines cancer as a term for a group of diseases in which abnormal cells divide without control and can invade nearby tissues. As a group, cancers are very common. Cancers are the second leading cause of death in the US, exceeded only by diseases of the heart and circulatory system. One of every four deaths in the US is attributable to some form of cancer. In 2009, approximately 1.47 million persons in the US received a cancer diagnosis, and approximately 568,000 persons died from cancer.
- Because cancer is common, cases might appear to occur with alarming frequency within a community even when the number of cases is within the expected rate for the population. As the US population ages, and as cancer survival rates continue to improve, in any given community, many residents will have had some type of cancer, thus adding to the perception of an excess of cancer cases in a community. Multiple factors affect the likelihood of developing cancer, including age, genetic factors, and such lifestyle behaviors as diet and smoking. Also, a statistically significant excess of cancer cases can occur within a given population without a discernible cause and might be a chance occurrence.
- Three considerations are important for suspected cancer cluster investigations. First, types of cancers vary in etiologies, predisposing factors, target organs, and rates of occurrence. Second, cancers often are caused by a combination of factors that interact in ways that are not fully understood. Finally, for the majority of cancers, the long latency period (i.e., the time between exposure to a causal agent and the first appearance of symptoms and signs) complicates any attempt to associate cancers occurring at a given time in a community with local environmental contamination. Often decades intervene between the exposures that initiate and promote the cancer process and the development of clinically detectable disease.
- Communicating effectively about the frequency and nature of cancer in explaining suspected cancer clusters can be difficult for public health agencies, and many of the scientific concepts involved (e.g., random fluctuation, statistical significance and latency period) might not be easy to explain to the community. Any number of community



members, friends, or relatives with cancer is alarming and is too many from a personal perspective. When persons are affected personally by a case of cancer, they naturally seek an explanation of the cause of the cancer.

Cancer Cluster Investigations

- As the 1990 Guidelines noted, finding a causal association between environmental contaminants and cancer is rare in a community cancer cluster setting. Evidence reported by state and local health agencies and federal agencies since 1990 that would suggest otherwise is limited, and most investigations of suspected cancer clusters do not lead to the identification of an associated environmental contaminant.
- State and local health agencies receive approximately 1,000 inquiries per year regarding suspected cancer clusters. The majority of these inquiries can be resolved during the initial response, which consists of the initial contact and follow-up contact with the caller, if needed. The resulting health education can be an important public service. Even if inquiries concern events that meet the statistical criteria for a cancer cluster, investigations of suspected cancer clusters are unlikely to find an associated environmental contaminant. For example, one of the largest suspected cancer clusters investigated by CDC's NCEH and by other agencies concerned cases of childhood leukemia in Fallon, Nevada. Although initial analysis demonstrated a statistically significant ($p < 0.05$) increase in the number of cases, subsequent epidemiologic investigations did not identify a statistically significant association with environmental contaminants.
- Suspected cancer clusters that consist of cases of one type of cancer, a rare type of cancer, or a type not identified usually in a certain demographic group are thought to be more likely to have a common cause. Even if these factors are present, the suspected cluster might not be associated with an environmental exposure and in fact might be a chance occurrence. A type of cancer under investigation might not be associated biologically with any environmental contaminants of concern in the community. In other words, a suspected environmental contaminant might not be in the causal pathway for a certain type of cancer. One common but false assumption held by persons not familiar with the scientific study of cancer is that a single environmental contaminant is likely to cause any or all kinds of cancer. Toxicological and epidemiologic studies do not support this assumption. Cancer is not one disease, but rather many different diseases with different causal mechanisms.
- In addition, two statistical issues influence the ability of the health agency to determine an association between the cancer(s) in question and environmental exposures. First, a suspected cancer cluster investigation with a small number of cases (e.g., one that involves a rare cancer type comprising only a few cases) might result in a lack of



statistical power to detect an association. Second, because of the substantial number of cancer patients who might live in a community, a spurious association with an environmental contaminant can occur by chance alone, without the contaminant being a causal factor.

- The health agency should avoid imprecise and post hoc definitions of such concepts as case, population, geographic area, or exposure period because such definitions might bias or limit an investigation. For example, case definitions that include different cancers generally are not useful, unless the environmental contaminant under consideration has been associated with multiple cancer types.
- Latency and change of residence add to the complexity of these investigations. Because of the long latency period associated with cancers, behaviors and exposures that might have contributed to the development of cancer in a person typically occur years to decades before the diagnosis (e.g., malignant mesothelioma, a lung tumor, is associated with asbestos exposure). The latent period between first exposure to asbestos and death from mesothelioma is often 30 years or longer. Latency needs to be considered in an investigation of a suspected cancer cluster because it influences the exposure period relevant to the investigation. If a person with cancer did not live in the suspected cancer cluster area during the relevant exposure period (possibly 20 years previously), then that person's cancer cannot be related to an environmental contaminant of concern or to any exposure in the suspected cancer cluster area. Conversely, the latency period might limit the ability to detect a cancer cluster or identify cancers related to an environmental exposure that occurred in the past. In a mobile population, a cancer cluster resulting from an environmental contamination occurring years or even decades earlier might go undetected because exposed residents have moved away from the community before the cancer develops. Thus, as persons move in and out of different communities, their cumulative exposure profile will change.
- Because investigations rarely demonstrate a clear association with an environmental contaminant, investigations of community-based cancer clusters usually do not provide the resolution communities seek.

Where can people get more information about cancer clusters?

In addition to [state and local health departments](#) and [cancer registries](#), the following agencies may have more information about cancer clusters.

Agency for Toxic Substances and Disease Registry (ATSDR) Centers for Disease Control and Prevention
1-800-232-4636 (1-800-CDC-INFO)

<http://www.atsdr.cdc.gov>

<http://www.atsdr.cdc.gov>



The CDC's ATSDR conducts public health assessments of potentially hazardous waste sites, performs health consultations on specific hazardous substances, designs and conducts health [surveillance](#) programs, and provides education and training about hazardous substances. Information about public health assessments conducted by ATSDR can be found on the [Public Health Assessments and Health Consultations](#) page. Reports can be searched by state or US territory. Contact information for ATSDR regional offices is available [online](#).

**National Center for Environmental Health (NCEH) Centers for Disease Control and Prevention
1-800-232-4636 (1-800-CDC-INFO)**

cdcinfo@cdc.gov <http://www.cdc.gov/nceh/clusters>

The CDC's NCEH works to promote healthy and safe environments and prevent harmful exposures. The NCEH website includes general information about cancer clusters, links to resources, and answers to frequently asked questions.

**National Institute for Occupational Safety and Health (NIOSH) Hazard Evaluation and Technical Assistance Branch
Health Hazard Evaluation (HHE) Program
Centers for Disease Control and Prevention
1-513-841-4382**

HHERequestHelp@cdc.gov <http://www.cdc.gov/niosh/hhe>

The HHE Program of CDC's NIOSH investigates potentially hazardous working conditions, including suspected cancer clusters. Employees, authorized employee representatives, and employers can request these evaluations. HHE reports are available on the NIOSH website.

**Office of Occupational Medicine
Occupational Safety and Health Administration (OSHA)
U.S. Department of Labor
202-693-2323**

<http://www.osha.gov/dts/oom/index.html>

OSHA's Office of Occupational Medicine performs workplace-related case evaluations and cluster investigations, including medical record reviews, employee interviews, and medical screening activities.

[Selected References](#)

Centers for Disease Control and Prevention. Investigating Suspected Cancer Clusters and Responding to Community Concerns: Guidelines from CDC and the Council of State and Territorial Epidemiologists. *Morbidity and Mortality Weekly Report* 2013; 62(RR08):1-14.

[\[PubMed Abstract\]](#)