

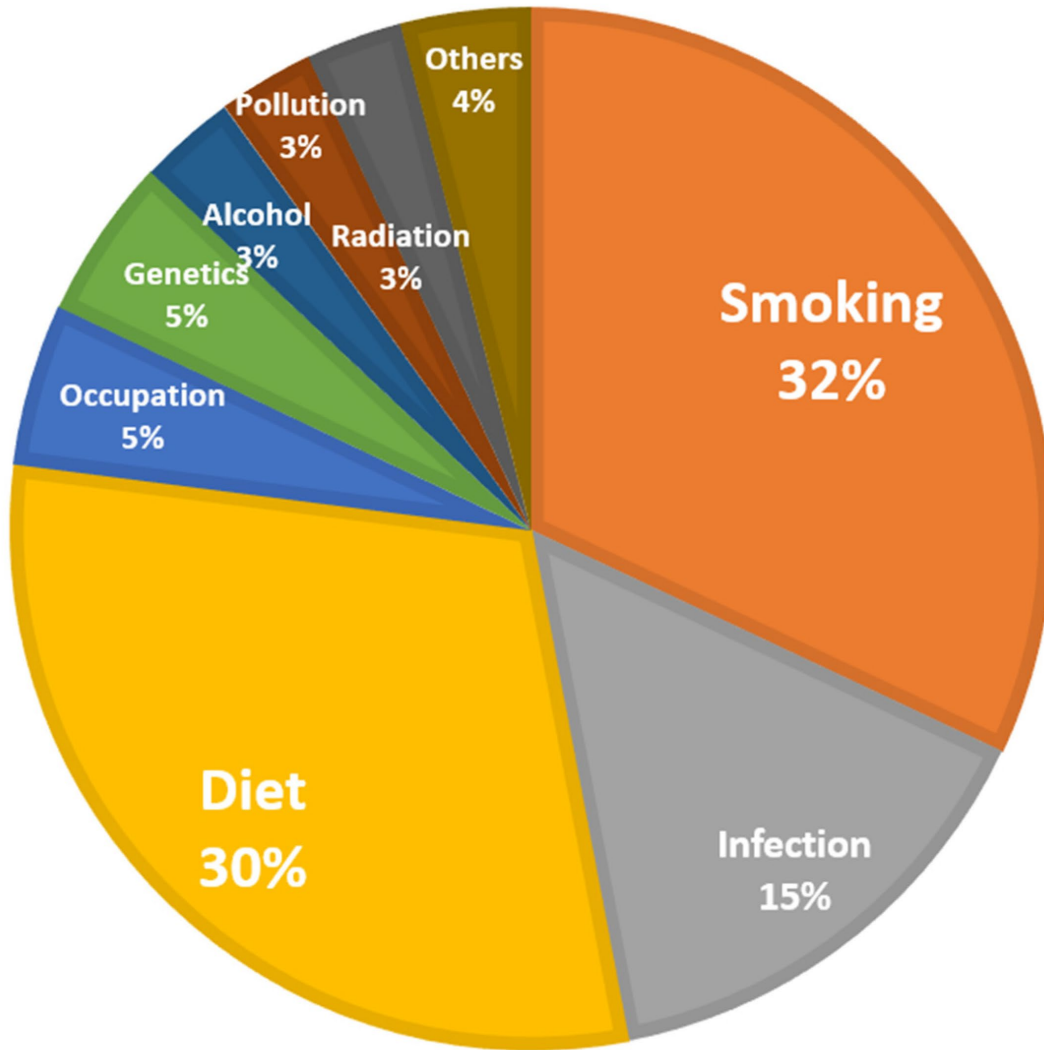
Epidemiological Approaches for Assessing Reports of Cancer Clusters and Environmental Exposures

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What is the Definition of a Cancer Cluster and How Should it be Investigated?

- CDC defines a cancer cluster as:
 - Greater than expected number of cases compared to a similar setting
 - Similar related cancers linked to the environmental exposure
 - Occurs within a group of people defined by demographics (sex, race, and age)
 - Limited to a geographic area (census tracts or zip code)
 - Occurs over a defined period of time
- It has been the responsibility of the Health Departments in the States and Territories Cancer Registries
- Assessment could include consultation, additional information gathering and analysis, defining geographic area and time frame of concern using spatial and temporal methods
- Environmental sample collection

Causes of Cancer



- Lifestyle and recreational exposures
- Occupational exposures
- Genetic predisposition
- Other confounding factors to consider are:
 - Demographics – race/ethnicity, birthplace
 - Social determinants of health - variations linked to extremes – income, education, access to medical care

Precedents: Environmental cancer clusters do occur (other than occupational risks)

- Fallon, NV: 2000-2001, 16 acute lymphoblastic leukemia cases, 0.3 expected; Host to thousands of diverse visitors – probably due to a virus
- Libby, MT: Multiple cases of mesothelioma in a small town Tailings of asbestos-containing vermiculite
- Cappadocia, Turkey: Local stone used to build houses - Cluster of mesothelioma cases in people and sheep
- Greece, Italy, New Caledonia: Clusters of mesothelioma from building materials or whitewash with asbestos
- Ukraine/Belarus: Localized thyroid cancer in young persons from nuclear fallout from Chernobyl nuclear accident
- Taiwan, Chile, Argentina, Bangladesh: Localized bladder cancer Groundwater contaminated with natural arsenic deposits

Examples of Reported Cancer Clusters



One of a few buildings in 2001 at Reich Farm in Toms River where hazardous chemicals were uncovered in barrels more than 30 years ago

Thought that groundwater contamination caused a cancer cluster of pediatric diagnoses (early to mid-90s)

Toms River cancer cluster still a mystery despite 20 years of studies - latest study said SAN Trimer didn't cause cancer in rats



More than 100 former Colonia High School students and staff over a 30-year period have been diagnosed with brain tumors

Other Unconfirmed “clusters” – Love Canal, NY and Hinkley, CA

Despite clear evidence of chemical toxins, no increase cancer frequency was documented

How Do We Find Causes of a Cancer Cluster

- Sources of information from the community and confirm with clinical information (health record)
- Mechanistic confirmation from the laboratory studies
- Animal studies (not like humans and difficult to extrapolate)
- Exposures could be airborne, waterborne, airborne viruses
- Epidemiologic patterns
 - Natural observations are hard
 - Multiple exposures
 - Doses are approximate
 - Could be chance occurrence or bias

Challenges

- Residents have been exposed to carcinogens at **some** dose
- They may have **some** added cancer risk
- The challenge is to see if a **measurable and unambiguous** increased risk has occurred
- Must examine **individual** cancers and **individual** tracts
- Must rule out association cannot be explained by a bias

What Are the Problems in Assessing Cancer Clusters?

- Demography Not Geography
 - Age, Sex, Ethnicity, Lifestyle
 - Income/Education, Occupation, Medical care
- Errors in diagnosis or attribution
- Errors in census estimates
- Mixture of different cancers
- Diagnosis before residence in area or after moving out
- **CHANCE** 
- The more multiple comparisons, the more likely a positive finding by chance

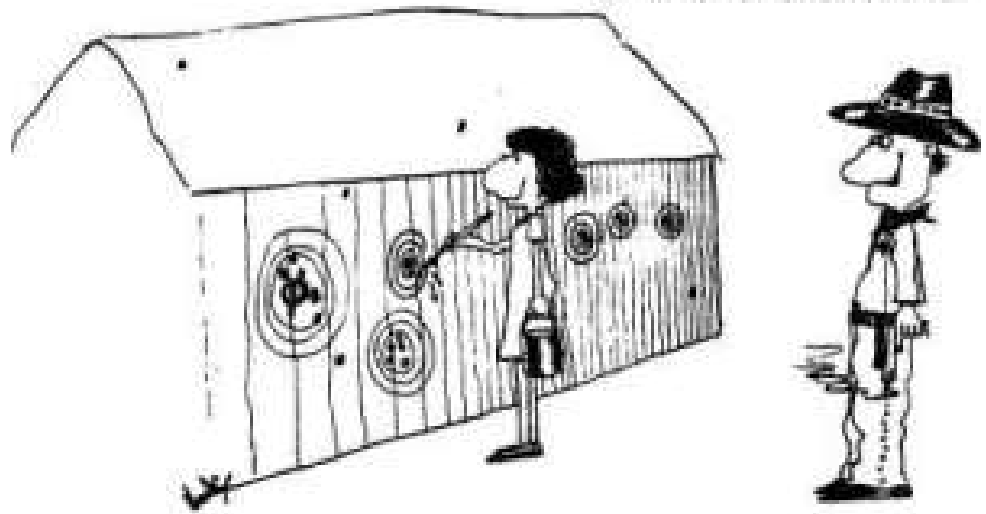
Number of Comparisons Matters

- When something happens 1% of the time by chance
 - If there are 100 neighborhoods, one is usual
 - If there are 1000 neighborhoods, there should be 10
 - If there are 5000 neighborhoods, there should be 50
- If it happens in your neighborhood, Never Chance

Texas Sharpshooter

Shooter looks at the wall filled with bullet holes and draws a target around where some of the holes are grouped, to show how precise his shooting is.

The Texas Sharpshooter Procedure



Aim, Shoot, and then Draw the Target

Can We Improve on the Assessments

- Public perception and fears in the community should be addressed by working with the community to gain trust in the process
- CDC and public health entities should provide educational materials and fact sheets about perceived cancer clusters
- Report back results and explain findings (statistics, exposures, etc.) after investigation
- If there is a disaster in a community like the Palestine train disaster-community outreach and monitoring should be launched immediately
- Public health agencies should work with minority serving public health entities and address concerns in environmental **injustice** communities

Questions??
