

Epidemiology Theory

Epidemiology in its broadest sense is the study of disease patterns in human populations. (wikipedia)

Epidemiology is the study of the determinants, occurrence, and distribution of health and disease in a defined population. Infection is the replication of organisms in host tissue, which may cause disease. A carrier is an individual with no overt disease who harbors infectious organisms. Dissemination is the spread of the organism in the environment.

Chain of Infection

There are three major links in disease occurrence:

1. The etiologic agent

The etiologic agent may be any microorganism that can cause infection. The pathogenicity of an agent is its ability to cause disease; pathogenicity is further characterized by describing the organism's virulence and invasiveness. Virulence refers to the severity of infection, which can be expressed by describing the morbidity (incidence of disease) and mortality (death rate) of the infection.

2. The method of transmission

The method of transmission is the means by which the agent goes from the source to the host. The four major methods of transmission are:

- > by contact
- > by common vehicle
- > by air
- > via a vector

3. The host

The organism may enter the host through the skin, mucous membranes, lungs, gastrointestinal tract, or genitourinary tract, and it may enter fetuses through the placenta. The resulting disease often reflects the point of entrance, but not always.

These links should be characterized before control and prevention measures are proposed. Environmental factors that may influence disease occurrence must be evaluated.

Epidemiologic Methods

Epidemiologic studies may be:

1. Descriptive

Organizing data by time, place, and person.

1.1 - Time Trends

> The **secular trend** describes the occurrence of disease over a prolonged period, usually years; it is influenced by the degree of immunity in the population and possibly nonspecific measures such as improved socioeconomic and nutritional levels among the population.

> The **periodic trend**. A temporary modification in the overall secular trend, the periodic trend may indicate a change in the antigenic characteristics of the disease agent

> The **seasonal trend**. This trend reflects seasonal changes in disease occurrence following changes in environmental conditions that enhance the ability of the agent to replicate or be transmitted

> The **epidemic** occurrence of disease. An epidemic is a sudden increase in occurrence due to prevalent factors that support transmission.

1.2 - Place Considerations

A description of epidemiologic data by place must consider three different sites: where the individual was when disease occurred; where the individual was when he or she became infected from the source; and where the source became infected with the etiologic agent. Therefore, in an outbreak of food poisoning, the host may become clinically ill at home from food eaten in a restaurant. The vehicle may have been undercooked chicken, which became infected on a poultry farm. These differences are important to consider in attempting to prevent additional cases.

1.3 - Infected Person

All pertinent characteristics should be noted: age, sex, occupation, personal habits, socioeconomic status, immunization history, presence of underlying disease, and other data.

2. Analytic

Incorporating a case-control or cohort study.

The two main analytic methods are the case-control (or case-comparison) method and the cohort method:

2.1 - The case-control method starts with the effect (disease) and retrospectively investigates the cause that led to the effect.

2.2 - The cohort method studies two populations: one that has had contact with the suspected causal factor under study and a similar group that has had no contact with the factor. When both groups are observed, the effect of the factor should become apparent.

3. Experimental

A hypothesis is developed and an experimental model is constructed in which one or more selected factors are manipulated. The effect of the manipulation will either confirm or disprove the hypothesis.

Epidemiology utilizes an organized approach to problem solving by:

- (1) confirming the existence of an epidemic and verifying the diagnosis.
- (2) developing a case definition and collating data on cases.
- (3) analyzing data by time, place, and person.
- (4) developing a hypothesis.
- (5) conducting further studies if necessary.
- (6) developing and implementing control and prevention measures.
- (7) preparing and distributing a public report; and (8) evaluating control and preventive measures.

Source:

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<http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=mmed.chapter.631> December 10, 1997