

Introduction to Epidemiology

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Key aspects of epidemiology

- Epidemiology deals with **populations**
- Epidemiology involves **measurement**
- Epidemiologic studies involve **comparison**
- Epidemiology is fundamentally **multidisciplinary**

Definitions of Epidemiology

Lilienfeld A: in Foundations of Epidemiology

the study of the distribution of a disease or a physiological condition in human populations and of the factors that influence this distribution

Last JM: A Dictionary of Epidemiology

the study of the **distribution** and **determinants** of health related states and events **in populations** and the application of this study to control of health problems"

What is the Unique Skill of Epidemiologists?

measuring disease frequency in
populations

Measuring Disease Frequency Has Several Components

- ✓ Classifying and **categorizing** disease
- ✓ Deciding what constitutes a **case** of disease in a study
- ✓ Finding a **source** for ascertaining the cases
- ✓ Defining the population **at risk** of disease
- ✓ Defining the period of **time of risk** of disease
- ✓ Obtaining **permission** to study people
- ✓ Making measurements of disease **frequency**
- ✓ Relating cases to **population and time at risk**

Two Broad Types of Epidemiology

DESCRIPTIVE EPIDEMIOLOGY

Examining the distribution of a disease in a population, and observing the basic features of its distribution in terms of time, place, and person.

Typical study design:

community health survey
(approximate synonyms - cross-sectional study, descriptive study)

ANALYTIC EPIDEMIOLOGY

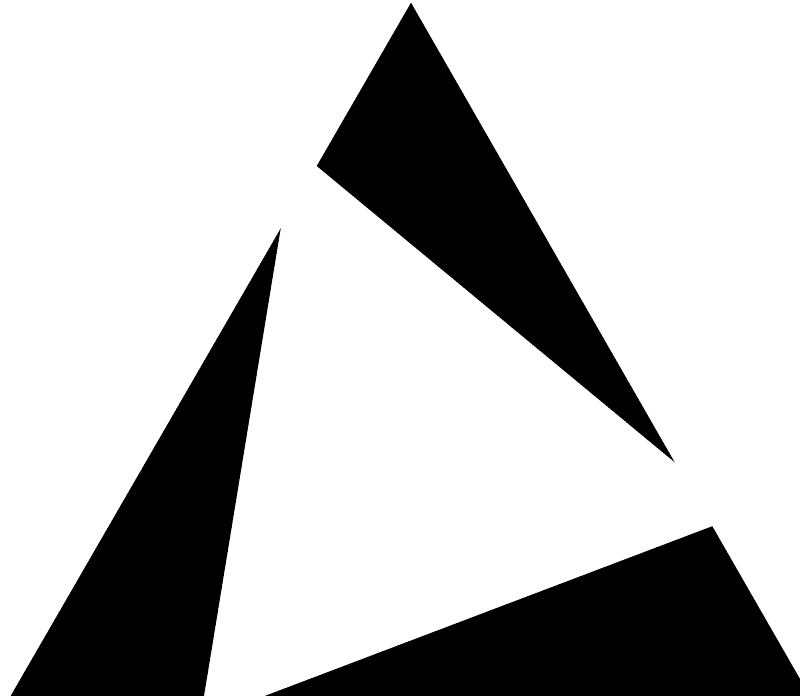
Testing a specific hypothesis about the relationship of a disease to a putative cause, by conducting an epidemiologic study that relates the exposure of interest to the disease of interest.

Typical study designs: cohort, case-control

The Basic Triad Of Descriptive Epidemiology

the three essential characteristics of disease we look for in descriptive epidemiology:

- **TIME**
- **PLACE**
- **PERSON**



Time

- Changing or stable?
- Seasonal variation.
- Clustered (epidemic) or evenly distributed (endemic)?
- Point source or propagated.

Place

- Geographically restricted or widespread (pandemic)?
- Relation to water or food supply.
- Multiple clusters or one?

Person

- Age
- Socio-economic status
- Gender
- Ethnicity/Race
- Behavior

Descriptive Epidemiology is Necessary for Analytic Epidemiology

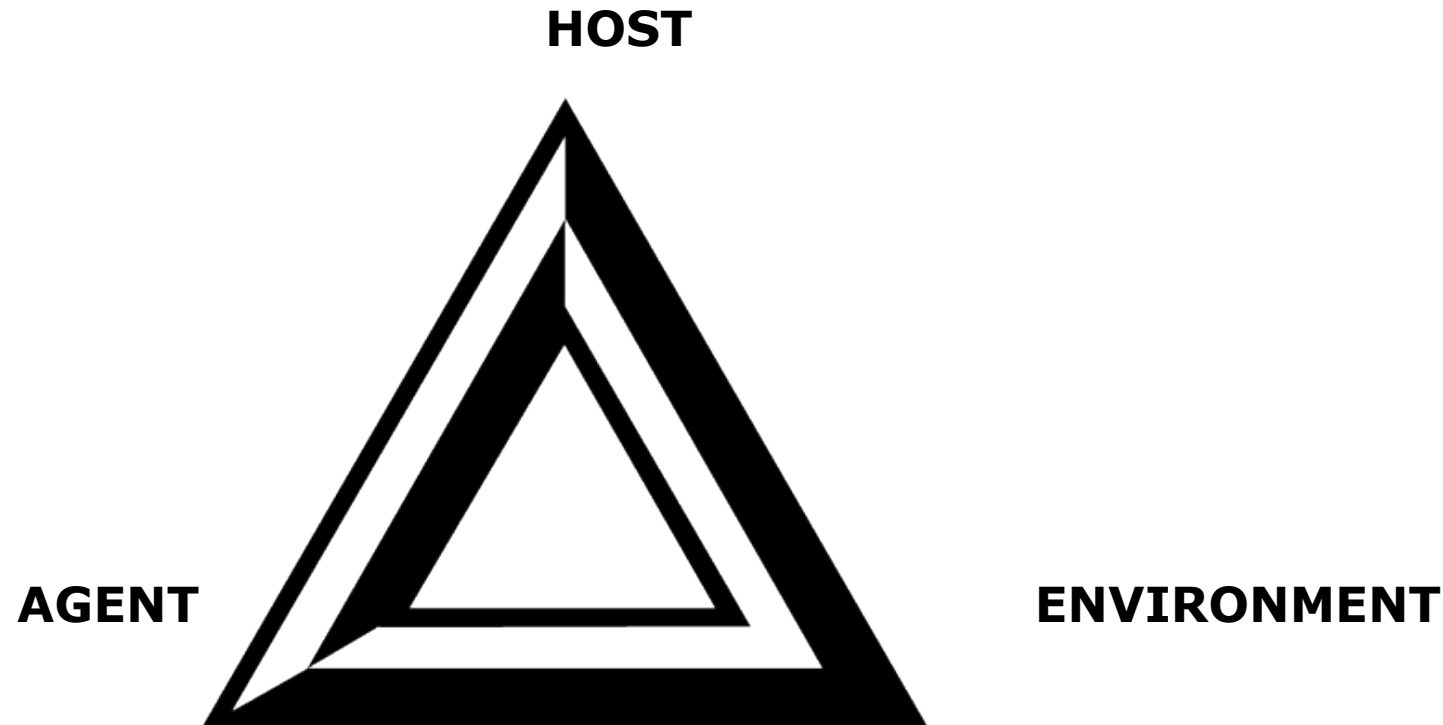
to undertake an analytic epidemiologic study you must first:

- know where to look
- know what to control for
- be able to formulate hypotheses compatible with laboratory evidence

A common error in epidemiology is moving to analytic epidemiology without having a solid base in the descriptive epidemiology of the condition.

The Basic Triad of Analytic Epidemiology

The three phenomena assessed in analytic epidemiology are:



Agents

- Nutrients
- Poisons
- Allergens
- Radiation
- Physical trauma
- Microbes
- Psychological experiences

Host Factors

- Genetic endowment
- Immunologic state
- Age
- Personal behavior

Environment

- Crowding
- Atmosphere
- Modes of communication – phenomena in the environment that *bring host and agent together*, such as:
 - Vector
 - Vehicle
 - Reservoir

Epidemiologists are required to have some knowledge of:

- **public health**, because of the emphasis on disease prevention.
- **clinical medicine**, because of the emphasis on disease classification and diagnosis.
- **pathophysiology**, because of the need to understand basic biological mechanisms in disease.
- **statistics**, because of the need to quantify disease frequency and its relationships to antecedents.
- **social sciences**, because of the need to understand the social context in which disease occurs and presents.

Purposes Of Epidemiology

1. Identify causes and risk factors for disease.
2. Determine the extent of disease in the community.
3. Study natural history and prognosis of disease.
4. Evaluate preventive and therapeutic measures
5. Provide foundation for public policy

Differences Between Laboratory Sciences And Field Sciences

In the Laboratory:

- Mostly experimental
- Variables controlled by the investigator
- All variables known
- Replication easy
- Results valid
- Meaning of results for humans uncertain.
- Little need for statistical manipulation of data.
- Highly equipment intensive

Differences Between Laboratory Sciences And Field Sciences

In the Field:

- Mostly observational
- Variables controlled by nature
- Some variables unknown
- Replication difficult; exact replication impossible
- Results often uncertain
- Meaning of results for humans clear
- Statistical control often very important

every health outcome has some interesting and useful epidemiologic characteristic

DEATH RATES BY SOCIAL CLASS FROM A CERTAIN CAUSE
AMONG 1,316 PEOPLE

	Men	Women	Children	Total
1 st class	67%	3%	0	38%
2 nd class	92%	14%	0	59%
3 rd class	84%	54%	66%	62%
Total	82%	26%	48%	62%

WHAT CAUSE OF DEATH IS THIS?

The previous slide shows death rates by class of ticket on the Titanic, a large ocean liner that sank after colliding with an iceberg in 1912

Thank You