

# **Analytical Epidemiology**

## **“Agent-Host-Environment”**

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# Epidemiologic Activities

- **...are often framed under the mantle of descriptive and analytic epidemiology**
  - **Descriptive epidemiology – person, place & time**
    - Demographic distribution
    - Geographic distribution
    - Seasonal patterns etc.
    - Frequency of disease patterns
  - **Useful for:**
    - Allocating resources
    - Planning programs
    - Hypotheses development

# Analytical Epidemiology

- **Second major type of epidemiology.** Descriptive Epidemiology is an antecedent.
- **Examining the Determinants of diseases** in a population. Search for **causes** or **risk factors**.
- **Investigating a hypothesis** about the cause of disease **by studying how exposures relate to disease.**
- Unlike descriptive epidemiology, **IT focuses on individual within population.**
- Analytic studies tend to be **more specific** than descriptive studies in their focus.
- **Objective not to formulate hypothesis but to test hypothesis.**

# Analytic Epidemiology

1. Built around the analysis of the relationship between two items.
  - a. Exposures.
  - b. Effects (disease).
2. Looking for determinants or possible causes of disease
3. Useful for hypothesis testing.
4. Analytic epidemiology studies require information to  
....
  - a. know where to look.
  - b. know what to control for.
5. Types of study designs:
  - a. Case control study. → Retrospective, ex post facto studies
  - b. Cohort study → Prospective, longitudinal studies

# Purpose of Studying Causal Models

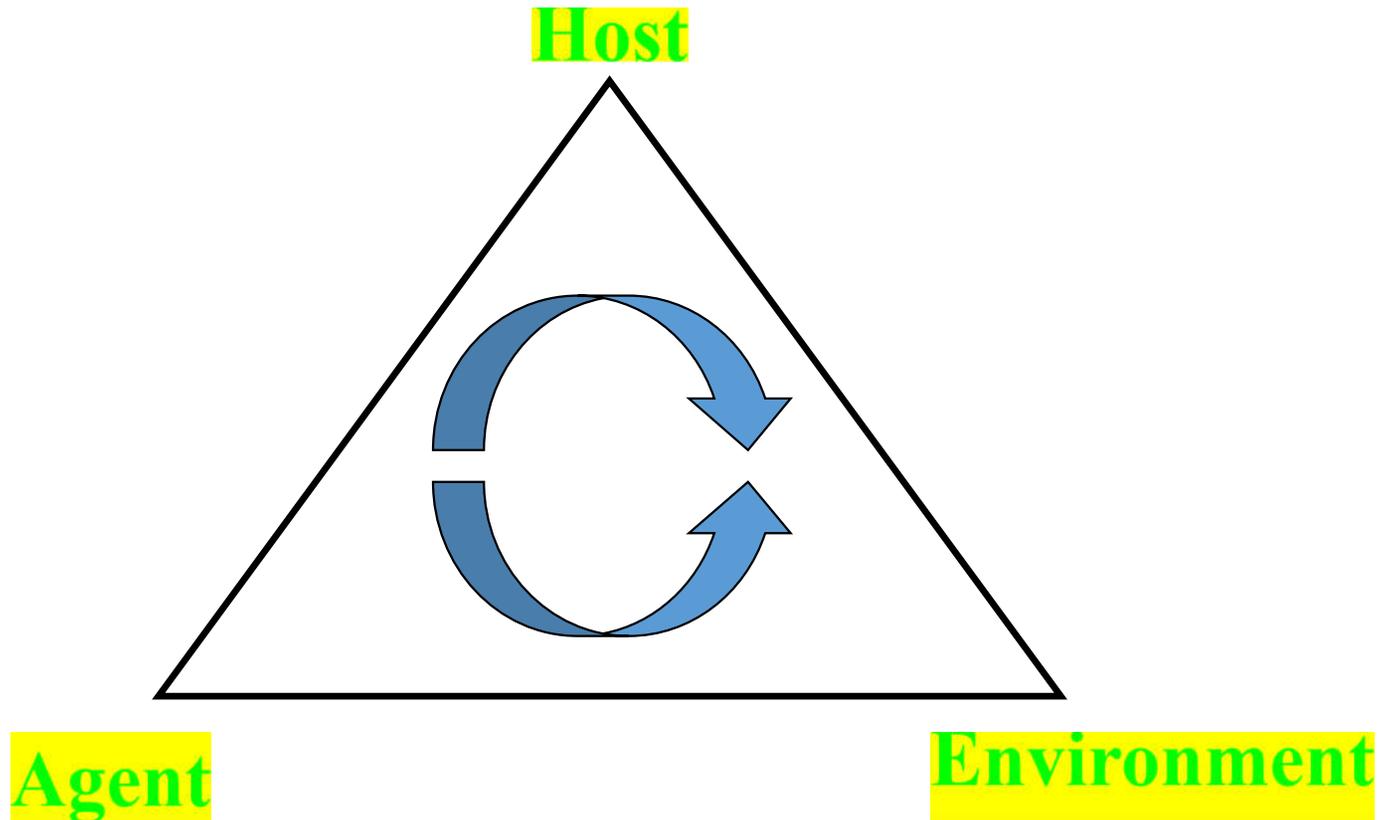
- Studying how different factors can lead to ill health is important to generate knowledge to help prevent and control diseases.
- The classic epidemiological triangles or triads help understanding the relation between a disease and the agent causing the disease

**Causal model = Analytical epidemiology**

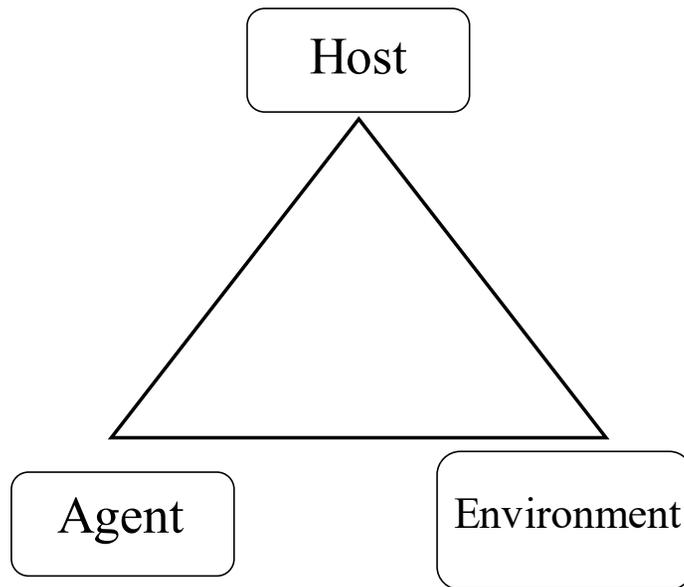
# The Analytical Epidemiologic Triad

- ✓ This model comprises a susceptible host (the person at risk for the disease), a disease agent (the proximate cause), and an environmental context for the interaction between host and agent.
- ✓ Thus, development of disease is a combination of events:
  - ✓ A harmful agent .
  - ✓ A susceptible host .
  - ✓ An appropriate environment.

# Epidemiologic Triangle



# The Epidemiologic Triangle



## Host Factors

**Personal traits**

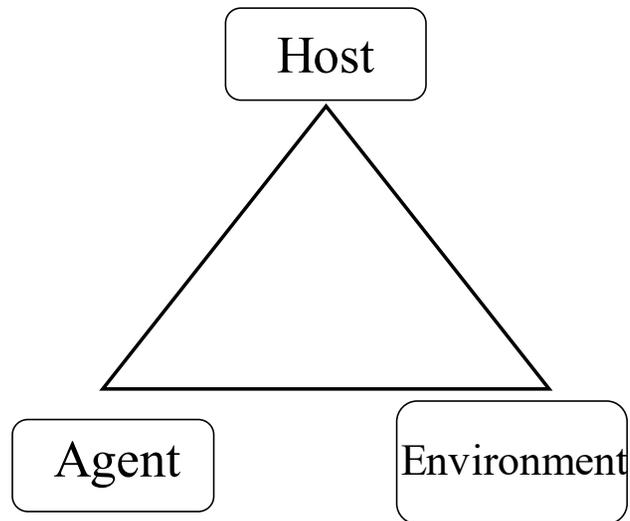
**Behaviors**

**Genetic predisposition**

**immunologic factors**

Influence the chance for  
disease or its severity

# The Epidemiologic Triangle



**Agents**

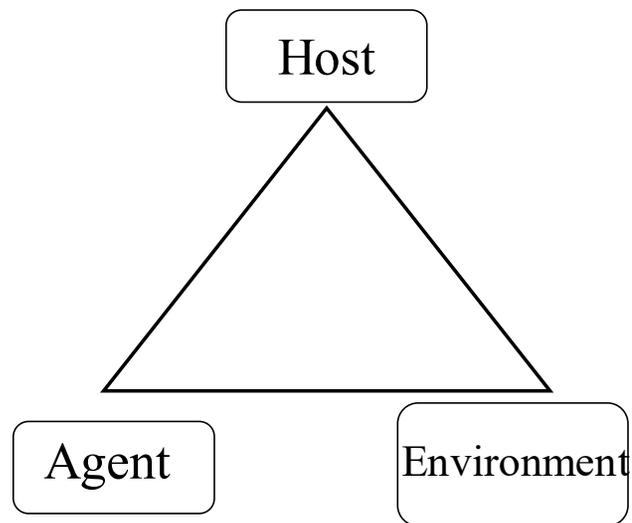
**Biological**

**Physical**

**Chemical**

**Necessary for**  
**disease to occur**

# The Epidemiologic Triangle



Environment

**External conditions**

**Physical or biologic**

**or social**

Contribute to the  
disease process

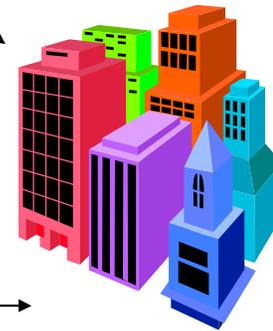
# The Analytical Epidemiology Triad

## Host:

Intrinsic factors, genetic, physiologic factors,  
psychological factors, immunity



Health  
or  
Illness  
?



## Agent:

Amount, infectivity,  
pathogenicity, virulence,....

## Environment:

Physical, biological, social

**Epidemics arise when host, agent, and environmental factors are not imbalanced**

- Due to **new agent**
- Due to **change in existing agent** (infectivity, pathogenicity, virulence)
- Due to **change in number of susceptible in the population**
- Due to **environmental changes that affect transmission** of the agent or **growth** of the **agent**

# Host Factors

- Host factors are **intrinsic factors** that influence an individual's exposure, susceptibility, or response to a causative agent. These include:
  - **Genetic** endowment
  - **Immunologic state**
  - **Personal behavior** (life-style factors): **diet, tobacco use, exercise**, etc
  - **Personal characteristics** (described before, under "person"), including: **age, gender, race, religion, occupation, marital status, socio-economic status, family background, previous diseases** .....etc.
    - \*\* refer to these characteristics in the previous lectures cause they are included in the exam