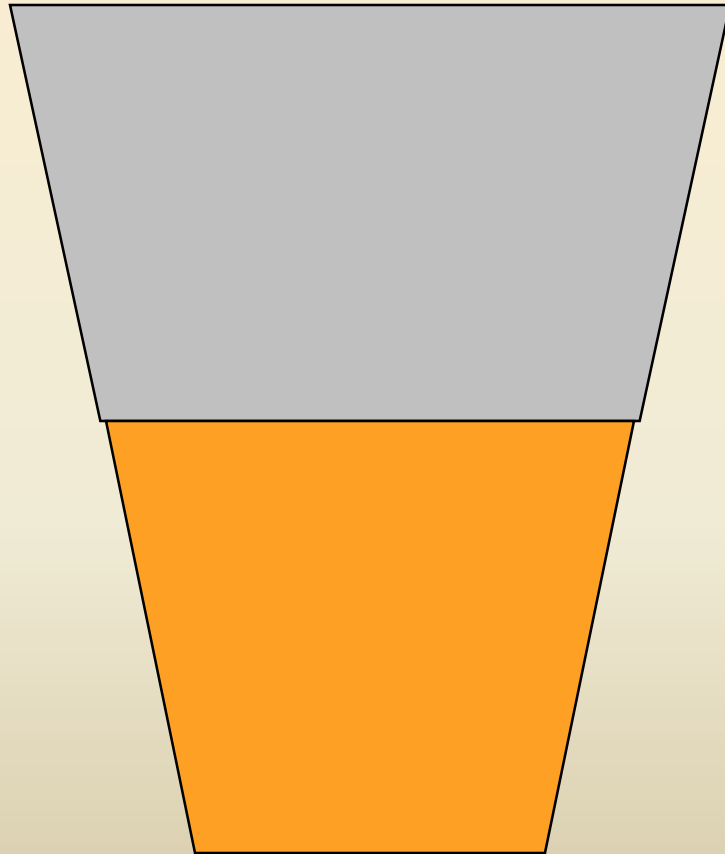


# DESCRIPTIVE EPIDEMIOLOGY

# How we view the world.....



- *Pessimist*: The glass is half empty.
- *Optimist*: The glass is half full.
- *Epidemiologist*: As compared to what?

# Epidemiology is...

- "The worst taught course in Medical school."
  - *Medical Student*

# Epidemiology is...

- "The science of making the obvious obscure."
  - *Clinical Professor*

# Epidemiology is...

- "The science of long division...."

$$I' = [(480)(\log_2)(10E6)] / [(9.1)(0.955po) + 0.45n]$$

- *Statistician*

# Definition of Epidemiology\*

***"The STUDY of the DISTRIBUTION and DETERMINANTS of HEALTH-RELATED STATES in specified POPULATIONS, and the application of this study to CONTROL of health problems."***

\*Last, J.M. 1988. A Dictionary of Epidemiology, 2nd ed.

# Epidemiology: Definition

**Dynamic study of the**

Determinants

Occurrence

Distribution

Control

Pattern



Of health and disease in a population

# Kinds of Epidemiology

- **Descriptive** Study of the occurrence and distribution of disease
- **Analytic** Further studies to determine the validity of a hypothesis concerning the occurrence of disease.
- **Experimental** Deliberate manipulation of the cause is predictably followed by an alteration in the effect not due to chance.



# Overview of epidemiologic design strategies

Epidemiological studies

Observational

Experimental

Descriptive

Analytical

RCT

Field trials

Community trials

Cross-sectional studies

Longitudinal

Correlational or ecological

Cross sectional or prevalence

Case control

cohort

# Descriptive vs. Analytic Epidemiology

## Descriptive

- Used when little is known about the disease
- Rely on preexisting data
- Who, where, when
- Illustrates potential associations

## Analytic

- Used when insight about various aspects of disease is available
- Rely on development of new data
- Why
- Evaluates the causality of associations

Both are important!

# Descriptive Studies

- **Relatively inexpensive and less time-consuming than analytic studies, they describe,**
- **Patterns of disease occurrence, in terms of,**
  - **Who gets sick and/or who does not**
  - **Where rates are highest and lowest**
  - **Temporal patterns of disease**
- **Data provided are useful for,**
  - **Public health administrators (for allocation of resources)**
  - **Epidemiologists (first step in risk factor determination)**

# Descriptive Epidemiology

- Correlational studies
- Case reports
- Case series
- Cross sectional studies

# Correlational Studies (Ecological Studies)

- **Uses measures that represent characteristics of entire populations**
- **It describes outcomes in relation to age, time, utilization of services, or exposures**
- **ADVANTAGES**
  - **We can generate hypotheses for case-control studies and environmental studies**
  - **We can target high-risk populations, time-periods, or geographic regions for future studies**

# Correlational Studies

- **LIMITATIONS**

- **Because data are for groups, we cannot link disease and exposure in individual**
- **We cannot control for potential confounders**
- **Data represent average exposures rather than individual exposures, so we cannot determine a dose-response relationship**
- **Caution must be taken to avoid drawing inappropriate conclusions, or *ecological fallacy***

# Patterns of disease Occurrence :

## Correlation of Population statistics

- **Ecologic** ( *correlation* ) studies
  - Used as first step in determining association
    - plot* : **disease (population) burden [ Y axis ]**  
**vs. prevalence of “risk factor” [ X axis ]**  
e.g. smoking vs. lung cancer

-

# Case Reports (case series)

- **Report of a single individual or a group of individuals with the same diagnosis**
- **Advantages**
  - ❖ **We can aggregate cases from disparate sources to generate hypotheses and describe new syndromes**  
**Example: hepatitis, AIDS**
- **Limitations**
  - ❖ **We cannot test for statistical association because there is no relevant comparison group**
  - ❖ **Based on individual exposure {may simply be coincidental}**



# Cross-Sectional Studies (prevalence studies)

- Measures disease and exposure simultaneously in a well-defined population
- **Advantages**
  - They cut across the general population, not simply those seeking medical care
  - Good for identifying prevalence of common outcomes, such as arthritis, blood pressure or allergies.
- **Limitations**
  - Cannot determine whether exposure preceded disease
  - It considers prevalent rather than incident cases, results will be influenced by survival factors
  - Remember:  $P = I \times D$

# Descriptive Epidemiology

- First phase of an epidemiological investigation.
- observing distribution of disease or health related characteristics in human populations.
- Identifying characteristics with which disease seems to be associated.

# Questions asked

- When is the disease occurring?
  - Time distribution.
  
- Where is the disease occurring?
  - Place distribution.
  
- Who is getting the disease??
  - Person distribution.

# Procedures in descriptive studies

- Steps
  1. Define the population
  2. Define the disease
  3. Describe the disease
  4. Measure the disease
  5. Compare with known indices
  6. Formulation of hypothesis

# Defining the population

- Investigations of populations, not individuals.
- Defining population base- in terms of age, sex, occupation, etc.
- Can be whole population or representative sample.
- Defined population-large , stable.
- Concept of defined population-provides denominator for calculating rates.

# Defining the disease

- Epidemiologist needs a definition of disease that is precise and valid.
- Diagnostic methods-acceptable to population and applicable to their use in large populations.
- Epidemiologist-operational definition- by which the disease or condition can be identified and measured.

# Describing the disease

- Characteristics frequently examined

Time	Place	Person
Year , Season	Climatic Zone	Age , Birth Order,
Month, Week	Country Region	Sex , Family Size
Day, Hour of onset	Urban /Rural / Local community	Marital State , Height Weight Occupation , Social Status , Education,
Duration	Towns, Cities , Institutions	Blood Pressure , Blood cholesterol , Personal habits

# TIME DISTRIBUTION

- Short term fluctuations
- Periodic fluctuations.
- Long term or secular trends.

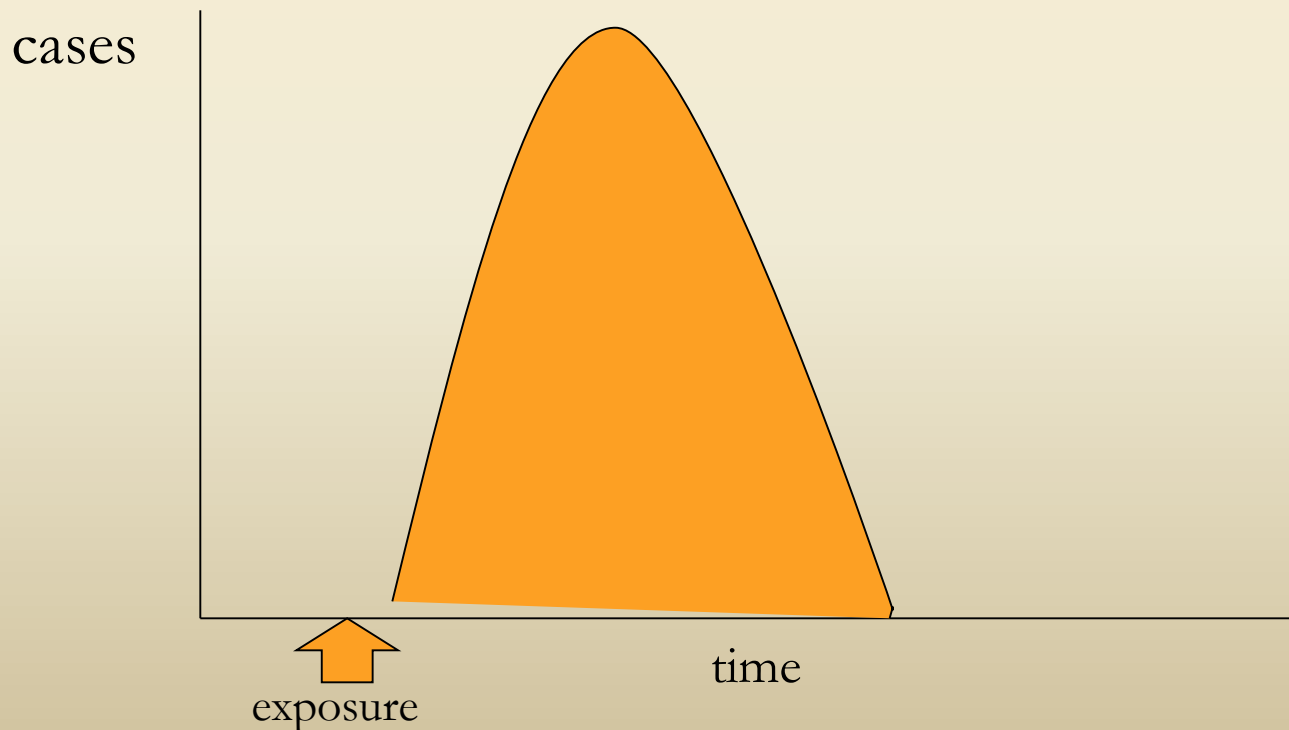


# Short Term Fluctuations

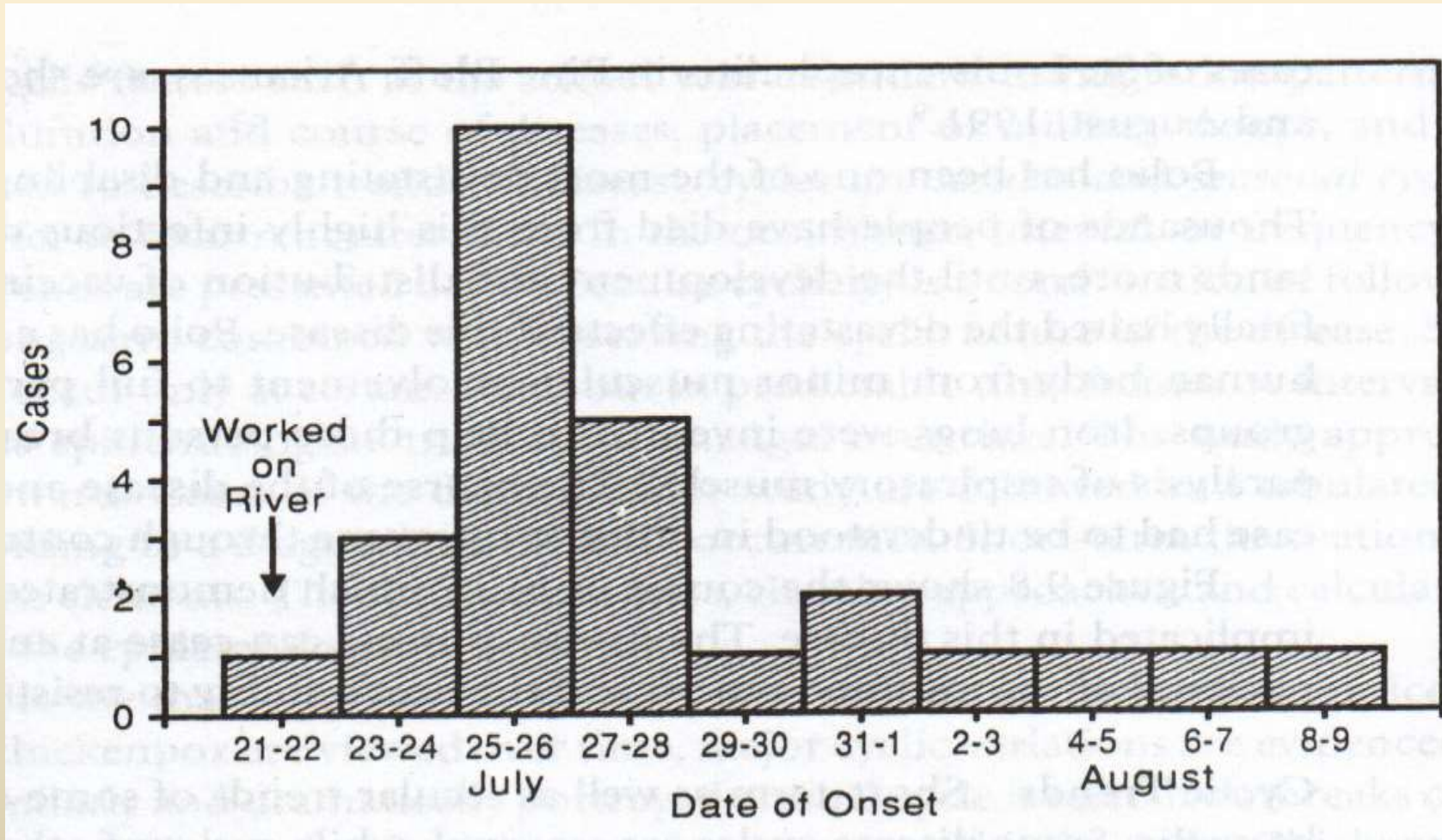
- Types of Epidemics
  1. Common - source epidemics
    - a) Single exposure or “point source” epidemics
    - b) Continuous or multiple exposure epidemics
  2. Propagated epidemics
    - a. Person to Person
    - b. Arthropod vector
    - c. Animal reservoir
  3. Slow (Modern Epidemic)

# Common Source Epidemics

- **Common source, single exposure epidemics**. (point source) E.g. Food poisoning, Bhopal gas tragedy.
- **Epidemic curve**: Rises and falls rapidly, Clustering of cases, All cases develop in one incubation period



# POINT SOURCE EPIDEMICS



- b) **Common source-continuous or repeated exposure**: prolonged ,continuous or intermittent exposure to a common source: e.g. contaminated vaccine.

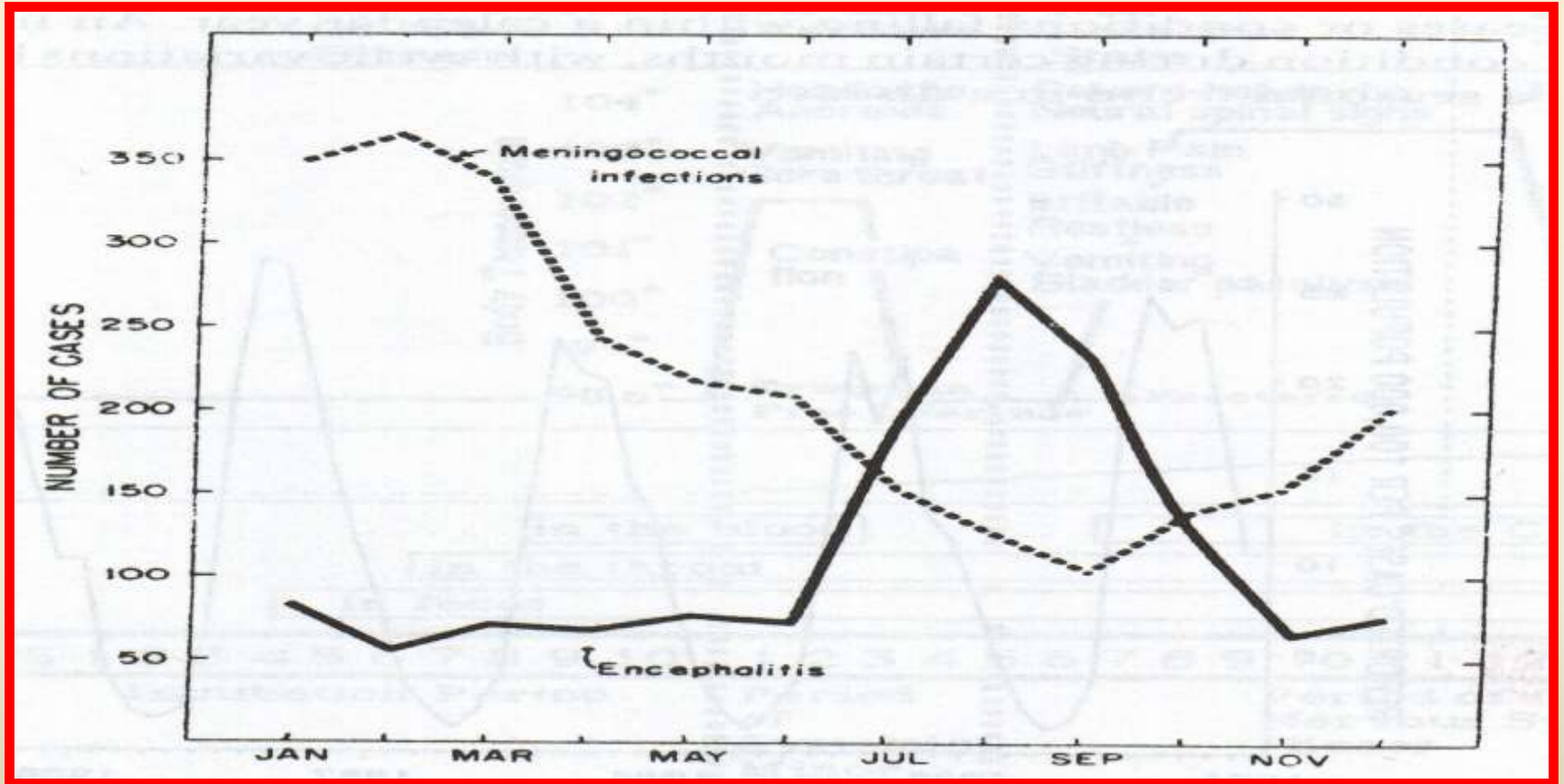
## B.PROPAGATED EPIDEMICS:

Infectious disease epidemic. Person to person transmission.

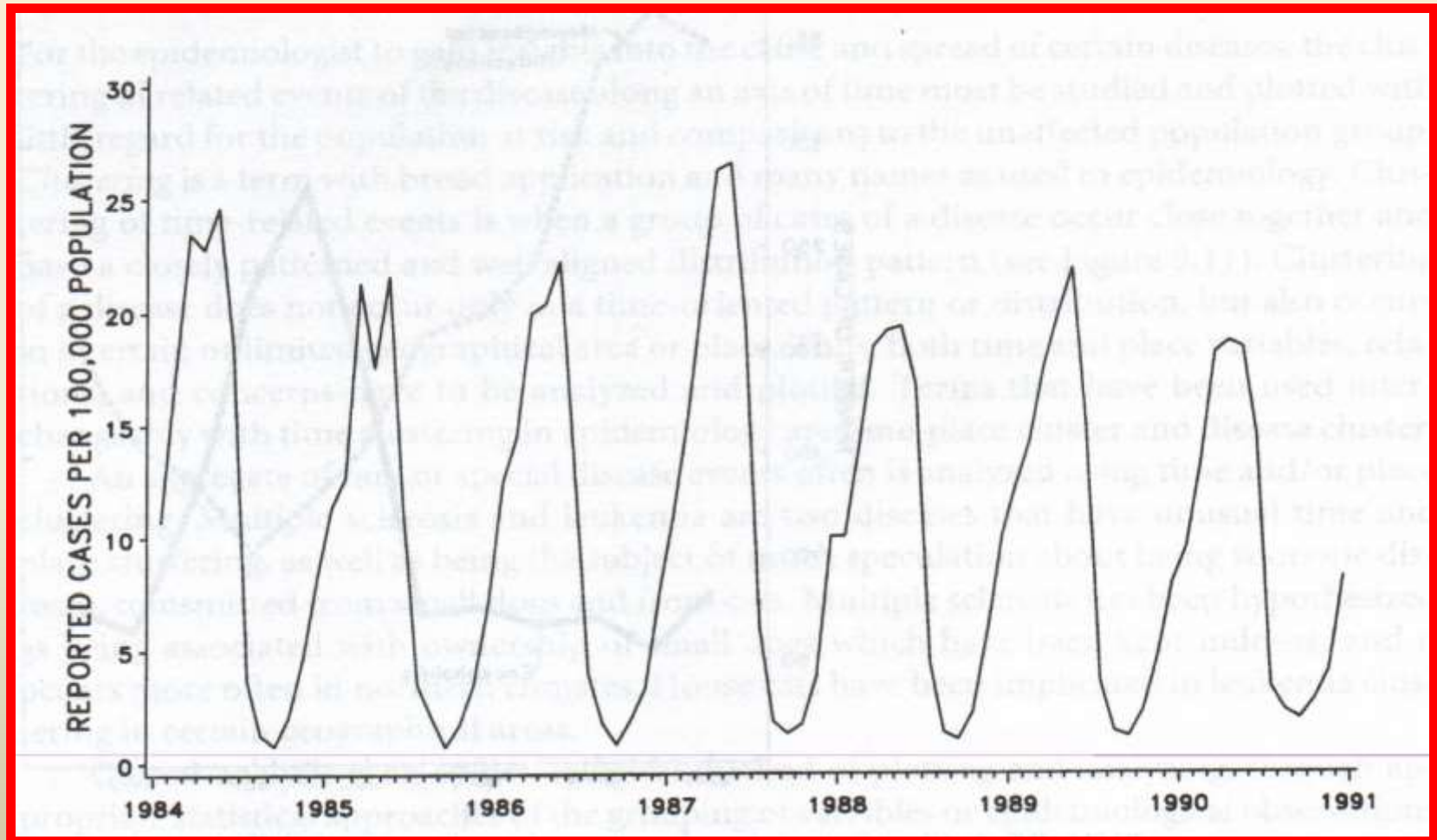
( Hepatitis A and Polio)

Epidemic rises gradually and tails off over a period of time.

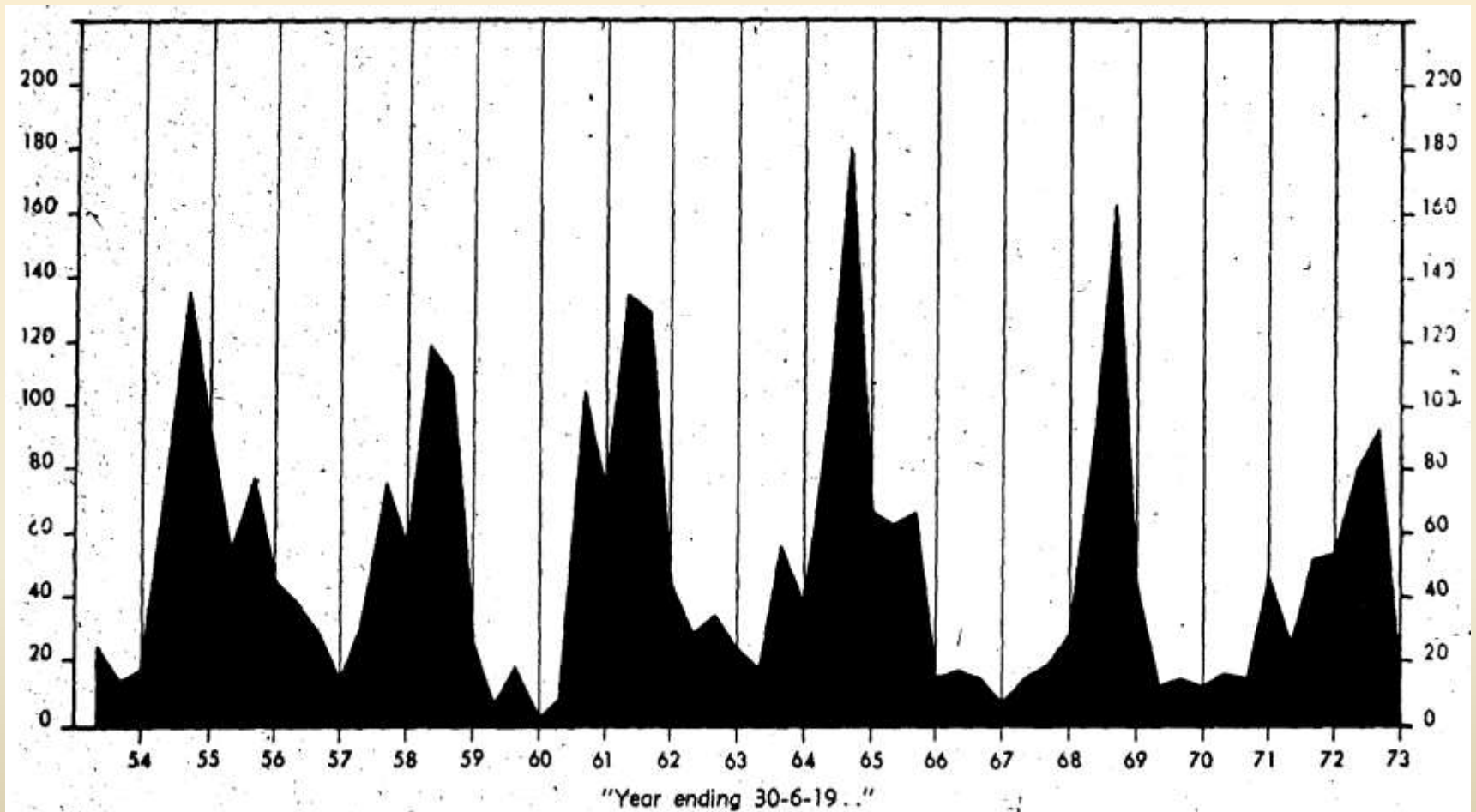
- **Seasonal trends:** seasonal variation e.g. measles, malaria.



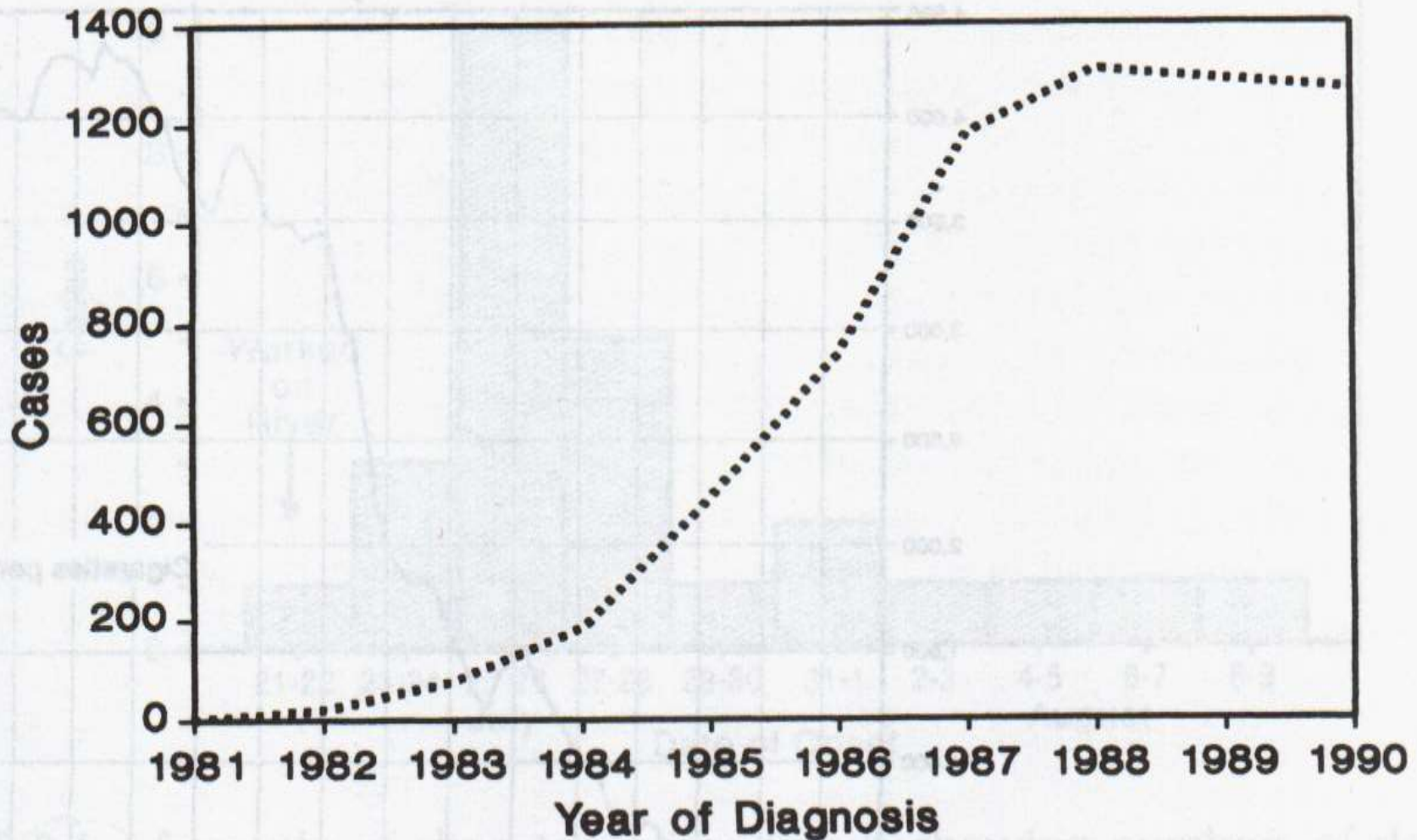
ii) Cyclic trend: influenza pandemics occur in intervals of 7-10 yrs.



# Whooping Cough - Four-monthly admissions, 1954-1973



### III. Long term or secular trends: changes in occurrence of diseases.e.g DM, CHD





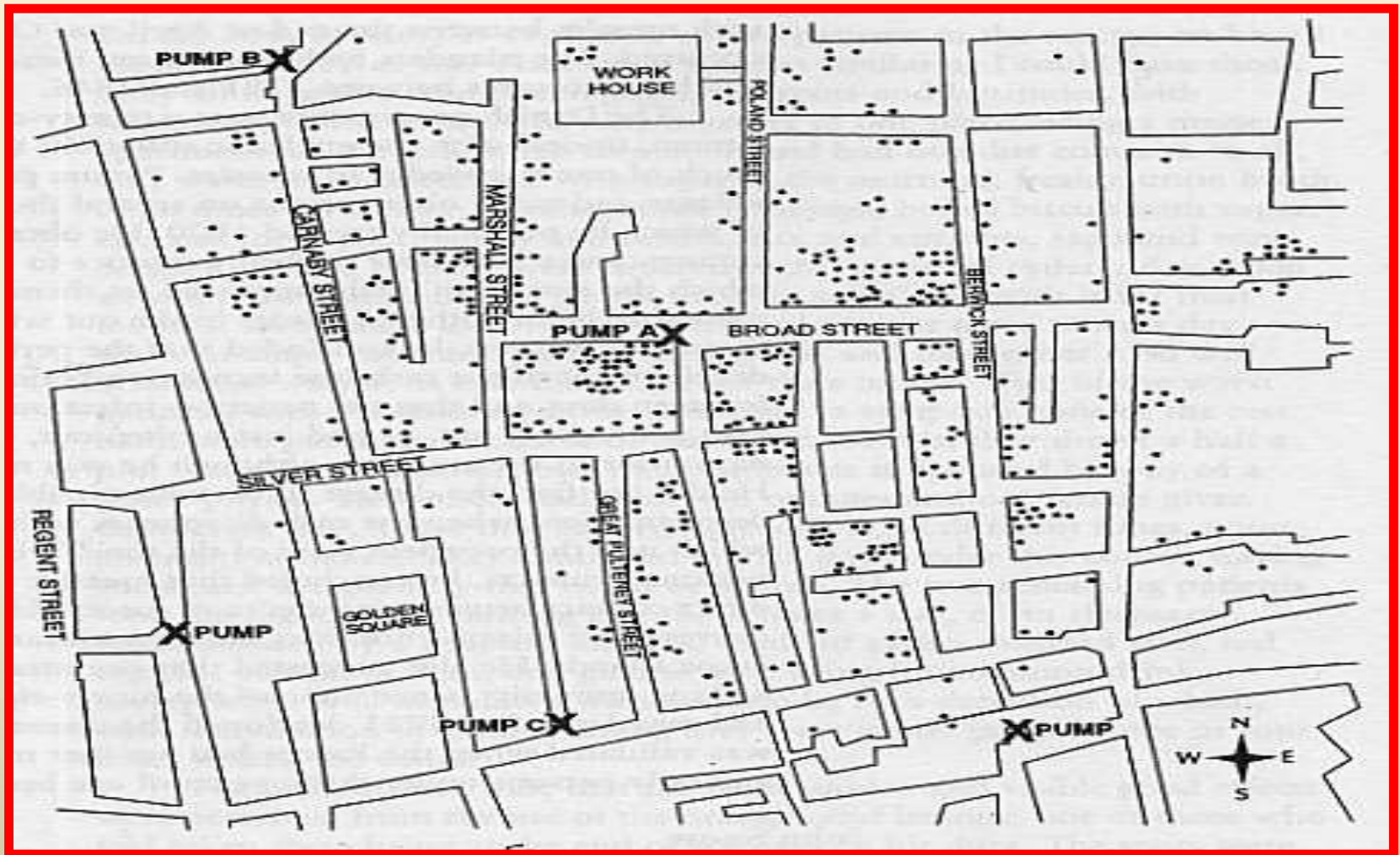
# Interpretation of time trends

- By surveillance and monitoring--- epidemiologist seeks which diseases are:
  - increasing,
  - decreasing
  - emerging health problems.

# PLACE DISTRIBUTION (Geographical Comparisons )

- 1. International Variations: e.g. Difference in incidence of cancer
- 2. National Variations : e.g. Goitre-common in north.
- 3. Rural / Urban Differences-
- 4. Local Distributions

- Spot Map – John Snow of England - Classic investigation of cholera epidemic in 1854 – Golden square district of London.



- Migration studies: movement of population from one country to another.
- Can be carried out in 2 ways:
  - a) Comparison of disease and death rates for migrants with those of their kin back home
  - b) Comparison of migrants with local population of the host country.

# Person Distribution

- 1. Age :
- 2. Sex
- 3. Ethnicity
- 4. Marital status
- 5. Occupation
- 6. Social Class
- 7. Behavior
- 8. Stress
- 9. Migration

- Measurement of Disease : Morbidity and mortality rates and ratios
- Morbidity – Incidence from Longitudinal studies.
- Incidence is the number of new cases of disease that develop in the population during a defined period.
- Prevalence from: Cross sectional studies
- Prevalence is the number of existing cases of disease in the population during a defined period.

# Cross- sectional studies

- Simplest form of observational studies.
- Known as Prevalence study.
- Single examination of population at one point in time.
- Results can be applied to the whole population- if sampling done correctly.
- More useful for chronic than acute diseases. e.g. Hypertension.

# Longitudinal studies

- Observations are repeated in same population over prolonged period of time by means of follow up examinations.
- Useful to:
  - 1) Study the natural history of disease and its future outcome.
  - 2) For identifying risk factors of disease.
  - 3) For finding out incidence rate.



## **5)Comparing with known indices:**

by making comparisons between different subgroups  
it is possible to arrive at clues about disease  
etiology.

## **6)Formulation of hypotheses:**

based on population, specific cause, expected  
outcome, dose-response relationship, time-response  
relationship.

# Uses of Descriptive Epidemiology

1. Provide data – disease load, types , morbidity and mortality rates
- 2 . Provide clues to disease aetiology and helps in formulation of hypothesis
3. Provide data for planning organizing and evaluating services.
4. Contribute to research .

THANK YOU!

