PREVENTIVE & SOCIAL MEDICINE VOL-I

VERSION X

PrepLadder

Structured Notes According to PSM

Revision friendly **Fully Colored Book/Structured Notes**

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In case of any discrepancy between book and videos, Authors's videos on PrepLadder app should be considered.

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PSM Vol-1

SCREENING OF DISEASES

DEMOGRAPHY AND HEALTH

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PREVENTIVE MEDICINE IN OBSTETRICS, PEDIATRICS AND GERIATRICS

NUTRITION AND HEALTH

SOCIAL SCIENCES AND HEALTH

ENVIRONMENT AND HEALTH

1. DEFINITIONS, COMPONENTS AND TOOLS OF EPIDEMIOLOGY

EPIDEMIOLOGY

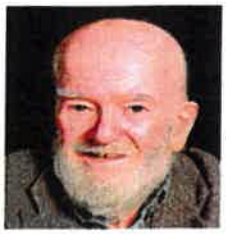
00:00:34

- Study of frequency, distribution and determinants of diseases / health related events & application of this study to control disease / health related events

AIM

- Study burden of disease
- Study associated & causative factors
- Control and prevention of disease

HISTORY



- John M Last : [redacted]
- John Snow : Father of Epidemiology/Father of modern Epidemiology
- Fracastoro : Founder of Epidemiology
- Father of Public Health : Cholera

COMPONENTS STUDIED IN EPIDEMIOLOGY

00:05:46

COMPONENTS

- **Disease frequency**
  - Incidence, prevalence
  - Measured in terms of rate, ratio and proportion
- **Disease distribution**
  - How a disease is distributed in terms of time, place and person
- **Disease determinants**
  - Why and how disease has occurred
  - Analytical study

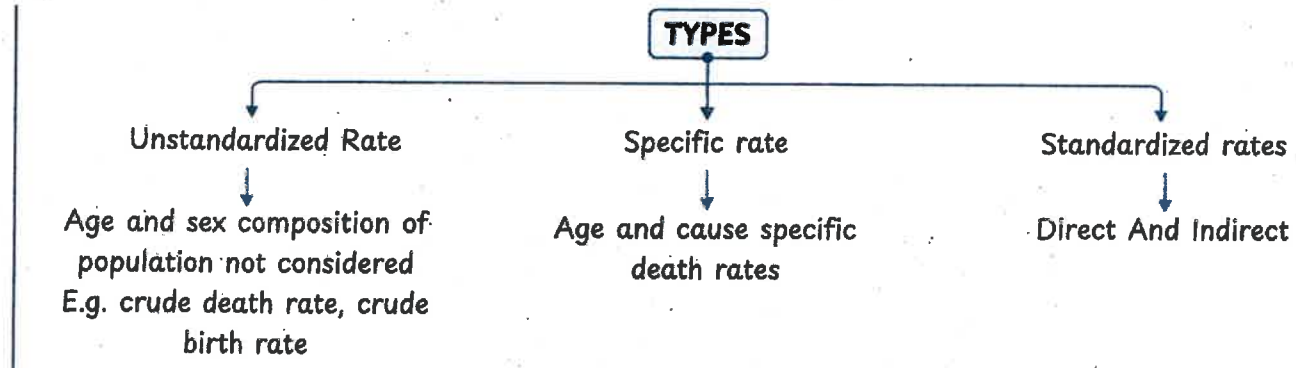
TOOLS OF MEASUREMENT IN EPIDEMIOLOGY

00:08:54

- Each one of them has numerator/denominator

Rate

- Measures occurrence of event (disease/death)
- In defined population, in definite time period
- Numerator is a part of denominator, but the multiplier is 1000, 10000 or 1 lakh
- E.g. Incidence, Maternal mortality rate



Proportion

- Numerator is part of denominator, and multiplier is 100
- E.g. prevalence, case fatality rate (deaths due to disease x / total cases due to disease x 100), secondary attack rate

Ratio

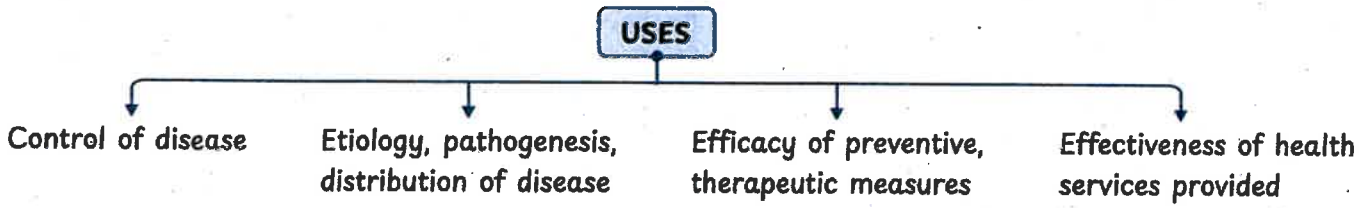
- Numerator is not a part of denominator
- E.g
  - Sex ratio = No. of females / No. of males × 1000
  - Relative risk (risk ratio) = Incidence of disease in exposed / Incidence of disease in non-exposed × 1000

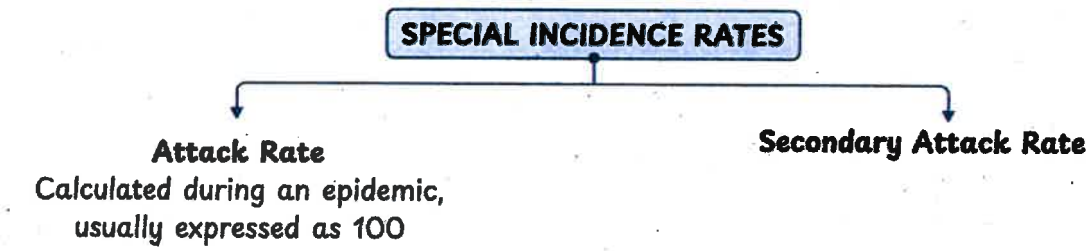
INCIDENCE

- No. of new cases of a disease / new spells / episodes of sickness occurring in a defined population during a specified time period
  Incidence = no. of new cases of a disease occurring in a defined population during a specified time period/population at risk × 1000
- Numerator is a part of denominator; multiplier is 1000 hence rate

HYP

- Measures rate at which new cases of disease occur
- More important for acute illness
- Primary level of prevention focuses on ↓ incidence of disease





PREVALENCE

00:21:34

- Total no. of all individuals who suffer from a disease (new + old i.e. total no. of existing cases of a disease)
  Prevalence = total no. of cases of a disease in a community at a point of time /total no. of population in the community at same point of time × 100
- Numerator is a part of denominator & multiplier is 100 → proportion

HYP

- Denotes total no. of cases of disease at a point of time (new + old)
- Assess Burden of disease

USES

- Burden of a disease assessed
- Resources directed for management of disease
- Control the disease

MEASUREMENT OF PREVALENCE

- P = I × D
- I = incidence,

TYPES

Point Prevalence

$$\frac{\text{Total no. of diseased (new +old) person in a defined population at one point of time}}{\text{No. of people in population at same point in time} \times 100}$$

Period Prevalence

- No. of persons with an episode of illness over a defined period /no. of persons in population over same period
- Period prevalence = $\frac{\text{No. of existing cases}}{\text{Total population}}$

DIFFERENCE BETWEEN INCIDENCE AND PREVALENCE

	INCIDENCE	PREVALENCE
Definition	Chance of developing a disease	Chance of already having a disease
Cases	New cases	Total Existing cases
Follow up	Required	Not required
Duration of disease	Independent	Dependent
Suited measure	Cause and effect	Burden of disease
Calculation	Cohort study	Cross sectional study

RELATIONSHIP BETWEEN INCIDENCE AND PREVALENCE

- $P = I \times D$

	INCIDENCE	PREVALENCE
Effective treatment (cures disease)	Same (risk factors are same)	↓ (duration ↓)
New treatment prevents death but does not cure disease e.g. ART	Same	↑ (duration ↑)
New treatment cures disease	Same	↓ (duration ↓)
Easily curable / fatal diseases	Same	↓ (duration ↓)
New preventive modality launched e.g. vaccination	↓ (caters to risk factors)	↓ (↓ incidence → ↓ prevalence in due time)

MCQ's

Q. Incidence of a disease in a population of 30,000 and 300 new cases is:
a. 0.1/1000
b. 10/1000
c. 100/1000
d. 1/1000

Ans (b) Incidence =300/30000 × 1000 = 10/1000

Q. In a population of 5000 number of new cases of TB is 500 ; old cases in the same population are 150. What is the prevalence of TB?
a. 9%
b. 12%
c. 13%
d. 18%

Ans (c) Prevalence = 500 + 150/5000 × 100 = 13%

Q. The following is true about prevalence and incidence?
a. Both are rates
b. Prevalence is a rate but incidence is not
c. Incidence is a rate but prevalence is not
d. Both are not rates

Ans (c)

Q. If the prevalence is very low as compared to the incidence for a disease, it implies?
a. Disease is very fatal and/or easily curable
b. Disease is non-fatal
c. Calculation of prevalence and incidence is wrong
d. Nothing can be said as they are independent

Ans (a)

Q. All the statements are true about disease except?
a. Incidence is probability that a healthy individual will develop the disease during specified period
b. Incidence will decrease if a new drug is effective in reducing deaths from the disease
c. Incidence measures absolute risk of developing disease
d. Incidence decreases if a particular prevention program is effective

Ans (b)

2. NEED, CLASSIFICATION, UNIT & APPROACH TO STUDY DESIGNS

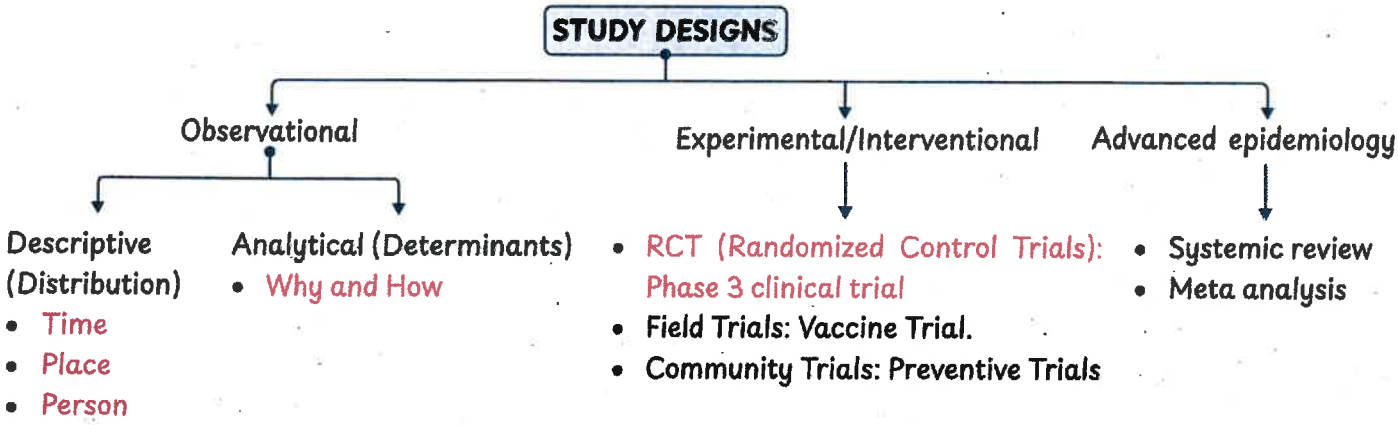
NEED OF STUDY DESIGNS

00:00:52

- Study designs are needed to know about the diseases
  - **Frequency**: No of cases Incidence & prevalence
  - **Distribution**:
  - **Determinants**: why, how diseases occurs

CLASSIFICATION OF EPIDEMIOLOGY STUDY DESIGNS

00:02:21



DIFFERENCE BETWEEN DESCRIPTIVE AND ANALYTICAL STUDY

DESCRIPTIVE EPIDEMIOLOGY	ANALYTICAL EPIDEMIOLOGY
• No Comparison Group	• Comparison group - always present
• **E.g.,** Case Report & Case Series	• **E.g.,** Case-Control study design o Cohort study design o Cross-Sectional study design o Ecological study design

HYPOTHESIS

00:11:45

- Hypothesis - an assumption yet to be verified
  - **Formation** of hypothesis: Descriptive epidemiology
  - **Testing** of hypothesis: Analytical epidemiology
  - **Confirming** of hypothesis: Experimental epidemiology
- Descriptive study: Preferred in case of new disease/ Disease of Unknown etiology

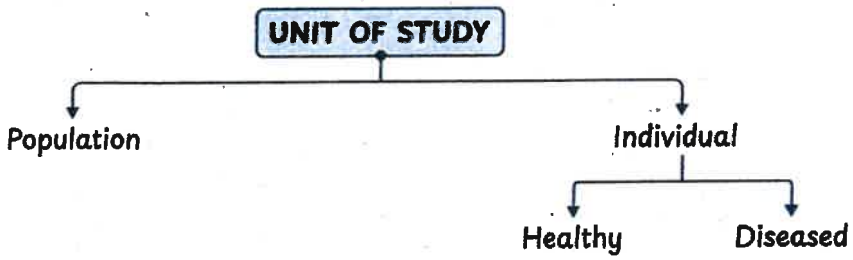
TYPES OF EPIDEMIOLOGICAL STUDIES

00:14:15

TYPES OF STUDIES	SYNONYMS	UNIT OF STUDY
	OBSERVATIONAL STUDIES	
Descriptive studies	Case report, Case series (aggregation of case report)	Individual
Analytical studies		
1. Ecological	Correlation, geographic, aggregate	Populations
2. Cross-sectional	Prevalence	Individuals
3. Case control	Case reference	Individuals
4. Cohort	Follow up/Incidence	Individuals
	EXPERIMENTAL STUDIES (INTERVENTION STUDIES)	
1. Randomized control trials	Clinical trials	Patients/ sick individuals
2. Field trials	Vaccine trials	Healthy individual
3. Community trial	Community studies	Communities

UNIT OF STUDY

00:17:39



- Unit of study
  - For all study designs – Individuals
  - Ecological study - population

BASIC APPROACH TO IDENTIFY STUDY DESIGNS

00:19:26

- Identify exposure and outcome
- Start of the disease
- Direction of study
  - Forward: Cohort study
  - Backward: Case control study
  - Same point of time: [redacted]
- Identify the comparison group
  - Diseased vs non diseased
  - Exposed vs non exposed

- Buzz Words: Distribution, Follow up, Matching, previous records, unit of study as population etc
- Rare Diseases (Case control study) or rare exposure (Cohort study)

Q. British investigators conducted a study to compare measles-mumps-rubella (MMR) vaccine history among 1,294 children with pervasive development disorder (e.g., autism and Asperger's syndrome) and 4,469 children without such disorders. (They found no association.) This is an example of which type of study?

Ans: Case control study

Explanation
- Outcome: Autism
- Exposure: MMR vaccine
- Buzzword: History
- Direction: Backwards
- Comparison group: Diseased vs non diseased
- For a rare disease, always start with the disease

Q. In a study begun in 1965, a group of 3000 adults in Baltimore were asked about alcohol consumption. The occurrence of cancer was studied in the group between 1981 and 1995

Ans: Prospective cohort

Explanation
- Exposure: Alcohol Consumption
- Outcome: Cancer
- Direction: Forwards
- Comparison group: Exposed vs non exposed

MCQ's

Q. Interventional Study is used for:
a. Hypothesis formation
b. Hypothesis testing
c. Hypothesis confirmation
d. Hypothesis manipulation
Ans: (c)

Q. Case series is a type of:
a. Descriptive study
b. Observational study
c. Analytical study
d. Interventional study
Ans: (a)

Q. The difference between Descriptive and Analytical studies:
a. Descriptive studies are used to test hypothesis
b. Analytical studies are used to formulate a hypothesis
c. Descriptive studies are the first phase in epidemiology
d. Analytic studies observe distribution of disease
e. Descriptive studies answer why and how of a disease
Ans: (c)

Q. The analytical study where the population is the unit of study is:
a. Cross-sectional
b. Ecological
c. Case-control
d. Cohort
Ans: (b)

Q. The best study of first choice for assessment of Unknown or New Disease with no etiological hypothesis
a. Cohort study
b. Case-control
c. Cross-sectional
d. Descriptive Epidemiology
Ans: (d)

3. DESCRIPTIVE EPIDEMIOLOGY

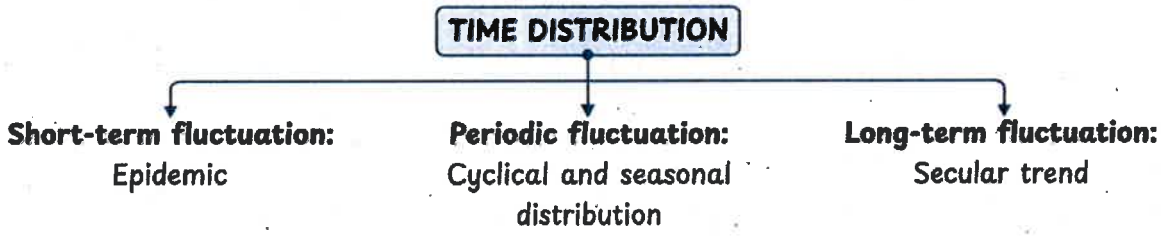
DESCRIPTIVE EPIDEMIOLOGY

00:00:36

- Study of distribution of disease in terms of time, place or person & identifying characteristics associated with it
- 1st phase of epidemiological investigation
- Helps in
  - Formulation of hypothesis.
  - Study distribution of disease
- New disease/disease of unknown etiology: 1st study design →

TIME DISTRIBUTION

00:04:45



SHORT-TERM FLUCTUATION

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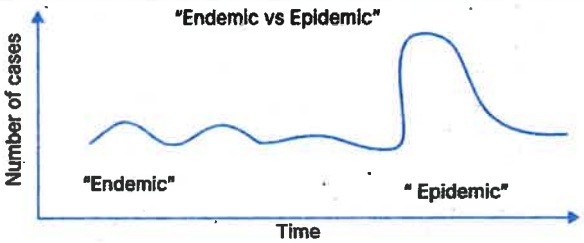
- Best example: Occurrence of an epidemic

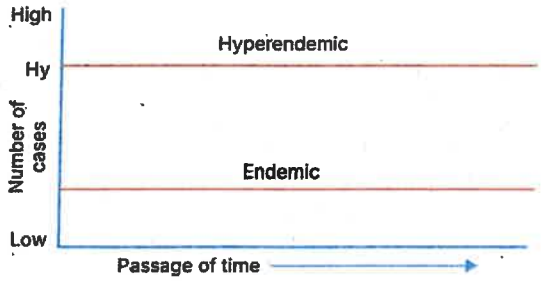
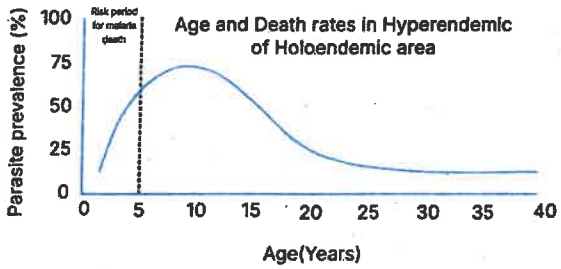
COMMON DEFINITIONS

Endemic	 • Constant presence of disease in a population. • Epidemiologically linked cases in terms of time, place, or person.

Epidemic	• Disease occurs clearly in excess of normal expectancy
	  ○ Mean + 2SD
	  ○ > 80% of expected frequency
	• Occurrence of even a single case of previously eliminated disease
	  ○ E.g., Polio (India)
	• Occurrence of a single case of an exotic disease
	  ○ E.g., Yellow fever (India)

Outbreak	• Similar to Epidemic • Localized distribution

Pandemic	• Worldwide distribution of cases
	• Disease should cross
	  ○ 2 continents or [redacted]
	  ○ E.g. HIV

Sporadic	• Haphazard distribution • Cases not epidemiologically linked in terms of time, place, and person.
Exotic	• Disease has never occurred earlier • E.g., Yellow fever (India)
Hyperendemic	• Disease is constantly present at high incidence/ prevalence rates and affects all age groups equally 
Holoendemic	 • High level of infection beginning early in life and affecting most of child population → state of equilibrium such that adult population shows evidence of disease much less commonly than do children • E.g., malaria (India)
Mesoendemic	• Disease in small, isolated communities of varying intensities

○ On an average, 30-40 cases of a disease X occurs in the population. Now, there are 38 cases seen. What type is this?
→ Endemic

EPIDEMIC CURVE

00:17:10

- Graphic depiction of the number of outbreak cases by date of illness onset
- Provide information on the outbreak's:

- Pattern of spread
- Magnitude
- Outliers
- Time trend
- Exposure, and/or disease incubation period.

TYPES

Common source epidemic
- Single exposure or point source
- Continuous exposure or multiple exposure

Propagated epidemic
- Person to person transmission
- Arthropod vector
- Animal reservoir

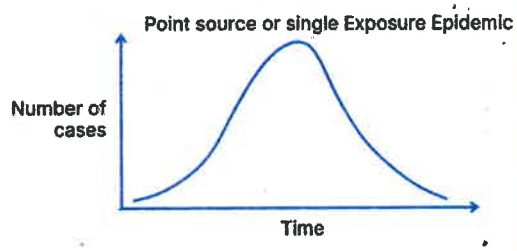
Slow or modern epidemic

HYP
- Epidemic continues over more than 1 incubation period (IP)
  - Common source, continuous or multiple exposure
  - Propagated

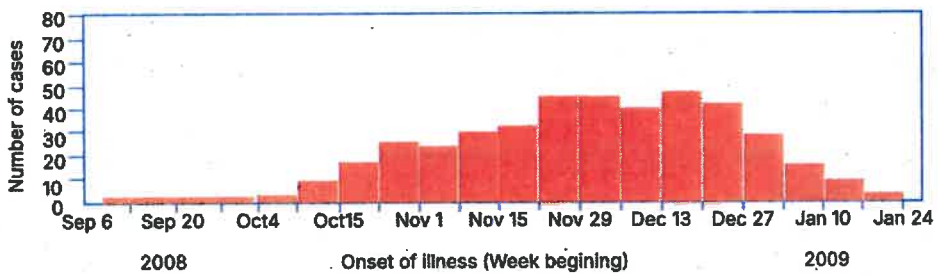
COMMON SOURCE EPIDEMICS

Point source or single exposure epidemic

- Rapid rise & rapid fall in cases.
- All cases occur over 1 IP of disease.
- Explosive in nature
  - Clustering of cases within 1 IP of disease.
- Single peak
- No secondary waves.
- Mostly infectious origin
  - E.g., food poisoning
- Non-infectious origin
  - Bhopal gas tragedy
  - Minamata disease Japan
  - Chernobyl tragedy



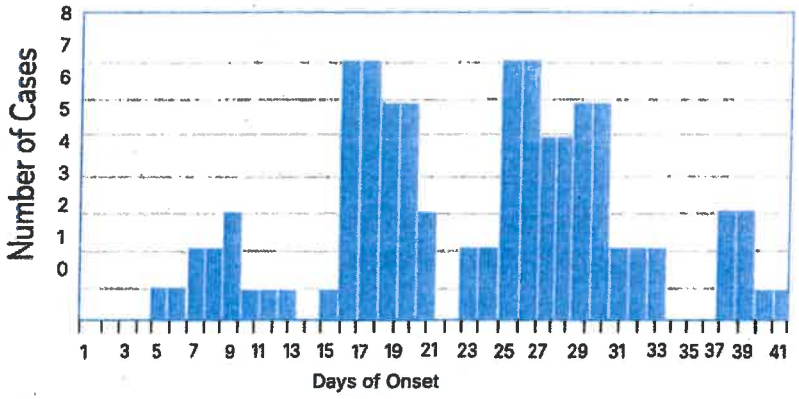
Common source or Continuous exposure



- Gradual rise → Plateau → Gradual fall
- Cases over > 1 IP of the disease
- Multiple peaks (secondary waves)

- Nonexplosive in nature
- Smooth rise in cases
- Prolonged plateau phase
- Epidemic extended or irregular
- Epidemic continues unless source is identified/community source found
  - E.g
    → Gonorrhea outbreak due to commercial sex worker
    → Contaminated well/pipe (human excreta)
    → Infected milk man
    → Infectious cholera or food-borne typhoid fever outbreaks due to carriers or contaminated canned foods

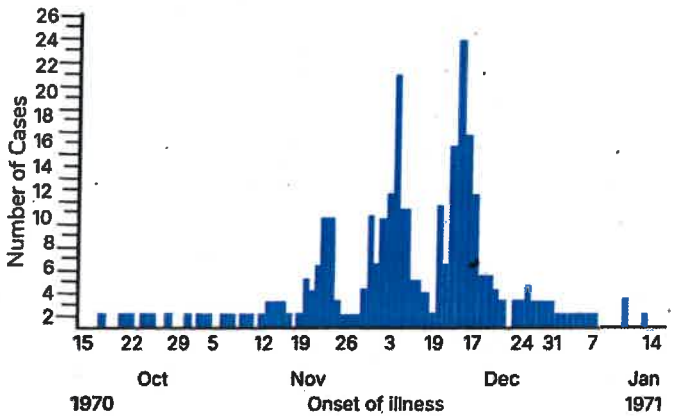
Common Source Intermittent Exposure



- Exposure is intermittent
- No relation to Incubation period
- Multiple peaks
- E.g., Contaminated food or tinned product sold over a period of time

PROPAGATED EPIDEMIC 00:28:22

- Person-to-person transmission happens
- Mostly infectious in origin
- Multiple spurts (multiple IP)
- Gradual rise of cases, not smooth rise → small plateau →
- Taller peaks
- E.g. Epidemics of hepatitis A, Epidemics of polio, Vector born disease, COVID



MIXED OUTBREAK PATTERN

00:31:42

- Involves both common source outbreak & secondary propagated spread to others (usually household members)
- E.g., many foodborne pathogens (Norovirus, Hepatitis A, Shigella, and E. coli)

Golden Points

Point source/ Single exposure	Common source /continuous exposure	Propagated
• Rapid rise and rapid fall of cases	• Gradual smooth rise and gradual fall of cases	• Gradual unsmooth rise of cases (bumpy rise) with multiple spurts
• 1 incubation period	• > 1 incubation period	• > 1 incubation period
• Explosive	• Not explosive	• Not explosive
• Single peak (Single incubation period) • No 2° waves	• Multiple peaks (Multiple incubation period) • Secondary waves seen	• Secondary waves seen
• No plateau phase	• Prolonged plateau	• Very short plateau
• Single tall peak	• Multiple Short peaks	• Taller peaks
• E.g. o Infectious (mostly)Food poisoning o Non-infectious: (Bhopal gas tragedy)	• E.g. o Contaminated well o Commercial sex worker	• E.g., o Person - person transmission o Hepatitis A o Polio

PERIODIC FLUCTUATION OF DISEASE

00:34:03

Cyclical Disease distribution	**Measles (unvaccinated area)**	• 2-3 years
	Rubella	• 4-7 years
	Influenza	• 7-10 years