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Measures of disease frequency

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Population at risk

- Portion of a population that is susceptible to a disease
- Can be defined on the basis of demographic or environmental factors

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Population at risk: Examples

- Population at risk of developing carcinoma of the cervix:
  - Female population
  - Age > 30 and < 70 years
- Population at risk of hepatitis B
  - Those individuals anti-HBc negative

Prevalence – (P)

- Number of existing cases (old and new) in a defined population at a specified point of time

$$P = \frac{\text{\# people with disease at a specified time}}{\text{Population at risk at the specified time}} \times 10^n$$

- In some studies the total population is used as an approximation if data on population at risk is not available

Point prevalence

- Measures the frequency of disease at a given point in time
- Applies when the data has been collected at one point in time
- P = C / N
  - C = # of observed cases at time 't'
  - N = Population size at time 't'

Example of point prevalence

- 150 children in a school
- Screening for refractory errors at time "t"
- 15 children require glasses
- Prevalence of refractory errors
  - 15 / 150 = 10%

Period prevalence - (PP)

- Measures the frequency of disease over some time
- Applies when the data has been collected over a period of time
- PP = C + I / N
  - C = # of prevalent cases at the beginning of the time period
  - I = # of incident cases that develop during the period
  - N = size of the population for this same time period

Exercise

- Scenario
  - Population of 150 persons
  - Follow up for one year
  - 25 had a disease of interest at the beginning
  - Another 15 new cases developed during the year
- Calculate:
  - Point prevalence at the start of the period
  - Period prevalence for the year

P = C/N = 25 /150 = 0.17 (17 %)

PP = (C+I)/N = (25+15)/150 = 0.27 (27 %)

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Factors influencing prevalence

- Number of new cases
- Duration of the illness
  - If the disease is short, the prevalence is reduced
    - The prevalence of sudden infant death = 0
  - If the disease is long, the prevalence is increased
    - Rare lifelong disease can accumulate to build up a large prevalence

Causes of increase and decrease of prevalence

Increase	Decrease
• Long duration	• Shorter duration
• Low cure rate	• High cure rate
• Low case fatality	• High case fatality
• Increase in new cases	• Decrease in new cases
• Immigration of patients	• Emigration of patients
• Improved detection	• Improved cure rate
• Emigration of healthy people	• Immigration of healthy people

Conclusion: Changes in prevalence may have many causes and are difficult to interpret

Uses of prevalence data

- Assessing health care needs
- Planning health services
- Measure occurrence of conditions with gradual onset
- Study chronic diseases

Incidence – (I)

- Number of new cases in a given period in a specified population
  - Time, (i.e., day, month, year) must be specified
- Measures the rapidity with which new cases are occurring in a population
- Can be expressed:
  - In absolute numbers
  - In terms of cumulated incidence
  - In terms of incidence density

Cumulated incidence - (CI)

$$CI = \frac{\text{\# of new cases}}{\text{Population at risk at the beginning}} \times 10^n$$

- Also known as:
  - Attack rate
- Assumes that the entire population at risk at the beginning was followed-up for the time period of observation

Risk

- Probability that an individual will experience a health status change over a specified follow–up period
- This assumes that the individual does not:
  - Have disease at the beginning
  - Die from other causes during follow up
- Corresponds to cumulated incidence

Incidence density - (ID)

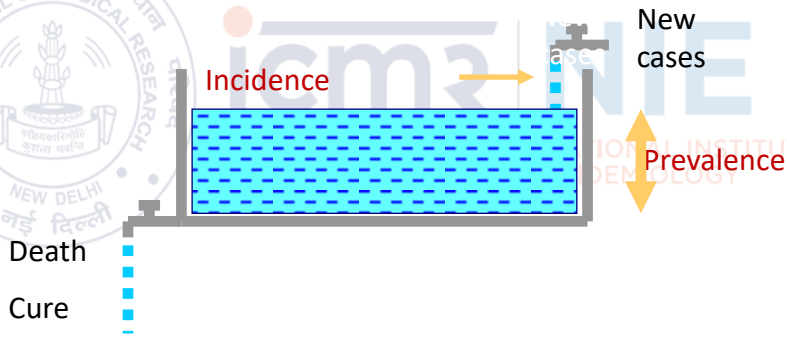
$$ID = \frac{\text{\# of new cases}}{\text{Total person-time of observation}} \times 10^n$$

- Also known as:
  - Incidence rate
- Reflects more exactly the person-time observed

Uses of incidence data

- Describe trends in diseases
- Evaluate impact of primary prevention programmes

The dynamic of incidence and prevalence



The relation between prevalence and incidence

- Prevalence depends on
  - Incidence (I)
  - Duration of the disease (D)

$$P = I \times D$$

- Change in prevalence from one time period to another may be the result of changes in incidence rates, changes in the duration of disease, or both

Patterns of incidence and prevalence

- High prevalence and low incidence
  - e.g., Diabetes Mellitus
- Low prevalence and high incidence
  - e.g., Common cold

Case fatality

- Place in relation the number of deaths from a disease to the number of cases
- Reflects severity
- Can be expressed as:
  - Proportion
  - Ratio
  - Not as rate (Although often referred to as case fatality rate)

Summary

- Prevalence is a static measure taken at a point in time
- Incidence is a dynamic measure taken over a certain time
- Mortality is calculated using population denominators to reflect burden while case fatality is calculated using cases as denominators to reflect severity

Thank you

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