

Rates In Epidemiology

1- Measurements of morbidity

Morbidity rates are rates used to quantify the occurrence of disease . Measures of morbidity include incidence, period prevalence, and point prevalence rates.

Incidence rate

The incidence of a disease is defined as the number of new cases of a disease that occur during a specified period of time in a population at risk for developing the disease.

$$\text{Incidence rate} = \frac{\text{Number of new cases of a disease over a period of time}}{\text{Total Population during the given period of time}} \times Kn$$

The critical element in the definition of incidence is new cases of disease. Because incidence is a measure of new events (i.e . transition from a non-diseased to a diseased state), incidence is a measure of risk. The appropriate denominator for incidence rate is population at risk but knowing the population at risk is difficult at this level. Hence, total population can be used as a denominator. Another important issue in incidence is the issue of time. For incidence to be a measure of risk we must specify a period of time and we must know that all of the individuals in the group represented by the denominator have been followed up for that entire period. The choice of time period is arbitrary: We could calculate incidence rate in one week ,one month, one year, 5 years, and so on.

Uses incidence rate

Incidence rate is important as a fundamental tool for etiologic studies of diseases since it is a direct measure of risk. If the incidence rate is significantly higher in one area, then the cause of that disease can be systematically searched.

Prevalence rate

Prevalence rate measures the number of people in a population who have a disease at a given time. It includes both new and old cases . The major type of prevalence is point prevalence rate .

Point Prevalence rate: measures the proportion of a population with a certain condition at a given point in time. Point prevalence rate can be determined by conducting cross-sectional study .

$$\text{Point Prevalence rate} = \frac{\text{All persons with a specific Condition at one point in time}}{\text{Total population}} \times K$$

Uses of prevalence rate

- Planning health facilities and human resource
- Monitoring chronic disease control programs like tuberculosis control program

Factors influencing prevalence

Increased by:

- Longer duration of the disease
- Prolongation of life of patients without cure
- Increase in new cases (increase in incidence)
- In-migration of cases
- Out-migration of healthy people

In-migration of susceptible people

- Improved diagnostic facilities (better reporting)

Decreased by:

- Shorter duration of the disease
- High case-fatality rate from disease
- Decrease in new cases (decrease in incidence)
- In-migration of healthy people
- Out-migration of cases
- Improved cure rate of cases

2- Measurements of Mortality

Mortality rates and ratios measure the occurrence of deaths in a population using different ways. Rates whose denominators are the total population are commonly calculated using either the mid - interval population or the average population. This is done because population size fluctuates over time due to births, deaths and migration.

1- Crude Death rate

$$(CDR) = \frac{\text{Total no. of deaths reported during a given time interval}}{\text{Estimated mid interval population}} \times 1000$$

2- Sex- specific mortality rate

$$\frac{\text{No. of deaths in a specific sex during a given time}}{\text{Estimated mid interval population of same sex}} \times 1000$$

3- Age- specific mortality rate

$$\frac{\text{No. of deaths in a specific age during a given time}}{\text{Estimated mid interval population of specific age group}} \times 1000$$

Example: The average total population of “Kebele Y” in 1996 was 6000 (3500 female & 2500 male). In the same year 300 people died (100 female & 200 male). Calculate the mortality rate (Crude death rate) for females .

$$\text{CDR for females} = \frac{100}{3500} \times 1000 = 29 \text{ per 1000 female population}$$

That means out of 1000 female population living in “Kebele Y”, 29 females died in 1996.

4- Proportionate mortality ratio

$$\frac{\text{No. of deaths from a specific cause during a given time}}{\text{Total no. of deaths from all causes in the same time}} \times 100$$

5- Case Fatality Rate (CFR)

$$\frac{\text{No. of deaths from a specific disease during a given time}}{\text{No. of cases of that disease during the same time}} \times 100$$

6- Neonatal Mortality Rate

$$\frac{\text{No. of deaths under 28 days of age reported during a given time}}{\text{No. of live births reported during the same time}} \times 1000$$

7- Infant Mortality Rate

$$\frac{\text{No. of deaths under 1 year of age during a given time}}{\text{No. of live births reported during the same time interval}} \times 1000$$

8- Under- five mortality rate

$$\frac{\text{No. of deaths of 0 – 4 years of age during a given time}}{\text{Average (mid – year) population of the same age at the same time}} \times 1000$$

9- Maternal Mortality Rate

$$\frac{\text{No. of pregnancy associated deaths of mothers in a given time}}{\text{No. of live births in the same time}} \times 1000$$