MEASUREMENTS OF FREQUENCY

Objectives

Students have to know :

1- What do frequency mean ?

2-Definitions of Rates ,Proportion ,and Ratio.

3- Definition of basic rates .

4- What do population at risk mean ?

The amount of sickness or disease or the frequency of a characteristic or an event must be quantified in relation to the background “reference” population. The frequency is expressed in terms of **rates, proportions and ratios**.

Rates are used to express the frequency of an event (sickness, disease, birth, death… etc) per unit of size of related population. Time period and place are specified.

All rates have:

1. Numerator: cases or events
2. Denominator: population at risk
3. Time limit or reference period and a place
4. A standard multiplication factor, usually a multiple of 10.

Population at risk: are those individuals who are at risk of getting ill and thus contributing to the cases which form the numerator. Generally the **numerator is part of the denominator .**

No. of persons with a characteristic or a state or No. of events

during a specified period of time and specified place

A rate =----------x K

population at risk during the same period and at the same place

(Note: K is a multiplication factor)

Proportions express the part in relation to the total. The numerator is part of the denominator but there is no multiplication factor. The value of a proportion is usually less than unity (less than one) . It equals one only if all individuals at risk become diseased.

- **Ratios** express the number of persons with a characteristics relative to the number of persons without the characteristics. The numerator is not part of the denominator. Ratio is not a common epidemiological parameter in descriptive epidemiology. In analytical epidemiology it can be used , example : OR.

Definition of basic rates

1. Rates related to fertility. These are useful indicators in health and demographic characteristics of population. The rates include:

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a. Crude birth rate (CBR): It is a crude measure of fertility in the population at a specific year.

$$\textbf{CBR} = \frac{\text{No. of live births in a year in a specific place}}{\text{Mid-year population in the same place}} \times 1000$$

b. General fertility rate (GFR): In this rate the numerator is the same as

that for crude birth rate but the denominator is the total number of women in the reproductive age (15 – 49).

$$\textbf{GFR} = \frac{\text{No. of live births in a year in a specific place}}{\text{No. of women aged (15 – 49) years}} \times 1000$$

2. Rates related to morbidity: These are used to measure the frequency of disease in the population at one point in time or during a period of time. They are very important because they reflect the health status of people and the expected burden on the health care system. Two morbidity rates are in common use:

Incidence rate: Incidence of a disease is the number of new cases or episodes of disease which occur during a specified period of time in a specific population or place. The incidence rate (IR) is the number of new cases or episodes (spells) of disease per unit of size of population.

$$\text{IR} = \frac{\text{Number of new cases of a disease in a year in a given population}}{\text{Total population at risk in the same year}} \times 1000$$

Incidence rate is more useful in the following situations:

To study disease of **short duration**.

To study the **etiology** of disease.

To evaluate **preventive measures**.

To determine the **risk of acquiring of disease**.

To assess **transmission of infectious agent.**

Prevalence rate: Prevalence refers to the total number of cases (old and new) of a disease or conditions existing in a given population at a point in time (point prevalence) or during a period of time (period prevalence). According to time specification, prevalence rate (number of existing cases per unit of size of population)

Number of existing cases (new & old) in a given population at a point in time

PR= ---------- X1000

Total population in the same place and the same point in ***time***

3. Rates related to mortality: These rates measure the impact of disease on the population in terms of death, thus they reflect in general the **severity of disease** and the **quality of health care services**. The commonly used mortality rates are:

1. Perinatal mortality rate. It relates total stillbirths and deaths in the first week of life to total births.
2. Stillbirth rate. It relates stillbirths to total births.
3. Neonatal mortality rate (early and late).
4. Post neonatal mortality rate.
5. Infant mortality rate (including neonatal and post neonatal rates).It relate the deaths in the first year of life to total births .
6. Crude death rate. It relates all deaths due to all causes to mid-year population

7. Case fatality rate (ratio). an indicator of disease severity an effectiveness of medical care.
8. Maternal mortality rate. It is an indicator of quality of maternal health care.

Case fatality = number of deaths due to a disease / number of people with the same disease * 1000

Cause specific mortality rate = number of deaths due to a disease / total midyear population * 1000

Crude death rate = all deaths during a year /total midyear population * 1000

Infant mortality rate = number of infant death / total number of live births * 1000

Maternal mortality rate = number of women deaths from puerperal causes / total number of live births * 1000

Demographic data

In any Iraqi population the demographic figure is as the following :

4 % under one year

13 % from 1-4 year

17% under five years

45 % under 15 years

18% none pregnant

22% bearing age women

Quiz

Define the followings :

- Rates
- Proportions
- Ratios
- Population at risk
- Incidence rate
- Prevalence rate

THANKS