l-Mustaqbal University / Nursing College
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Epidemiology

Lecture 4

Measurements in Epidemiology

By

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- **The four types of epidemiologic measures are**:
- 1. Count
- 2. Ratio
- 3. Proportion
- 4. Rate

Count

- The simplest and most frequently performed quantitative measurement in epidemiology is **a count**.
- Count of the number of persons in the group who have a particular disease or a particular characteristics.
- E.g. cases of influenza reported in New York, during January of a particular year.

Ratio

- **Ratio** is numerical expression, which indicates the relationship in quantity between two parts.
- Obtained by dividing one quantity by another.
- Example: (20) male patients were attended the clinic and (10)female patients the ratio of male to female is 2:1.

Of 1,000 motorcycle fatalities, 950 victims are men and 50 are women. The sex ratio for motorcycle fatalities is:

$$\frac{\text{Number of male cases}}{\text{Number of female cases}} = \frac{950}{50} = 19{:}1 \text{ male to female}$$

Proportion:

For a count to be descriptive of a group it must be seen in proportion to it; that is must be divided by the total number in the group.

- proportions may be expressed as percentages (%)

Calculation of the Proportion of African-American Male Deaths Among African-American and White Boys Aged 5 to 14 Years

A	B	Total (A + B)
Number of deaths among African-American boys	Number of deaths among white boys	Total
1,150	3,810	4,960

Proportion = $A/(A + B) \times 100 = (1{,}150/4{,}960) \times 100 = 23.2\%$

Rate

- **Rate:** is the quantity amount or degree of something measured in **specific period of time.**

- It is similar to proportion but it is calculated in a specific period(**usually one year**)

- **Epidemiologic rates contain the following elements:**
- 1- Disease frequency.
- 2- Unit size of population.
- 3- Time period during which an event occurs.

The crude death rate: reflects all deaths in the population regardless of age or cause of death. The crude death rate presents a picture of the overall health status of the population.

(e.g. all cancer deaths in 2000).

$$\textbf{Crude Death Rate} = \frac{\text{Number of death}}{\text{Number of deaths Estimated midinterval population}} * 1000$$

Specific Rate: Rates for specific segments/groups of the population (e.g. sex, age, race, cause of death, cancer site).

$$Age-specific\ death\ rate = \frac{Number\ of\ deaths\ of\ a\ specified\ age\ group}{Estimated\ midinterval\ population\ of\ that\ age\ group} \times 1000$$

Prevalence

- The number of existing cases depends on the number of people who developed their illness in the past and have continued to be ill at the present time (i.e. old and new).

$$Prevalence = \frac{Total\ Number\ of\ (old + new)\ cases\ over\ a\ time\ period}{Total\ population\ at\ risk\ during\ the\ same\ time\ period} \times (e.g., 100,000)$$

Incidence

- Is defined as the number (No.) of new cases of disease.
- Incidence is a measure of a disease developed in a person who did not have the disease.
- Transition from non disease to disease status.

Incidence rate

- No. of new cases in the population during specific period/ no of population at risk of developing the disease at that period.

Incidence is the measure of disease developing in a person who did not have the disease .

$$Incidence\ rate = \frac{Number\ of\ new\ cases\ over\ a\ time\ period}{Total\ population\ at\ risk\ during\ \ the\ same\ time\ period} \times Multiplier(e.g., 100,000)$$

Factors of Influencing prevalence rate :

1. **The number of new cases(incidence):** if the incidence increase the prevalence will increase.

2. **The severity of illness :**if the deaths increase the prevalence will decrease ,if the disease is easily cured the prevalence also decrease.

3. **The duration of illness:** if the duration of the disease increase the prevalence will increase.

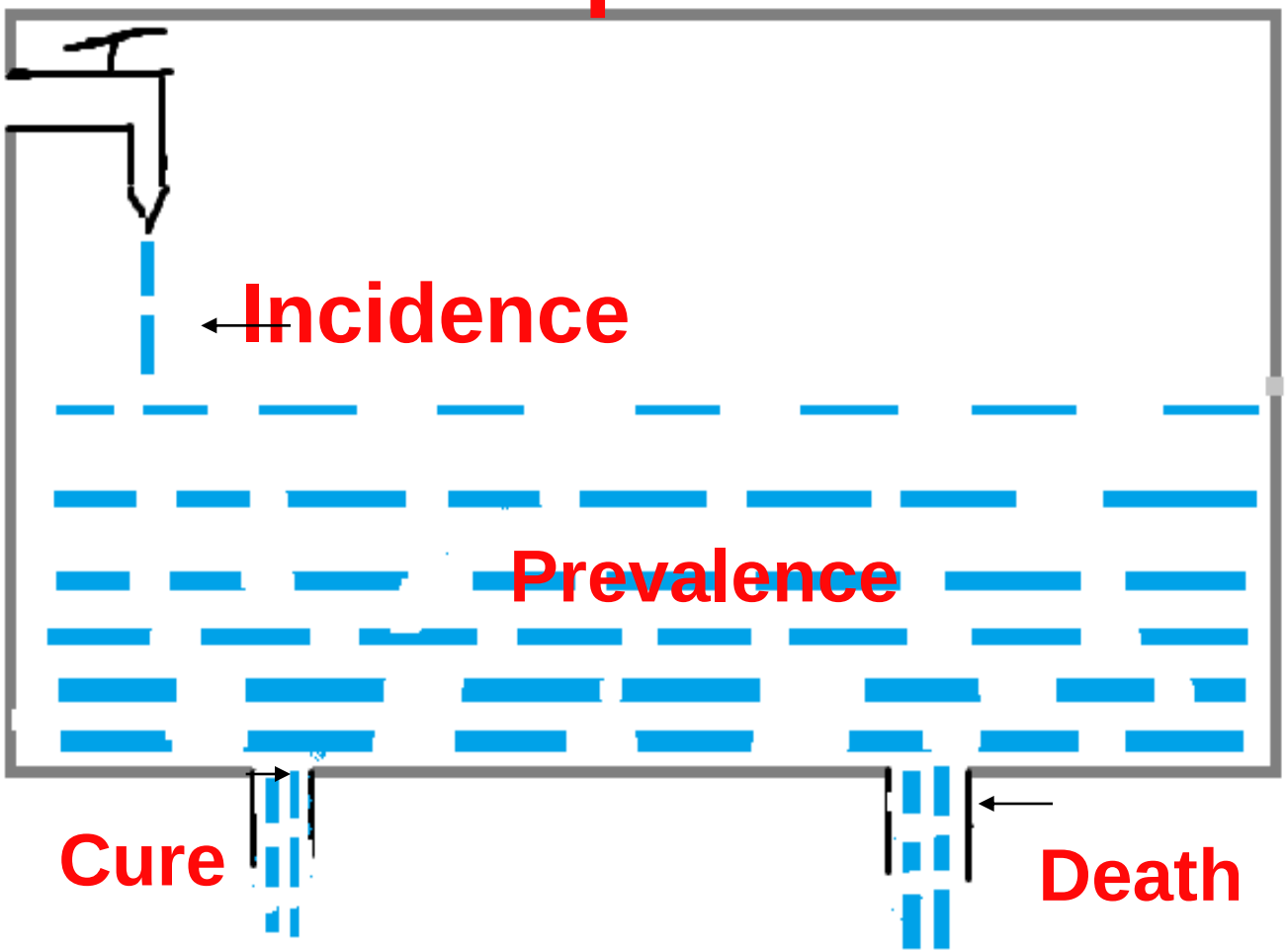
Period prevalence:

- The prevalence of a particular disease in a longer period such as one month , six months , one year or even more (life time prevalence).

Point prevalence :

- Is used to know how much of a particular disease is present in a population at a particular point in time(one day) ,
  - exampleDec.31,2019.

Relationship between incidence and prevalence



Vital statistics:

- Tools used to evaluate the health status of the community .
- By vital statistics we refer to data collected from ongoing recording ,registration of all vital events (birth, deaths ,fetal deaths ,marriages and divorces).
- The nurse or physician is responsible for filling the certificates of death , birth and fetal death

Crude Birth Rate (CBR)

Crude Birth Rate (CBR) :Is the No. of live births per 1000 population of certain locality and year .

Number of live birth (during a year)

----------X (1000)

Mid year population in certain locality

Birth rate is generally high in developing countries including Iraq , due to :

1- high fertility rates due social and traditional motives .

2- poor family planning facilities

3– factors related to marriage (the youngest age of marriage is associated with long childbearing period .

Key Points About CBR

- It provides a general indication of a population's fertility level.
- Higher CBR values are common in developing countries, while lower values are typical in developed countries due to factors like family planning and economic conditions.

Crude Death Rate (CDR) =

$$\frac{\text{Total number of deaths for all ages and causes}}{\text{Mid year population (MYP)}} * 1000$$

Global Comparison (Approximate Figures)

- **High CBR**: Many developing countries, particularly in Africa, have CBRs above 30 births per 1,000 people.
- **Moderate CBR**: Countries like India and Indonesia often have CBRs between 15-25.
- **Low CBR**: Many developed nations (e.g., Japan, Germany) have CBRs below 10, often indicating aging populations and low fertility rates.

$$\text{Neonatal Mortality Rate} = \frac{\text{Number of deaths under 28 days during a given time interval}}{\text{Number of live births during the same time interval}} \times 1000$$

$$\text{Infant Mortality Rate} = \frac{\text{Number of deaths under one year of age during a given time interval}}{\text{Number of live births during the same time interval}} \times 1000$$

$$\text{Maternal Mortality Rate} = \frac{\text{Number of deaths assigned to pregnancy related causes during a given time interval}}{\text{Number of live births during the same time interval}} \times 1000$$

THANKS