MEASURING DISEASE OCCURRENCE

INCIDENCE AND PREVALENCE

(MORBIDITY MEASURES)

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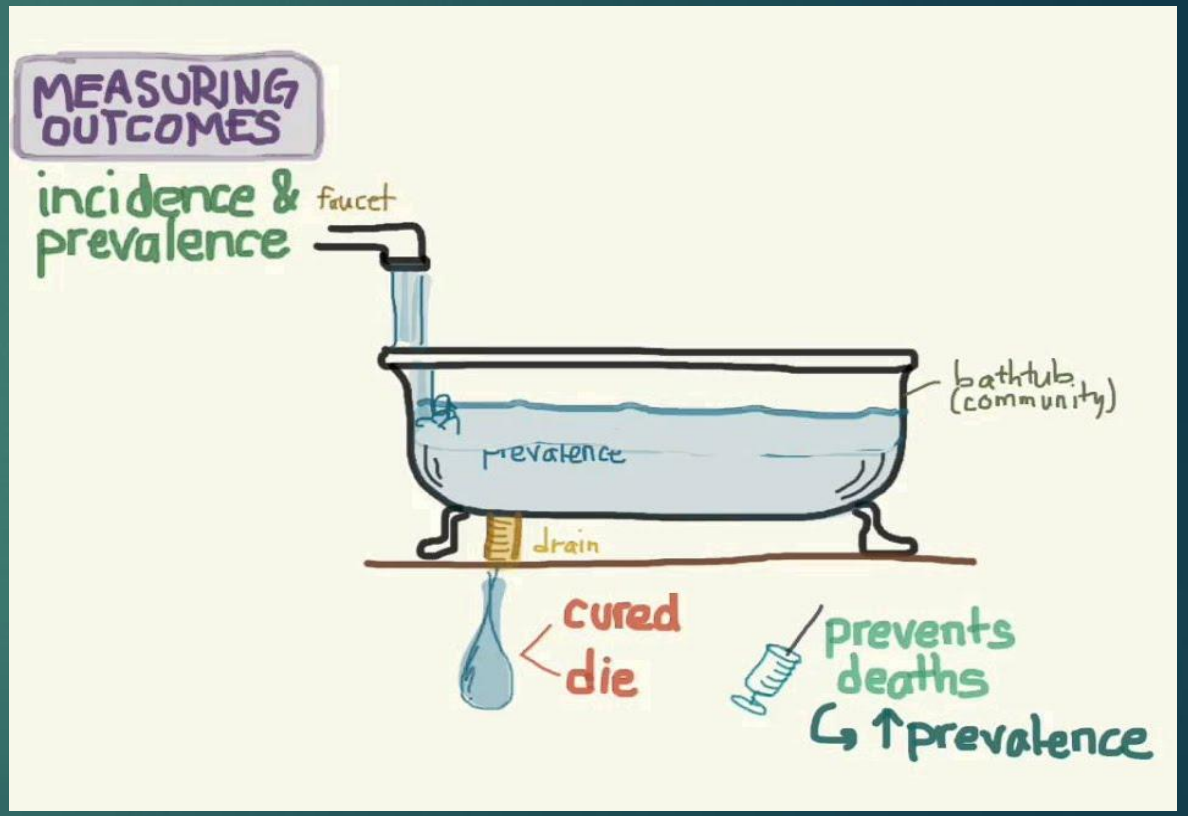


How do we measure diseases?

Four *quantitative* descriptors to measure disease occurrence:

- Numbers
- Ratios
- Proportions
- Rates

Descriptors

Numbers: Use of actual number of events

e.g 100 cases of TB in community A

Ratios: Quantifies the magnitude of one occurrence X, in relation to another event Y as X/Y

e.g Ratio of TB cases in community A to B is 1:10

Descriptors

Proportions: a ratio in which the numerator is included in the denominator

e.g proportion of TB cases in community A is 10%

Rates: a proportion with time element

It measure the occurrence of an event overtime

e.g US measles cases in 2000/US population in 2000

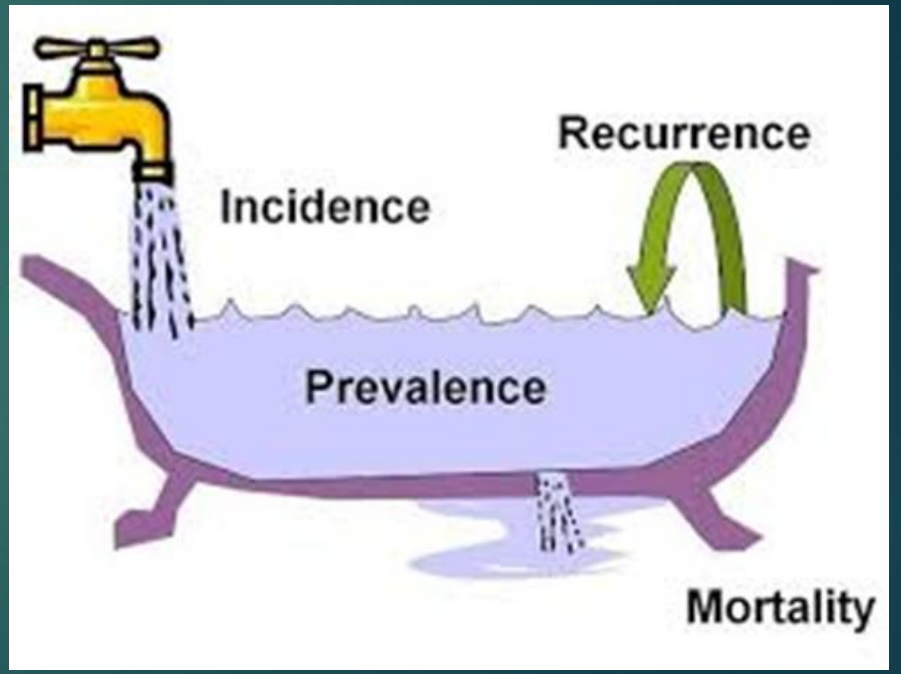
Measurement of Disease Occurrence
Morbidity measures

Morbidity rates are rates that are used to quantify the magnitude/frequency of diseases

Two common morbidity measures:

Incidence rates (Cumulative incidence, incidence density)

Prevalence

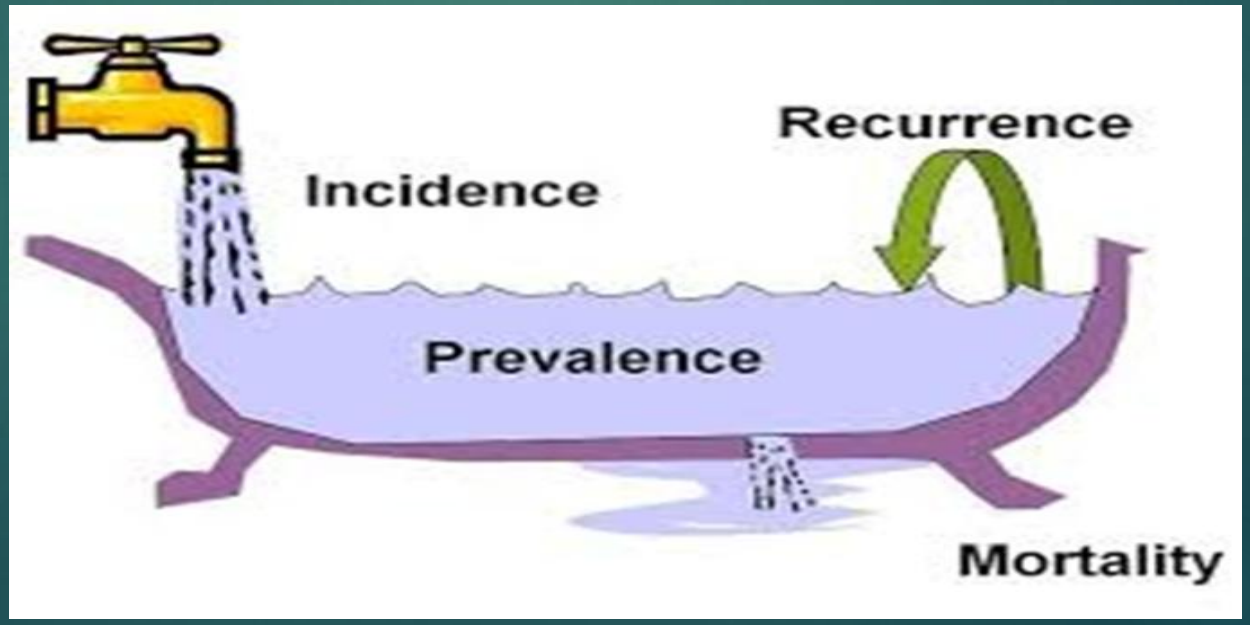


Incidence rate

- ✓ The proportion of a population that develops a disease overtime (during a period of time)
- ✓ The risk/probability of an individual developing a disease overtime
- ✓ The rapidity with which new cases of a disease develop overtime
- ✓ The proportion of unaffected individuals who on average will contract the disease overtime
- ✓ Case fatality rate and attack rate are different types of incidence.

Cumulative incidence

$$\text{Cumulative Incidence} = \frac{\text{Number of new cases of a disease during a specified period}}{\text{Population at risk at the baseline}}$$



Other types of **Incidence**

- **Attack rate can be calculated as the number of people affected divided by the number exposed**.

It is used instead of incidence during a disease outbreak in a narrowly defined population over a short period of time (e.g. food poisoning in a party).

- **Case fatality is the proportion of cases with a specified disease who die within a specified time. It measures disease severity. Expressed as percentage.**

Practical challenges in measuring incidence rate

1. Identification of population at risk

   Population at risk constitutes all those free of the disease and susceptible to it

2. Population is not static/it fluctuates/as a result of births, deaths and migration

3. People are at risk only until they get the disease and then no more at risk

Prevalence

- It measures the proportion of a population with a disease at a point in time
- It describes current burden of disease in a population in order to facilitate planning and resource allocation.

e.g. What is the prevalence of cognitive disorder among school children in Jordan?

What is the prevalence of anxiety disorder among JU medical students?

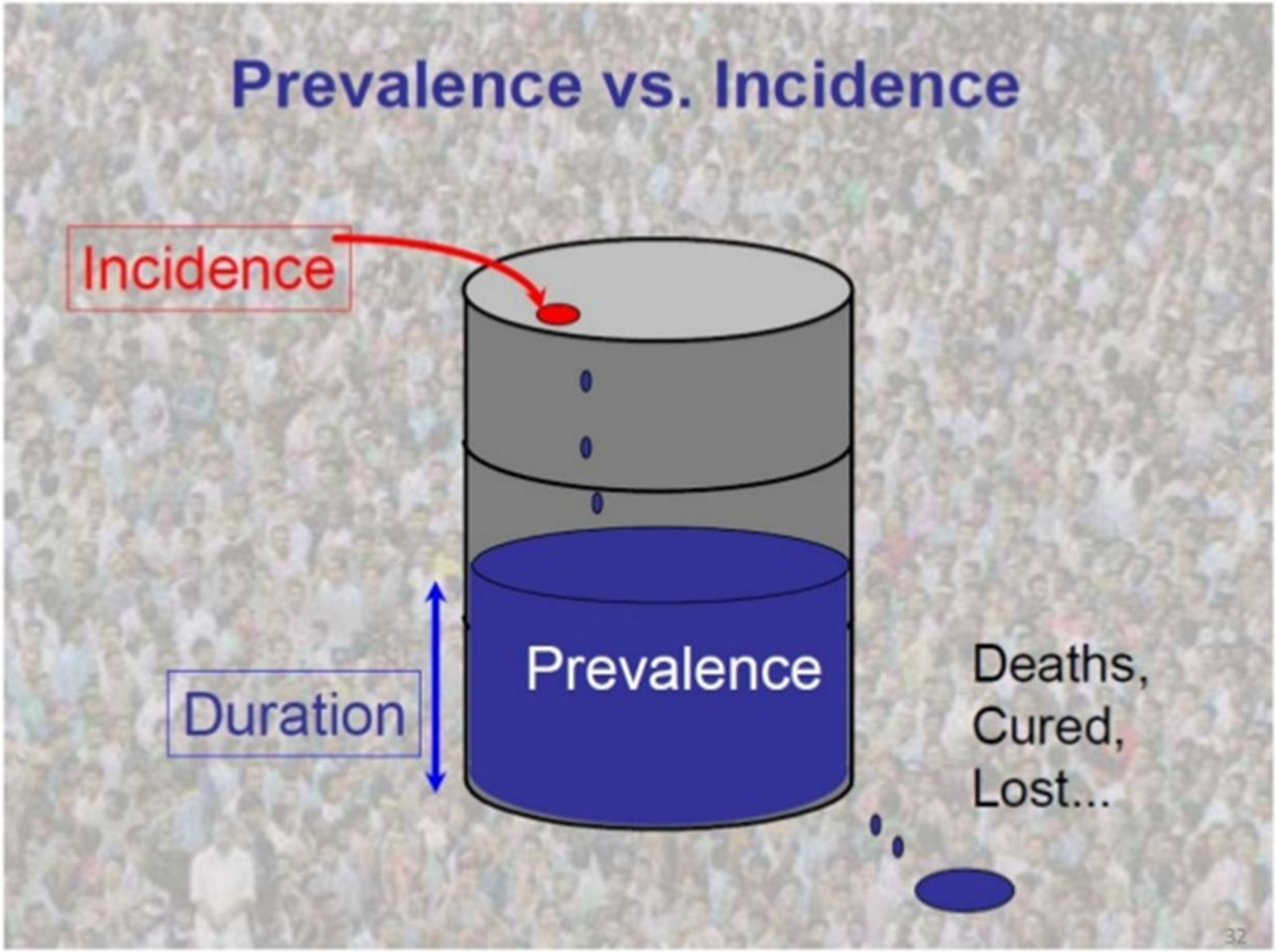
prevalence

Measures the proportion of a population with a disease at a point in time

prevalence =All persons with a disease / Total population

It is not a rate, but a true proportion (%)

Prevalence vs. Incidence



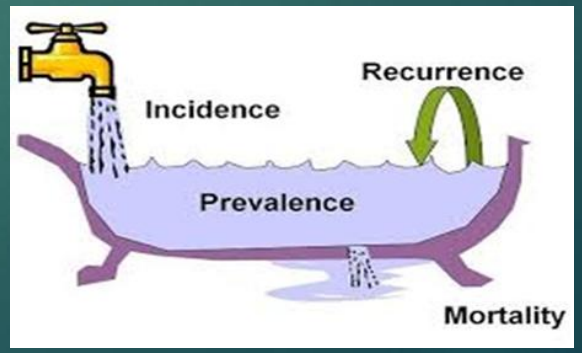
Prevalence = Incidence Rate x Average Duration

- ✓The relationship can be visualized by thinking of inflow and outflow from a reservoir. The fullness of the reservoir can be thought of as analogous to prevalence
- ✓Raindrops might represent incidence, or the rate at which new cases of a disease are being added to the population, thus becoming prevalent cases.
- ✓Water also flows out of the reservoir, analogous to removal of prevalent cases by dying or being cured of the disease.

Relationship between prevalence & incidence rates

Prevalence= Incidence x duration

An increase in prevalence may not necessarily be due to an increase in incidence rate, it could be due to an increase in average duration of a disease due to decrease in death and/or recovery rates.



Prevalence = Incidence Rate x Average Duration

If: the frequency of disease is rare (i.e., <10% of the population has it).

- ✓ If the average duration of disease remains constant, then **preventive measures that reduce the incidence** of disease would be expected to result in a decreased prevalence.
- ✓ Similarly, if the incidence remained constant, then developing a **cure** would reduce the average duration of disease, and this would also reduce the prevalence of disease.
- ✓ **In the late 1990s anti-retroviral therapy was introduced and greatly improved the survival of people with HIV. However, they weren't cured of their disease, meaning that the average duration of disease increased. As a result, the prevalence of HIV increased during this period.**

Calculation …

A survey of respiratory disease was conducted and the results are presented in the table below.
Calculate the prevalence of chronic bronchitis in the total group.

Prevalence of chronic bronchitis, by age, in a sample of 2383 employed men: , 1981.			
Age (years)	Number Surveyed	Frequency	Prevalence (%)
45-49	496	18	3.6
50-54	672	18	2.7
55-59	1215	18	1.5
Total	2383	54	2.3
$\chi^2 = 0.983$, p = 0.612			

Prevalence = 54 / 2383 = 0.0226 x 100% = 2.3%

= 0.0226x 1000= 22.6 cases/ 1000 pop.

A study was conducted to examine the incidence of Carpal Tunnel Syndrome (CTS) among computer operators in a certain corporation. An initial survey was given to 12 administrative assistants. Two of the 12 administrative assistants had symptoms and 10 did not reveal signs or symptoms equivalent to CTS. The administrative assistants who did not reveal signs or symptoms equivalent to CTS were then recruited into a study and followed for 4 years. The findings are listed below

3 of the 10 administrative assistants developed CTS during the 4 year follow-up period ……Calculate Cumulative Incidence (per 1,000).

Subjects	Follow-up Time(yrs)	CTS
1	1	yes
1	2.5	yes
1	3	yes
2	2	fired
1	1	transferred
4	4	no

Cumulative Incidence= 3/ 10 = 0.3 x 100% = 30%

= 0.3 x 1000 = 300 cases per 1,000 population

Attack rate

- An **attack rate** is a specific type of incidence rate.
- It is calculated for a narrowly defined population observed for a limited time, such as during an **outbreak.**
- **often due to a very specific exposure**
- Usually expressed as a percentage

- **Attack rate = No. of new cases of illness during a specified time period / Total population at risk during that specified period**

Attack Rate - Example

The Public Health Unit was called in to investigate more than 20 reports of people being ill with gastroenteritis after eating at a large restaurant in Amman during the first week of March 2018.

- An investigation was conducted interviewing people who ate at the restaurant during that week
- They found 2000 people ate at the restaurant that week and 400 became sick.

What was the attack rate?

- Attack rate = 400/2000 = 20 ill per 100 persons