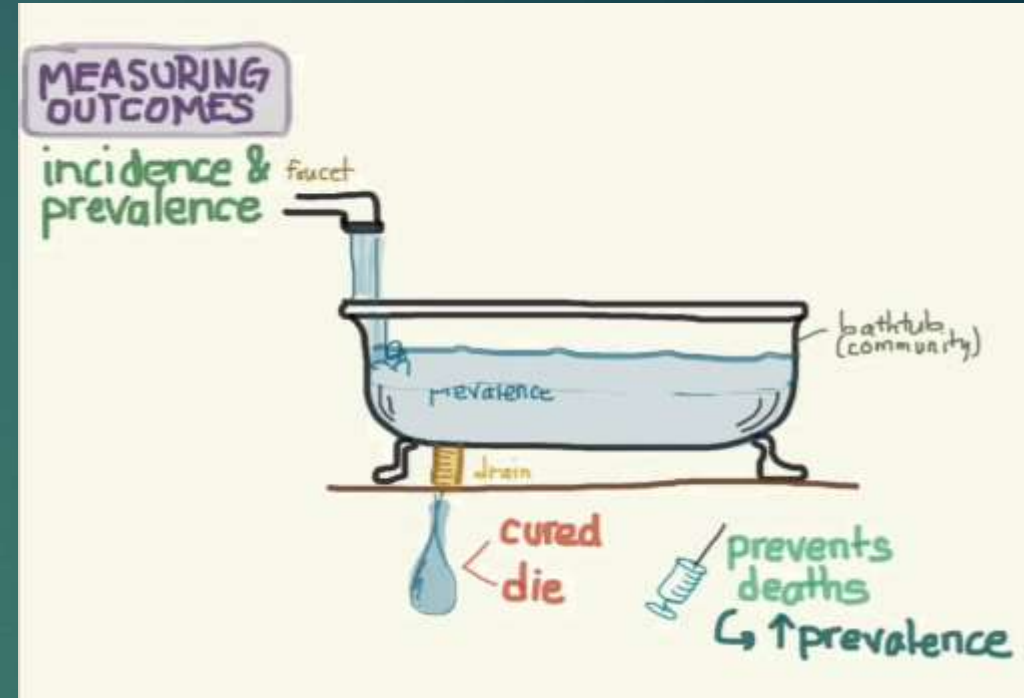


MEASURING DISEASE OCCURRENCE

INCIDENCE AND PREVALENCE

(MORBIDITY MEASURES)

اعتلال



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How do we measure diseases?

Four *quantitative* descriptors to measure disease occurrence:

- ▶ Numbers أول شيء منبراً فيه
- ▶ 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%

البيانات جزء من المقام

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

بفرق عن ال Proportions
بانه متعلق
بفترة زمنية



Measurement of Disease Occurrence

Morbidity measures

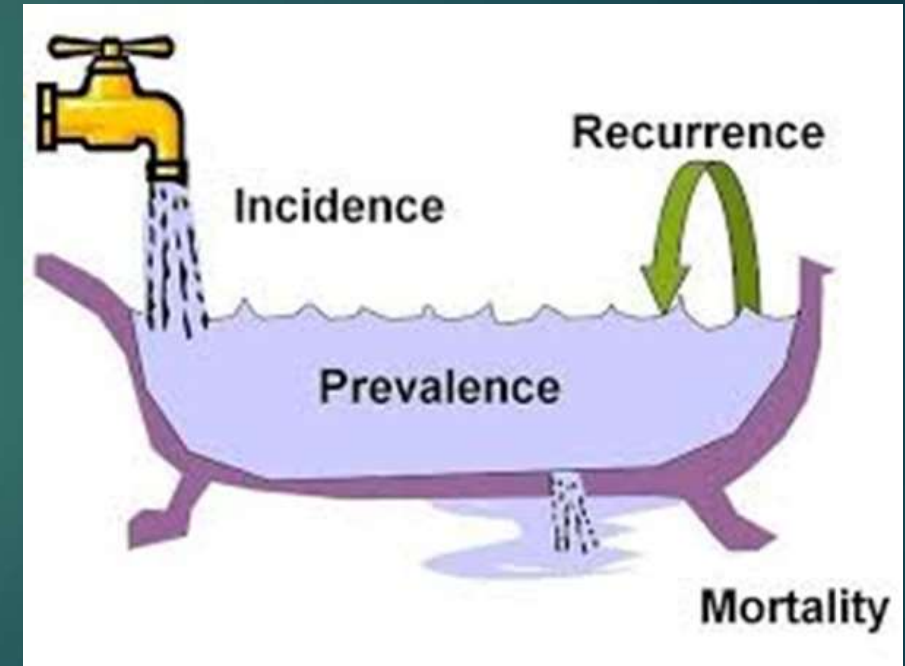
Morbidity rates are rates that are used to quantify the magnitude/frequency of diseases

Two common morbidity measures:

Incidence rates (Cumulative incidence, incidence density) *أكثر دقة حساب*

Prevalence (Period prevalence, point prevalence) *لا يتم في وقت متدد*

it's not a rate



- during certain periods.

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Incidence rate

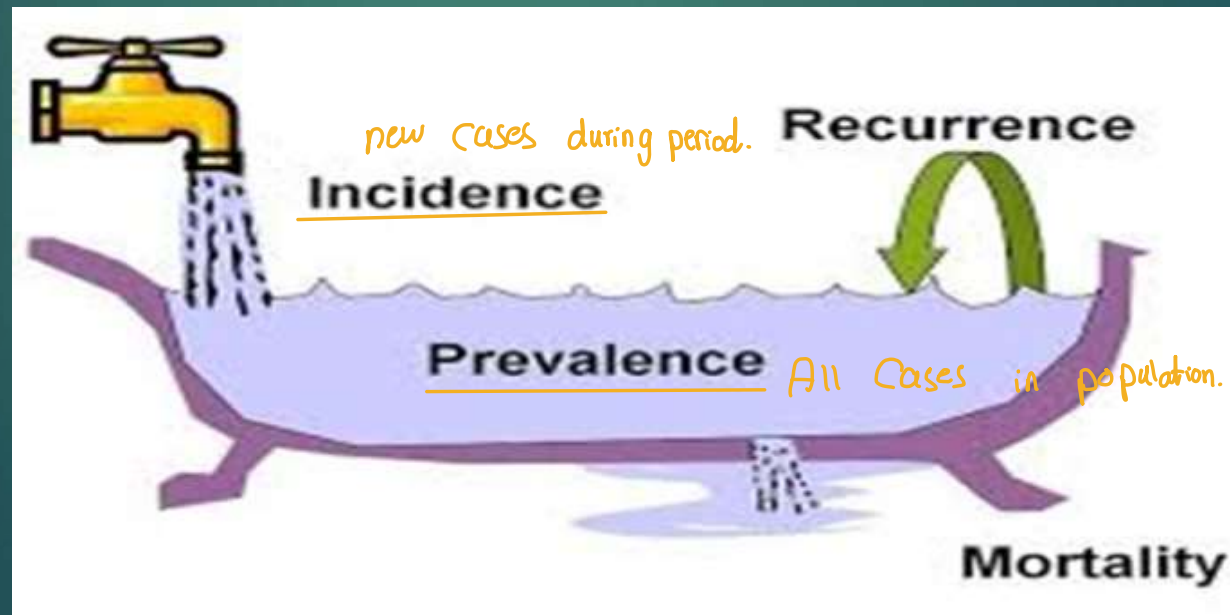
- ✓ The proportion of a population that develops a disease overtime
- ✓ The risk/probability of an individual developing a disease overtime
- ✓ The rapidity with which new cases of a disease develop overtime
- ✓ The proportion of unaffected individuals who on average will contract the disease overtime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



Cumulative incidence

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

able to develop the disease



Cumulative Incidence

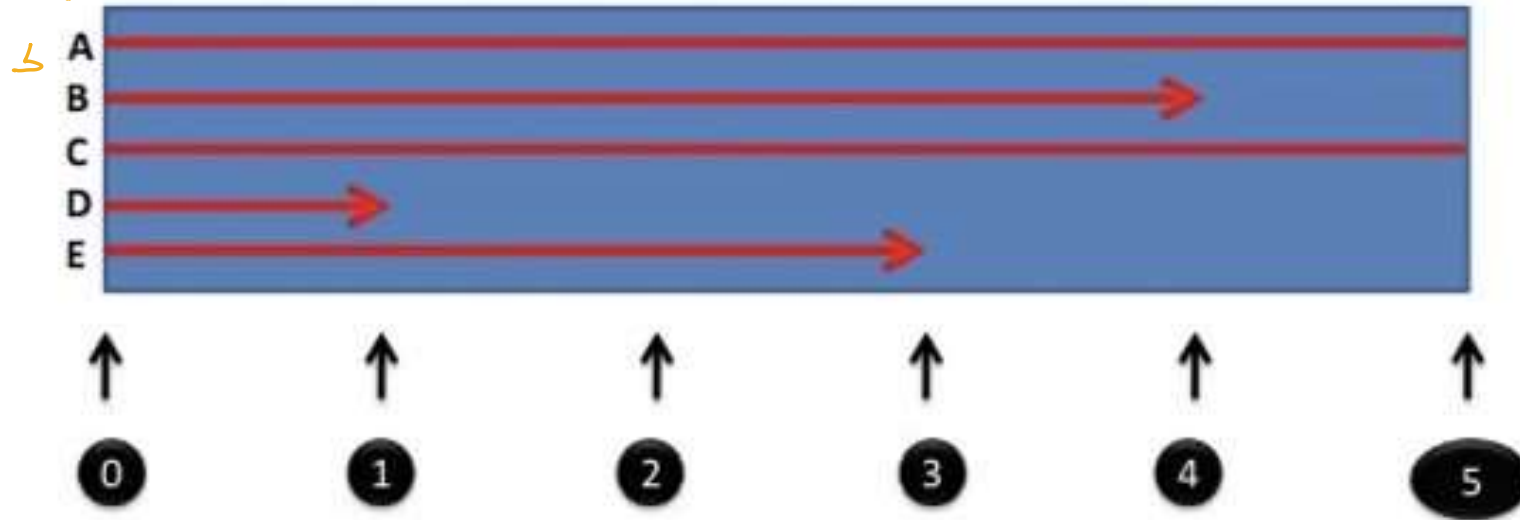
Table 2.4. Relationship between cigarette smoking and incidence rate of stroke in a cohort of 118 539 women¹³

Smoking category	Number of cases of stroke	Person-years of observation (over 8 years)	Stroke incidence rate (per 100 000) person-years)
Never smoked	70	395 594	17.7
Ex-smoker	65	232 712	27.9
Smoker	139	280 141	49.6
Total	274	908 447	30.2

Cumulative incidence rate
= $(274/118539) \times 1000$
= 2.31 cases per 1000 women

Incidence Density

Five cases, followed up through 5 years.



A 5 years

D 1 year

Total p-y = 18

B 4 years

E 3 years

person year

C 5 years

Incidence = $(3/18) \times 1000 = 166.67$ per 1000 person-years

Other types of Incidence

من كل الي
أكلوا
كم واحد
أصيب بالمرض

► 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).

من الي أصبوا
بالمرض
كم واحد
توفي منهم

► Case fatality is the proportion of cases with a specified disease who die within a ^{مترادف لـ rate} **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 during a specified period or 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?

population.

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



prevalence

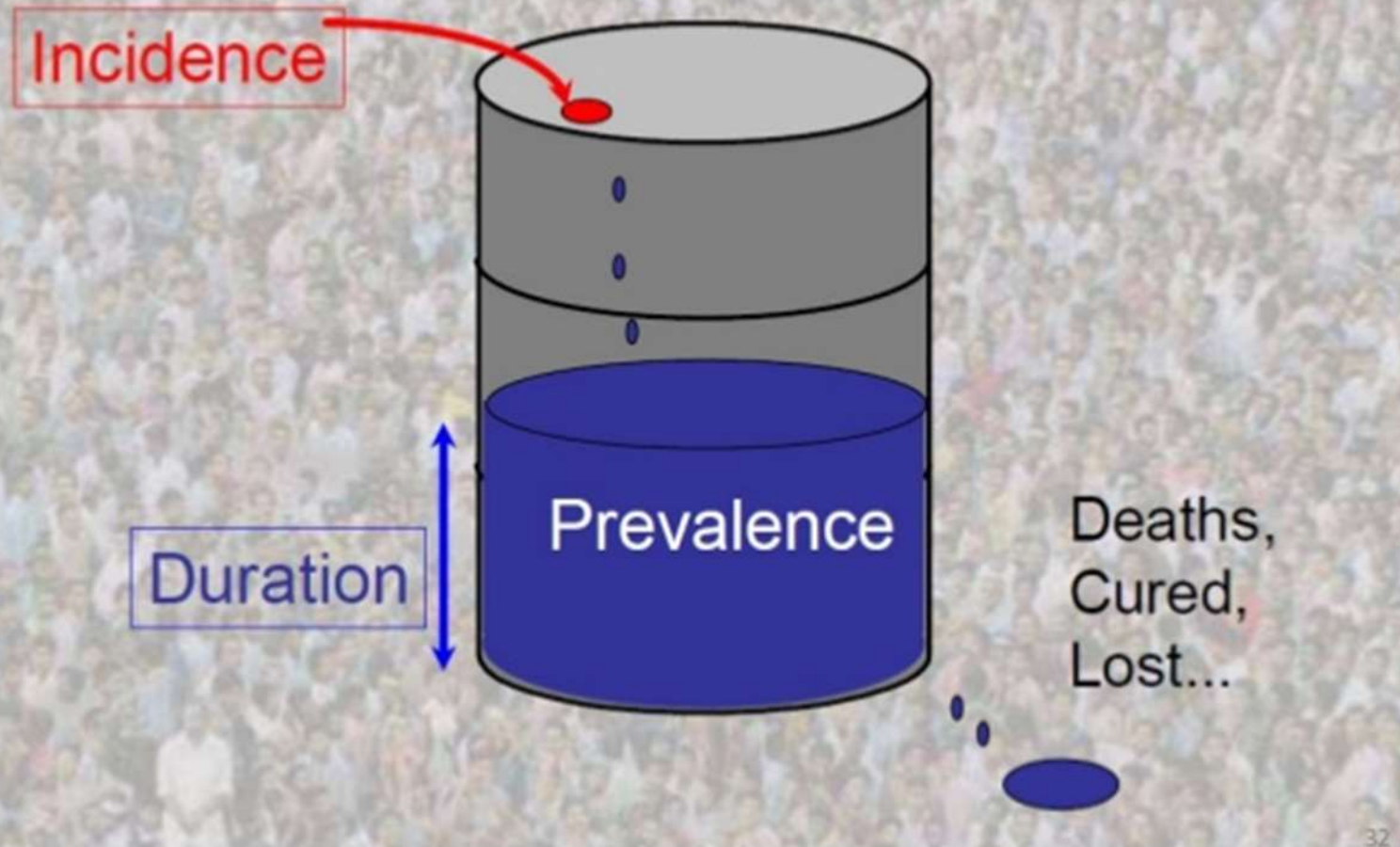
Measures the proportion of a population with a disease at a point in time

prevalence = All persons with a disease / Total population

It is not a rate, but a true proportion



Prevalence vs. Incidence

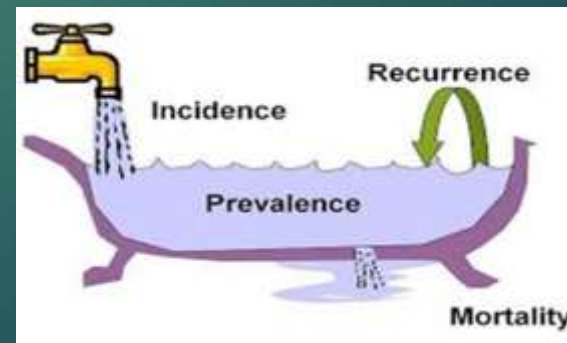


Relationship between prevalence & incidence rates

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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.



* بزيادة ال Prevalence ← إذا زاد عدد الحالات الجديدة ، زادت الوباء (أي بقل فيها المرض) مع الإنسان

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** *living longer.* **increased.** As a result, the prevalence of HIV increased during this period.



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, and 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.

Calculation ...

A survey of respiratory disease was conducted and the results are presented in the table below.

Calculate the prevalence of chronic bronchitis in each age group and 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
$\chi^2 = 0.983, p = 0.612$			

$$\text{Prevalence} = 54 / 2383 = 0.0226 \times 100\% = 2.3\%$$
$$= 0.0226 \times 1000 = 22.6 \text{ cases/ 1000 pop.}$$



Example

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 periodCalculate Cumulative Incidence (per 1,000).

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

At base line

عند بداية الدراسة

$$\text{Cumulative Incidence} = 3 / 10 = 0.3 \times 100\% = 30\%$$

$$= 0.3 \times 1000 = 300 \text{ cases per 1,000 population}$$



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

- ▶ **Attack rate** =
No 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 Riyadh during the first week of March 2011.
- ▶ 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

فترة زمنية
متعددة الساعات
لبنفس الأكل

ندج عنا لصاله الأولى
حبب المصابين
لعدوا غيرهم

Secondary attack rate

Special form of incidence measure spread of infection within a family or household following exposure to the first primary case in the family