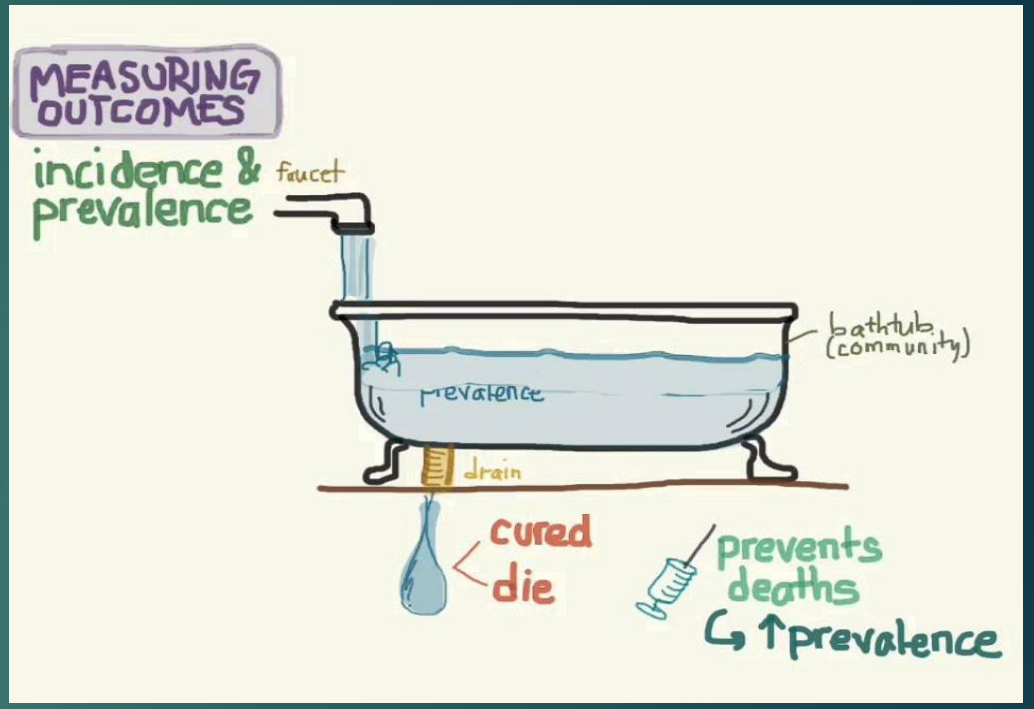
MEASURING DISEASE OCCURRENCE

INCIDENCE AND PREVALENCE (MORBIDITY MEASURES)



LINK TO ORIGINAL SLIDES WITH RECORD

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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

يحدد حجم حدوث واحد

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

X/Y مثل Y فيما يتعلق بحدث آخر ،X

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

Descriptors

النسبة التي يكون فيها البسط

مدرج في المقام

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

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

نسبة مع عنصر الوقت

إنه يقيس حدوث حدث مع مرور الوقت

على سبيل المثال حالات الحصبة في الولايات المتحدة في عام 2000/سكان الولايات المتحدة في

Rates: a proportion with time element 2000

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

معدلات الاعتلال هي معدلات يستخدم لقياس كمية حجم/تكرار الأمراض

هناك مقياسان شائعان للمراضة:

معدلات الإصابة (التراكمية الإصابة، كثافة الإصابة)

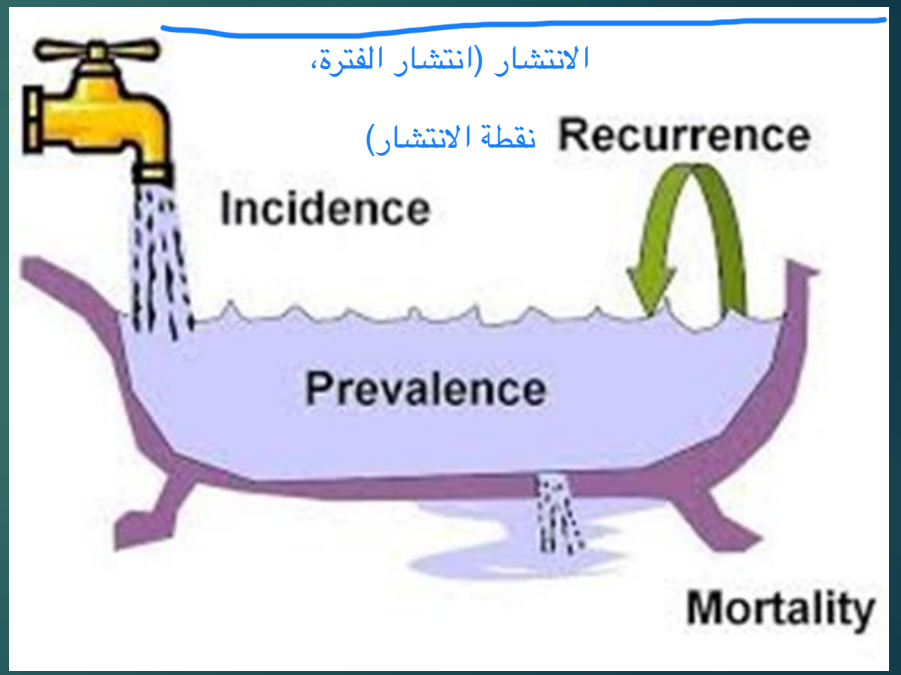
الانتشار (انتشار الفترة، نقطة الانتشار)

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 (Period prevalence, point prevalence)



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.

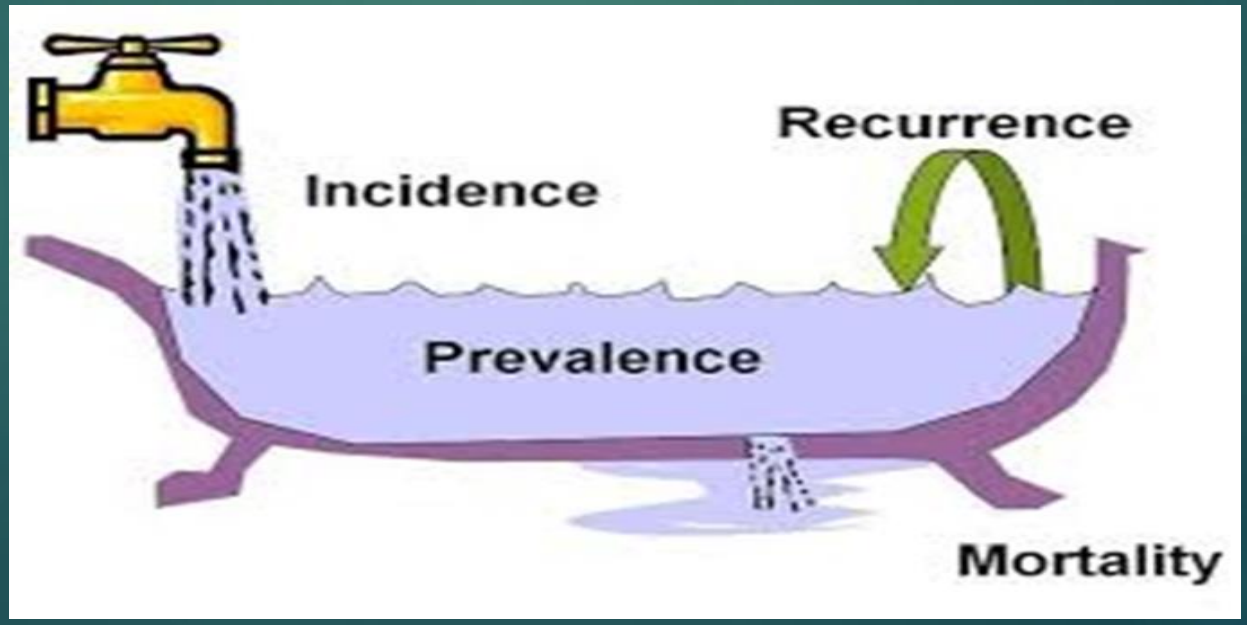
نسبة الأفراد غير المتأثرين الذين على

المتوسط سوف يتعاقد مع المرض مع مرور الوقت

✓ معدل وفيات الحالات ومعدل الهجوم هما معدل حدوث.

Cumulative incidence

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



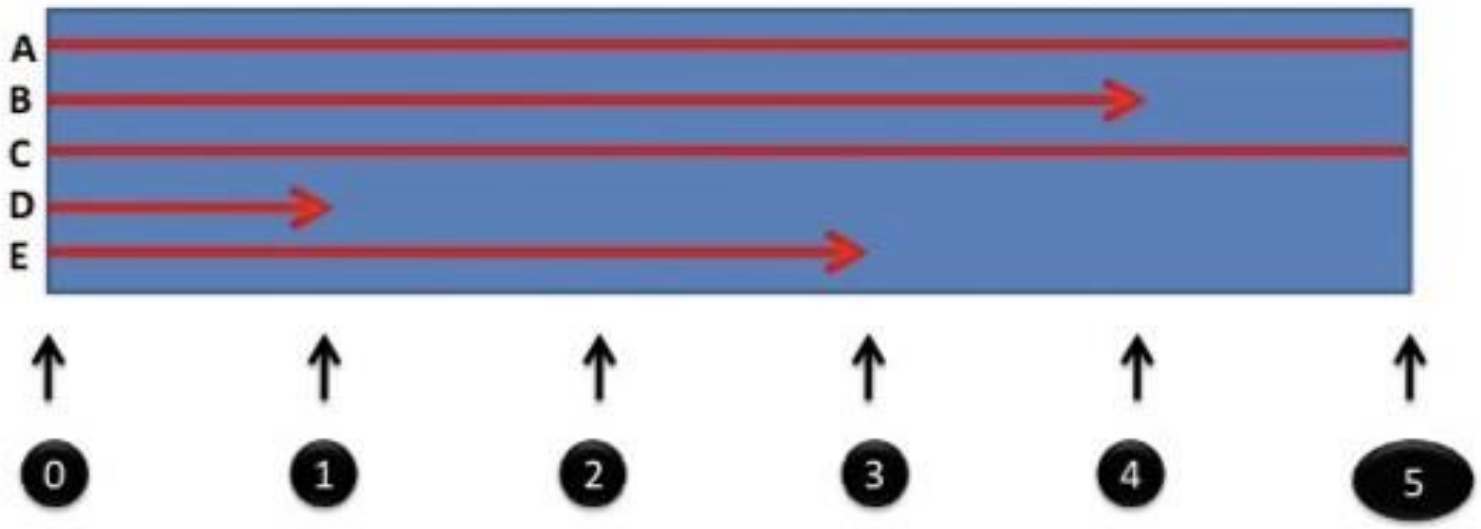
Cumulative Incidence

Table 2.4. Relationship between cigarette smoking and incidence rate of stroke in a cohort of 118 539 women[13]

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)x1000
= 2.31 cases per 1000 women

Incidence Density



Duration (in years)

A 5 years

B 4 years

C 5 years

D 1 year

E 3 years

Total p-y = 18

Incidence= (3/18)x1000 = 166.67 per 1000 person-years

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

   يتضمن

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

   السكان ليسوا ثابتين/يتقلبون/نتيجة ل

   المواليد والوفيات والهجرة

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?

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

- إنه يقيس نسبة السكان الذين لديهم المرض خلال فترة محددة أو في وقت ما
- يصف العبء الحالي للمرض في السكان في من أجل تسهيل التخطيط وتخصيص الموارد.

على سبيل المثال ما هو انتشار الاضطراب المعرفي بين أطفال المدارس في الأردن؟

ما هو انتشار اضطراب القلق بين JU؟ طلاب الطب؟

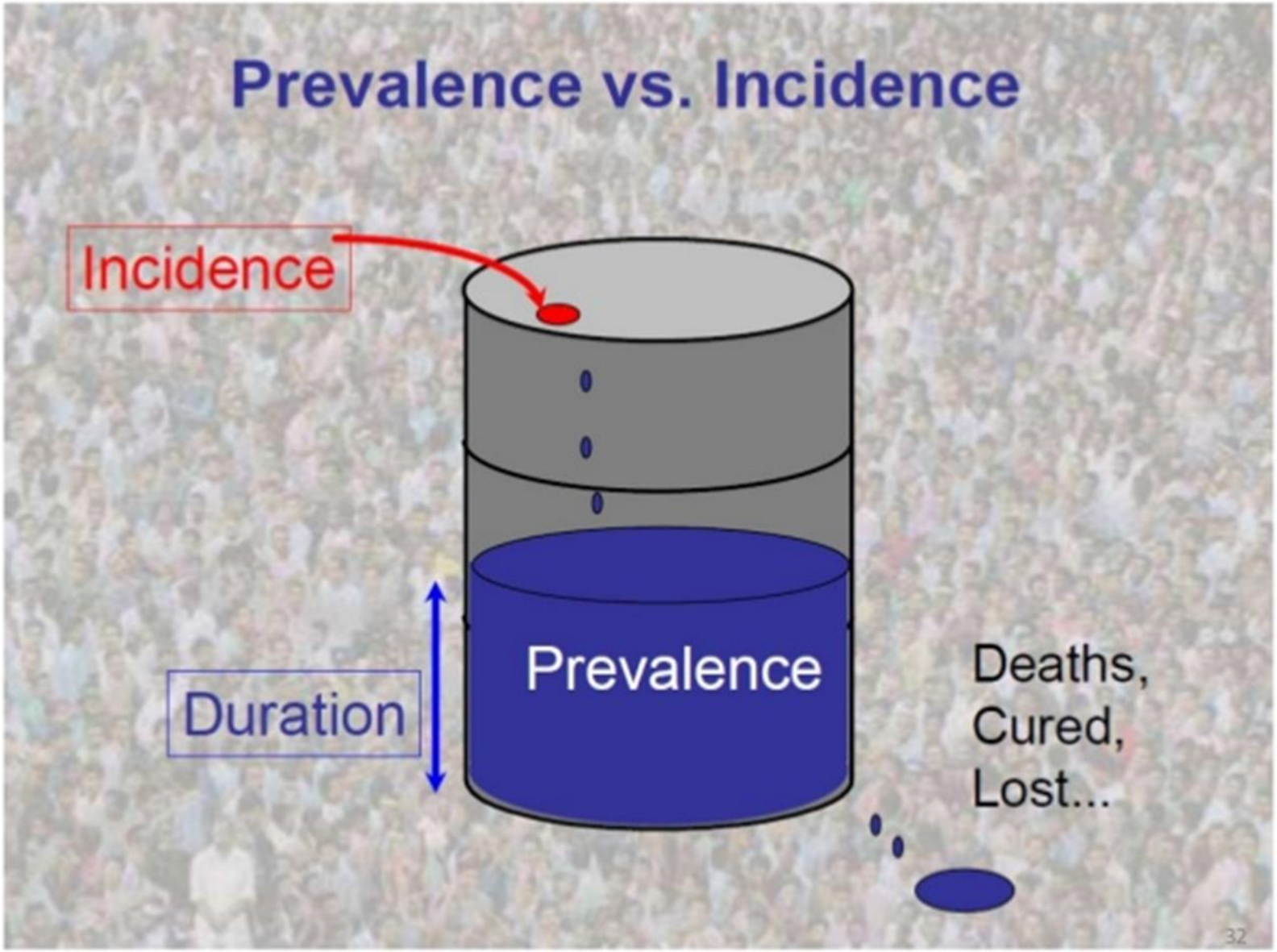
prevalence

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

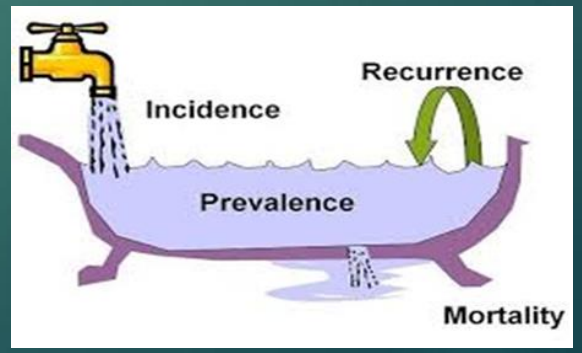
Prevalence vs. Incidence



Relationship between prevalence & incidence rates

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.**

التدابير الوقائية التي تقلل معدل الإصابة ستقلل ال prevalence

شفاء

✓ في أواخر التسعينيات، تم إدخال العلاج المضاد للفيروسات القهقرية بشكل كبير
تحسين بقاء الأشخاص المصابين بفيروس نقص المناعة البشرية. ومع ذلك، لم يتم علاجهم
من مرضهم، مما يعني أن متوسط مدة المرض
زيادة. نتيجة لذلك، زاد انتشار فيروس نقص المناعة البشرية خلال هذا
فترة.

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.

يمكن تصور العلاقة من خلال التفكير في التدفق الداخلي
والتدفق من الخزان. ملء ال
يمكن اعتبار الخزان مشابه للانتشار،
وقد تمثل قطرات المطر حدوثا، أو المعدل عند
ما هي الحالات الجديدة للمرض التي تضاف إلى
السكان، وبالتالي تصبح حالات سائدة.
✓يتدفق الماء أيضا من الخزان، على غرار إزالة
الحالات السائدة عن طريق الموت أو الشفاء من المرض.

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			

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).

أجريت دراسة لفحص حدوث متلازمة النفق الرسغي (CTS) بين مشغلي الكمبيوتر في شركة معينة. تم تقديم مسح أولي إلى 12 مساعدون إداريون. كان لدى اثنين من المساعدين الإداريين الاثني عشر أعراض و10 لم تكشف عن علامات أو أعراض تعادل CTS. الإداري المساعدون الذين لم يكشفوا عن علامات أو أعراض تعادل CTS كانوا في ذلك الوقت تم تجنيده في دراسة ومتابعته لمدة 4 سنوات. النتائج مدرجة أدناه

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

- معدل الهجوم هو نوع محدد من معدل الإصابة.
- يتم حسابه لسكان محددين بشكل ضيق لوحظ
لفترة محدودة، كما هو الحال أثناء تفشي المرض.
- غالبا بسبب تعرض محدد للغاية
- عادة ما يتم التعبير عنها كنسبة مئوية

Attack Rate

- Attack rate =

$$\frac{\text{No new cases of illness during a specified time period}}{\text{Total population at risk during that specified period}}$$

Attack Rate - Example

تم استدعاء وحدة الصحة العامة للتحقيق أكثر

أكثر من 20 تقريرا عن مرض الأشخاص بالتهاب المعدة والأمعاء بعد

تناول الطعام في مطعم كبير في الرياض خلال الأسبوع الأول

من مارس 2011.

- 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

تم إجراء تحقيق لإجراء مقابلات مع الأشخاص الذين

أكلت في المطعم خلال ذلك الأسبوع

- 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

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

شكل خاص من قياس الإصابة انتشار

العدوى داخل الأسرة أو الأسرة

بعد التعرض للحالة الأولية الأولى

في العائلة