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. It is usually expressed as a percentage.

EX: Of 75 persons who attended a college picnic, 46 subsequently developed a gastrointestinal (GI) illness. Calculate the attack rate.

Attack rate = No of new cases / population at risk x 100

= 46/75 x 100 = 61%

Secondary attack Rate

the frequency of new cases of a disease among the contacts of known cases. This can be very important for diseases that are spread from person to person, such as TB, measles, shigellosis, and varicella. The formula is:

Secondary attack rates are often calculated for households. To calculate the number of household contacts (denominator), subtract the number of primary cases from the total number living in the households.

EX: ten cases of measles occurred among 90 children attending a childcare center. Each infected child came from a different family. The total number of persons in the 10 affected families was 44.

One incubation period later, 15 family members of the 10 infected children also developed the flu. Calculate the attack rate in the childcare center and the secondary attack rate among family contacts of those cases.

Attack rate = New cases / Population x 100 = 10 / 90 x 100 = 11.1%
No of new cases among contact

Secondary attack rate = \[ \frac{15}{(44-10)} \times 100 = 44.1\% \]

Total No. of contact

Two important measurements commonly used in measuring of disease or health problem: "Incidence" and "Prevalence".

1- Incidence:

An incidence rate (sometimes referred to simply as incidence) is a measure of the frequency that a new case of illness or health problem, occurs in a susceptible population over a specified period of time.

The formula for calculating an incidence rate follows:

\[
\text{Incidence rate} = \frac{\text{new cases occurring during a given time period}}{\text{population at risk during the same time period}} \times K
\]

Notice that the denominator is the population at risk. This means that persons who are included in the denominator should be able to develop the disease that is being described during the time period covered.

Thus, if we are calculating incidence for uterine cancer, the denominator must include only women, because men are not at risk for developing uterine cancer.

Ex: Among the inpatients of Al Kindy Teaching Hospital during the year 2006, a total of 120 were admitted with a primary diagnosis of UTI. For
the same year, the hospital had a total of 24000 patients. The incidence of UTI in that year was \( \frac{120}{24000 \times 1000} = 5 \) per 1000 patients per year (2006).

Example: Incidence rate

- Recruit one thousand women
- 100 had hysterectomies, leaving 900 at risk of uterine cancer
- Follow the 900 women @ risk for 10 years
- 10 develop uterine cancer

\[
\text{Incidence Rate} = \frac{\text{no. of onsets}}{\text{no. @ risk}} = \frac{10 \text{ women}}{900 \text{ women}} = 0.011
\]

Interpretation: The average 10-year risk of uterine cancer in this cohort is 1.1% or 11 per 1000

**Uses of Incidence:**
1- Determine the risk of disease occurrence
2- Useful in determining the causal association (disease etiology)

Note: Increase incidence may indicate failure of prevention & control measures Or change in agent-host character.

**2- Prevalence:**
The number of all person with a disease or health problem at a specified point of time in the total population

\[
\text{All the cases occurring during a given time period} \\
\text{Prevalence rate} = \frac{\text{no. of cases}}{\text{total population at the same time period}} \times K
\]
Prevalence includes both "old" and "new cases", (amount of the disease in the community). i.e. in measuring the prevalence of smoking in 1999, both people who began smoking prior to 1999 and those who just began in 1999 are included.

In prevalence, we have:

A- Point prevalence: Prevalence of the disease at a point in time.

Ex: Suppose we are interested in finding out how many people living in a city had DM. If 100 out of 1000 people tested were positive for DM, this proportion [10%] is called point prevalence.

B- Period prevalence: Prevalence of the disease in certain period of time, weeks, months or years.

Ex: If we estimated the number of DM patients in a year.

So the main use of prevalence in epidemiology is to assess the public health impact of the disease or health problem

The relation between Incidence & Prevalence

\[ P \sim I \quad \& \quad P \sim D \]

\[ P = I \times D \]

Ex: Average annual incidence of Ca lung is 45.9 per 100,000. The average annual prevalence is 23.0 per 100,000 duration. Calculate the average duration of the disease.

\[ P = I \times D \]

\[ D = P/I \]

\[ D = 23.0/45.9 = 0.5 \text{ year} \]
Factors affecting incidence:

1. New risk factor e.g. oral contraception.
2. Changing habits e.g. increased smoking.
4. Changing intervention programmes e.g. vaccination.
5. Migration.
7. Screening.
8. New diagnostic tools.