

### Basic terms in disease occurrence

**Endemic;** is used in two senses:

1. the **usual frequency** of occurrence of a disease in a population
2. the **constant presence** of a disease in a population

Eg. in Iraq; Bovine theileriosis, and Copper deficiency in Al Zubair /Basrah.

**Hyperendemic;** is refer to a disease which is constantly and persistently present in a population at a high rate of incidence and/or prevalence and which equally affects in all age groups of that population.

**Epidemic;** is used to describe a sudden, usually unpredictable, increase in the number of cases of an infectious disease in a population.

Commonly for those new disease entrance eg screw worm, FMD and RP.

**Pandemic occurrence;** is a widespread epidemic that usually affects a large proportion of the population.

Eg. Pandemics of rinderpest, and foot-and-mouth disease.

### Sporadic occurrence

- A sporadic outbreak of disease is one that occurs **irregularly and haphazardly**.
- Eg. Glanders

### Outbreaks

- as 'an occurrence of disease in an agricultural establishment, breeding establishment or premises, including all buildings as well as adjoining premises, where animals are present', the term generally implying that several animals are affected.
- Eg. As New strain of FMD

### Basic concepts of disease quantification

#### 1 Morbidity (Latin: morbus = disease);

- The amount of disease in a population, or the number of animals that become ill in a population.
- Refers to having a disease or a symptom of disease, or to the amount of disease within a population
- **Morbidity rate;** refers to the rate at which a disease or illness occurs in a population and can be used to determine the health of a population and its healthcare need
- **Mortality;** the number of deaths

- **Mortality rates:** the ratio between deaths and individuals in a specified population and during a particular time period
- **Demography**(demo= people; -graphia = writing, description); The measurement and description of the size of populations and their characteristics constitute.

## The structure of animal populations

### 1 Contiguous populations

- It is one in which there is much contact between individuals in the population and members of other populations.
- Contiguous populations predispose to transfer and persistence of infectious diseases over large areas because of the inherent mixing and movement of animals.
- Dogs and cats that are not confined to houses move freely within cities, coming into contact with other urban, suburban and rural animals of their own and different species

### Separated populations

- Separated populations occur as discrete units such as herds and flocks.

## Important mathematic and epidemiologic terms

**TABLE 3-1** List of Important Mathematical and Epidemiologic Terms Used in This Chapter

Mathematical Terms	Epidemiologic Terms: Frequency	Epidemiologic Terms: Risk	Measures Related to Morbidity and Mortality	Measures Related to Natality
Percentage	Count	Attack rate	Case fatality rate	Maternal mortality rate
Proportion	Period prevalence	Incidence rate/ cumulative incidence/ incidence proportion	Crude rate/crude death rate (crude mortality rate)	Infant and perinatal mortality rates/fetal death rate
Rate	Point prevalence	Reference population	Life expectancy	Birth rate
Ratio	Prevalence	Risk factor/population at risk	Specific rate	General fertility rate

### Definitions of mathematical terms that are used in epidemiology.

- Ratio (R)	$R = \frac{X}{Y}$	X and Y can be any number, including ratios.
- Rate (r)*	$r = \frac{X}{\Delta t}$	Type of ratio where the numerator is usually a count, and the denominator is a time elapsed.
- Proportion (p)	$P = \frac{A}{A + B}$	Type of ratio where the numerator is part of the denominator.
- Percent (P)	$P = \left( \frac{A}{A + B} \right) \times 100$	A proportion is multiplied by 100.

## Measures of disease occurrence

**Prevalence, P;** is the number of instances of disease or related attributes (e.g., infection or presence of anti-bodies) in a known population, at a designated time, without distinction between old and new cases.

$$P = \frac{\text{number of individuals having a disease at a particular point in time}}{\text{number of individuals in the population at risk at that point in time}}$$

**Incidence** is the number of new cases that occur in a known population over a specified period of time .

The two essential components of an incidence value are:

1. the number of new cases;
2. the period of time over which the new cases occur.

**Cumulative incidence** (also termed risk);

is the proportion of non-diseased individuals at the beginning of a period of study that become diseased during the period.

$$CI = \frac{\text{number of individuals that become diseased during a particular period}}{\text{number of healthy individuals in the population at the beginning of that period}}$$

**Incidence rate;** measures the rapidity with which new cases of disease develop over time(week, month, year...).

$$I = \frac{\text{number of new cases of disease that occur in a population during a particular period of time}}{\text{the sum, over all individuals, of the length of time at risk of developing disease}}$$

**Attack rate** is used to describe the proportion of animals that develop the disease.

## The relationship between prevalence and incidence rate

- A disease with a long duration is more likely to be detected during a cross-sectional survey than is a disease of short duration.
- **Eg.**, chronic arthritis, lasting for several months, could be detected by a cross-sectional abattoir survey that was undertaken any time during the several months that the arthritis was present.
- However, clinical louping ill, lasting for a few days, could be detected by a cross-sectional survey only if the survey was conducted during the short period that the disease was apparent.
- *Prevalence, P, depends on the duration, D, and the incidence rate, I, of a disease:*
- $P \propto I \times D$
- *This means that a change in prevalence can be due to:*
  1. a change in incidence rate
  2. a change in the average duration of the disease
  3. a change in both incidence rate and duration.

## Application of prevalence and incidence values

### Mortality;

are analogous to incidence measures .

**Cumulative mortality;** the number of deaths due to a particular disease over a specified period of time.

$$CM = \frac{\text{number of individuals that die during a particular period}}{\text{number of individuals in the population at the beginning of that period}}$$

**Mortality rate** (mortality density);

$$M = \frac{\text{number of deaths due to a disease that occur in a population during a particular period of time}}{\text{the sum, over all individuals, of the length of time at risk of dying}}$$

**Death rate** is the total mortality rate for all diseases - rather than one specific disease in a population.

**Case fatality;** refer to the tendency for a condition to cause the death of affected animals in a specified time.

$$CF = \frac{\text{number of deaths}}{\text{number of diseased animals}}$$

**Survival;** is the probability of individuals with a specific disease remaining alive for a specified length of time.

$$S = \frac{N - D}{N}$$

D = the number of deaths observed in a specified period of time,

N = the number of newly diagnosed cases under observation during the same period of time