**Family and Community Medicine**

**Fundamentals of Epidemiology -Measures of disease frequency**

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**Population**

Group of people with a common characteristic like age, race, sex

Two types of populations, based on whether membership is permanent or transient:

Fixed population: membership is permanent and defined by an event

Ex. Atomic bomb survivors

Dynamic population: membership is transient and defined by being in or out of a "state.”

Ex. Residents of the City of Baghdad

Want to quantify disease occurrence in a population

Measures of disease frequency should take into account:

* + Number of individuals affected with the disease
  + Size of population
  + Length of time the population was followed

**Epidemiological Outcomes**

**Ratio: Relationship between two numbersExample: males/females**

**Proportion: A ratio where the numerator is included in the denominatorExample: male infant/total births**

**Rate: A proportion with the specification of timeExample: (deaths in 1999/population in 1999) x 1,000**

**Measures of health status**

* **Measures of frequency:**
* **Measures of association**
* **Measures of potential population impact**

**Prevalence rate is defined as:**

**The proportion of a population-at-risk affected by a “disease” at a specific point in time**

**Prevalence rate (P) is calculated by:**

**Number of people with the diseaseat a specific time/# of people in the populationat risk at the specified time**

**Types of Prevalence Rates**

**Point Prevalence rate** =# persons with the condition /total number of persons at point of time.

**Period Prevalence rate** = # persons with the condition/ total number of persons at specified period of time.

**Factors influencing increase prevalence rate**

* Longer duration of the disease
* Prolongation of life without cure
* Increase in new cases (incidence / risk)
* Out-migration of non-diseased people
* In-migration of susceptible/diseased people
* Improved diagnostic &/or reporting

**Factors influencing decrease prevalence rate**

* Shorter duration of the disease
* Increased case-fatality rate
* Decrease in new cases (incidence / risk)
* In-migration of “healthy” people
* Out-migration of diseased people
* Improved cure rate

**Uses**

1. Pretest probability
2. Community diagnosis
3. Basis for decision making and planning
4. Provide clues for etiology

**Incidence**

**There are 2 main ways incidence is reported:**

Cumulative Incidence or attack rate

Incidence rate or incidence density

**Cumulative Incidence**

**Cumulative incidence (CI) =**is the proportion of people in a population who became diseased or ill or experienced an event during the specified period of time.

**CI = No**. new cases of disease or events during time period/Total population at risk at the beginning of the time period

Example:

**The incidence of AIDS in the Australian population was 178 in 2001 ie 178 new cases ofAIDS were diagnosed in Australia in 2001.**

**Cumulative Incidence**

**Two assumptions when calculating Cumulative Incidence:**

entire population at risk has been followed from the beginning of the study till the end

All participants are at risk of the outcome of interest

**Attack Rate**

Attack rate is a type of cumulative incidence applied to a narrowly defined population observed for a limited period of time, such as during an epidemic.

**Attack rate = No new cases of illness during a specified time period**/

**Total population at risk duringthat 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 during the first week of April 2010.

An investigation was conducted interviewing all person who ate at the restaurant during that weekthey found 2000 persons ate at the restaurant that week and 400 became sick.

What was the attack rate?

Attack rate = 400/2000 = 20 ill per 100 patrons

**Incidence Rate (Incidence Density)**

The incidence rate or incidence density is the number of new cases in a population divided by the total time units each individual in the population at risk was observed.

**Incidence Rate=No new cases of disease or events during the specified time period/**

**Sum of the length of time during which each person in the population is at risk**

**Why do we have problems in measuring incidence?**

* **Fixed cohort or dynamic cohort?**
* **deaths from other causes**
* **loss to follow-up - migration, refusals**
* **medical interventions e.g. hysterectomy**
* **end of study**
* **unequal entry into study (unequal follow-up)**

**Uses of incidence**

- Prediction ⎫ individuals

- Clinical dx ⎭

- Etiologic studies (cause) ⎫

- Community dx ⎬ population

- Prevention/evaluation ⎭

Outcome evaluation of a program

i.e. change in incidence of new or

Recurrent events

**Relationship between Incidence and Prevalence**

**Cancer of the pancreas**

* **Incidence low**
* **Duration short**
* **Prevalence low**

**Adult onset diabetes**

* **Incidence low**
* **Duration long**
* **Prevalence high**

**Mumps**

* **Incidence high**
* **Duration short**
* **Prevalence low**

**Essential hypertension**

* **Incidence high**
* **Duration long**
* **Prevalence high**

**Mortality studies**

Basic and commonly available information for characterizing a population and community dx

Sources: \*death notifications (DC) [numerator]

\*counts, census in defined areas [denominator]

**Types of Mortality Rates/Ratio**

* **annual death rate**
* **crude death rates**
* **infant mortality rates (ratio)**
* **neonatal mortality rates**
* **postneonatal mortality rates**
* **perinatal mortality rates**
* **fetal death rates**
* **fetal death ratios**
* **abortion rates**
* **maternal mortality rates**
* **adjusted mortality rates**
* **standardized mortality ratio**
* **specific death rates**
* **proportionate mortality rate-**
* **case fatality rate**

**Mortality rates**

**1. Proportional mortality** = death from certain cause/ all death

**2. Case fatality**= death from certain disease / all cases of that disease

i. tells you how important - relatively

ii. Tells you how dangerous

**3. Crude mortality** :The crude mortality rate is the mortality rate from all causes of death for a population.

= all deaths/ average population, typically during a year

**4. Stratum specific mortality** The cause-specific mortality rate is the mortality rate from a specified cause for a population.

The numerator is the number of deaths attributed to a specific cause.

The denominator remains the size of the specific population at the midpoint of the time period. eg age, sex specific - infant mortality

**Case Fatality rate (percent): The case-fatality rate is the proportion of persons with a particular condition (cases) who die from that condition.**

**It is a measure of the severity of the condition.**

**=** No. of individuals dying during a specified period of time after disease onset or diagnosis \*100/ No. of individuals with a specified disease

In case fatality the morbidity meets the mortality.

**Crude Death Rate=**

Total no. of deaths from all causes in 1 year \*1000

No. of persons in the population at midyear

**Uses of Mortality data**

1. Index of severity of disease
2. Index of risk of a disease

* When case fatality rate is high
* When duration of disease (survival) is short

**Problems**

1. Underlying cause of death
2. Quality of data
3. Cross comparability over time



