PBIO 504

Measures of Disease Occurrence and Risk

Measures of Disease Frequency in Populations

- Occurrence of disease in a single group or population:
  - Prevalence
  - Incidence
  - Attack Rate
  - Case Fatality
  - Survival Rate
- Compare occurrence of disease in two groups or populations (e.g. exposed or not exposed to some risk factor of interest)
  - Risk Ratio
  - Rate Ratio

Incidence (Cumulative Incidence)

In is the *Probability of Disease* (values btw 0 and 1)

$$\frac{\text{New cases occurring during the period of observation}}{\text{Population at risk at the beginning of observation}}$$

Incidence is a Measure of Risk of Disease

Note: The denominator only includes persons who were free of the disease of interest at the start of observation.

Incidence Rate (Incidence Density)

- The rate at which new cases develop in a population at risk during the period of observation

  IR = new cases per person-time at risk

- IR = $\frac{\text{new cases occurring during a period of observation}}{\text{person-time at risk during observation}}$
- Note: *the denominator here is the sum of the amount of time each person is actually free of disease during the period of observation*
- Example: Person-years at risk=2 people*1 yr+

+3 people*4yrs+ 1 person*5yrs+…

Incidence Rate (Incidence Density)

If we are interested in *how fast* a certain condition develops in a population, we would calculate the *rate* of new cases to the total person time free of Dz contributed by all those under observation, even those who got sick (they contribute their time in which they were free of Dz)

Note:

Incidence rate is **not** a proportion because the denominator is not fixed, therefore its value can exceed 1.0

Prevalence

- Numerator: all cases in the population (i.e. those that occurred in the past and are still in the population and those cases that are new)

- Denominator: all persons in the population of interest, whether or not they are pre-existing cases of the disease

- A proportion: number of persons with the disease as a proportion of the total population

Prevalence

- The proportion of the population having a certain disease
  - at a point in time (point prevalence)
  - during a period of time (period prevalence)

- The prevalence of a condition depends on how many people who were already diagnosed still have this condition at the time prevalence is measured.

- Prevalence is a static measure of the amount of disease in a population at a point in time (point prevalence) or during a specific time period during which the number of cases is counted (period prevalence).

Factors Affecting Prevalence

1. Incidence of disease -- the new cases
2. Duration of disease -- cases surviving from the past

Pe=Incidence x Duration (approximately equal)

- Prevalence can increase if the incidence of disease is unchanged but cases survive for longer time because of better treatment.
- Prevalence can increase if incidence increases while survival remains constant.
- Prevalence can remain the same if incidence increases and survival decreases proportionately.