OUTLINE

- MORBIDITY AND MORTALITY DATA
- Descriptive epidemiology

Definition of some basic terms

- **Parameter**: Descriptive measure computed from data of a population
- **Statistic**: Descriptive measure computed from data of a sample

Definition of some basic terms

- **Population**: The largest collection of entities for which we have interest at a particular time.
- **Sample**: Part of a population.
- **Simple random sample**: Is when a sample n is drawn from a population N in such a way that every possible sample of size n has the same chance of being selected.

Definition of some basic terms

- **Variable**: A characteristic of the objects under observation that takes on different values for different cases, example: age, gender, diastolic blood pressure.
- **Dependent variable**: Variable of interest. Known as well as the outcome.
- **Independent variable**: Predicts or influences the dependent variable. Known as well as the exposure.
Morbidity & Mortality Data

- **Morbidity**: Illnesses
- **Mortality**: Deaths

---

Morbidity & Mortality Data

**Modes of expression**

- Absolute numbers
- Rates
- Ratios

---

Morbidity & Mortality data: Sources

- Vital statistics
- Routine reporting system
- Registries
- Special population groups
- Health surveys

---

Measures of mortality

<table>
<thead>
<tr>
<th>Measure</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude death rate</td>
<td>Number of deaths / Number of individuals</td>
</tr>
<tr>
<td>Disease specific death rate</td>
<td>Number of deaths due to a specific disease / Number of individuals at risk</td>
</tr>
<tr>
<td>Sex specific death rate</td>
<td>Number of deaths of males (females) / number of males (females)</td>
</tr>
<tr>
<td>Case fatality rate</td>
<td>Number of individuals dying after disease onset / diagnosis / Number of individuals with the disease</td>
</tr>
<tr>
<td>Proportionate mortality rate</td>
<td>Number of deaths from a specific disease / Total number of deaths</td>
</tr>
</tbody>
</table>
In-class questions

- A city contains 100,000 people: 45,000 males & 55,000 females.
- 1,000 people die per year: 600 males & 400 females.
- There were 50 cases of lung cancer per year: 40 males & 10 females
- 45 died of lung cancer: 36 males & 9 females

Measure of disease: morbidity

Incidence rate = \( \frac{\text{Number of NEW cases of a disease occurring in population during a specified time period}}{\text{Number of persons at risk of developing the disease during that time period}} \)

Prevalence rate = \( \frac{\text{Number of EXISTING cases of a disease in the population at specified time period}}{\text{Number of persons in the population at specified time period}} \)

Measures of morbidity

Incidence cases
- Number of NEW cases of a disease occurring in the population during a specified time period

Prevalent cases
- Number of cases of a disease that are PRESENT in the population

Prevalence
- Point prevalence: Number of cases PRESENT in a specific point in time
- Period Prevalence: Number of cases PRESENT over a specified period

Incidence
- Point Incidence: Number of NEW cases in a specific point in time
- Period Incidence: Number of NEW cases over a specified period
Measures of morbidity: Example

- Incident cases between January 15, 2004 & May 6, 2004
- Point Prevalence January 15, 2004
- Point Prevalence May 6, 2004
- Period Prevalence between January 15, 2004 & May 6, 2004

Study Designs

- Experimental studies
- Observational studies
  - Analytic studies
  - Descriptive studies
  - Randomized Controlled trials
  - Case control
  - Cohort

In-class questions

During 1977, a total of 412 cases of a particular disease were reported in a city having a population of 212,000. What is the incidence rate per 100,000 population in that city during that year?

Two Broad Types of Epidemiology

**DESCRIPTIVE EPIDEMIOLOGY**
- Examining the distribution of a disease in a population, and observing the basic features of its distribution in terms of time, place, and person.
- Typical study design: community health survey (approximate synonyms - cross-sectional study, descriptive study)

**ANALYTIC EPIDEMIOLOGY**
- Testing a specific hypothesis about the relationship of a disease to a putative cause, by conducting an epidemiologic study that relates the exposure of interest to the disease of interest.
- Typical study designs: cohort, case-control
Case reports/ case series

- **Case reports**: documents unusual medical occurrences that can represent the first clues in the identification of new diseases or adverse effects of exposures.

- **Case series**: are collections of individual case reports.

---

Study Designs

- **Experimental studies**
- **Observational studies**
  - **Analytic studies**
  - **Descriptive studies**
- **Randomized Controlled trials**
- **Case control**
- **Cohort**
- **Case report/ case series**
  - **Correlational**
  - **Cross sectional**

---

**Case reports: Example 1**

The first pediatric case of acquired immunodeficiency syndrome (AIDS) observed in Switzerland is described. The 3-year-old African/Swiss patient was most probably vertically infected from her asymptomatic, HTLV-III antibody positive Zairian mother. Clinical symptomatology started at 14 months of age, and diagnosis was made at 22 months when medical care and comprehensive investigation were initiated at this clinic.

**Correlational Studies**

- Known as well as ecological studies.
  - Measures representing characteristics of entire population are related to factors of interest (example: age, utilization of health services, consumption of food, medication...)

---

Correlational Studies

- Units of analyses are usually populations or groups rather than individuals.
- Done quickly and inexpensively.

Correlational Studies: Limitations

- Seldom possible to evaluate causal relationships from observed association.
- Data on other factors (other than the one studying) may not be available. Inability to control for such variables.
- No individual link between exposure and effect since dealing with groups or populations.
Study Designs

- Experimental studies
- Observational studies
  - Analytic studies
  - Descriptive studies
- Randomized Controlled trials
- Case control
- Cohort
- Case report/case series
- Correlational
- Cross sectional

Cross Sectional Studies

- Exposure & outcome
- Exposure & no outcome
- No exposure & outcome
- No exposure & no outcome

Cross Sectional Studies

- Called also prevalence studies

- Exposure and disease are assessed simultaneously among individuals in a defined population.

Cross Sectional Studies

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>a</td>
</tr>
<tr>
<td>No</td>
<td>c</td>
</tr>
</tbody>
</table>

Prevalence rate of outcome in exposed \( (P_E) = \frac{a}{a+b} \)

Prevalence rate of outcome in non-exposed \( (P_Ē) = \frac{c}{c+d} \)

Prevalence Rate Ratio (PRR) = \( \frac{(P_E)}{(P_Ē)} = \frac{a}{a+b} \times \frac{c+d}{c} \)
Cross Sectional Studies: Example

Association between smoking and weight control measures (university students, at a specific time, specific place)

<table>
<thead>
<tr>
<th>Smoking</th>
<th>Weight control measures</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td>420</td>
<td>737</td>
<td>1157</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>176</td>
<td>642</td>
<td>818</td>
</tr>
</tbody>
</table>

Prevalence rate among exposed group = 420/1157 = 0.36
Prevalence rate among non-exposed group = 176/818 = 0.22
Prevalence rate ratio = 0.36/0.22 = 1.64

Cross Sectional Studies: example

Association between parity and physical activity among pregnant women presenting to a specific clinic – at one point in time

<table>
<thead>
<tr>
<th>Parity</th>
<th>Physical activity</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nulliparous</td>
<td></td>
<td>123</td>
<td>52</td>
<td>175</td>
</tr>
<tr>
<td>Multiparous</td>
<td></td>
<td>50</td>
<td>161</td>
<td>211</td>
</tr>
</tbody>
</table>

Prevalence rate among nulliparous = 123/175 = 0.70
Prevalence rate among multiparous = 50/211 = 0.24
Prevalence Rate Ratio = 0.70/0.24 = 2.9

Cross Sectional Studies: Example

Association between parity and physical activity among pregnant women presenting to a specific clinic – at one point in time

<table>
<thead>
<tr>
<th>Parity</th>
<th>Physical activity</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nulliparous</td>
<td></td>
<td>123</td>
<td>52</td>
<td>175</td>
</tr>
<tr>
<td>Multiparous</td>
<td></td>
<td>50</td>
<td>161</td>
<td>211</td>
</tr>
</tbody>
</table>

Prevalence rate among nulliparous = 123/175 = 0.70
Prevalence rate among multiparous = 50/211 = 0.24

Cross Sectional Studies

Advantages

- Short duration
- Low cost
**Reverse causality:** did the exposure precede the outcome?

- Physical Activity → CHD
- Osteoarthritis → PA
- Selective survival: only identify prevalent cases

**Selective survival:**

**Cross Sectional Studies**

**Disadvantages**

- Reverse causality: did the exposure precede the outcome?
- Selective survival: only identify prevalent cases

**Cross Sectional Studies: Abstract**

**OBJECTIVE:** A health survey of three villages in the vicinity of a pulp and paper mill along the Kampar river in the province of Riau, Indonesia was conducted to find whether exposure to the effluents from the mill was related to skin conditions and ill health.

**METHODS:** A cross sectional survey was carried out of children living in the three villages

What is the dependent variable(s)?

**Cross sectional Study**

**Hypothesis**

Is Hockey associated with Asthma?

???

**Cross Sectional Studies: Abstract**

**OBJECTIVE:** A health survey of three villages in the vicinity of a pulp and paper mill along the Kampar river in the province of Riau, Indonesia was conducted to find whether exposure to the effluents from the mill was related to skin conditions and ill health.

**METHODS:** A cross sectional survey was carried out of children living in the three villages

What is the independent variable(s)?

---

Results: However, there was an increased risk of diarrhoea in Sering especially with drinking water directly from the river (prevalence rate ratio (PRR) 4.9, 95% confidence interval (95% CI) 0.4 to 63.9). An increased risk was also found within the upstream village Rantau Baru (PRR 2.3, 95% CI 0.9 to 5.8) and downstream village Sering (PRR 1.4, 95% CI 0.4 to 5.2) when children who drank water directly from the river were compared with those who never did.