**Study Designs**

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

**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

**Descriptive Studies**

- **Objective**: Ask questions to generate hypotheses.
- **Provide data on**: Who? Where? When?
  - Person
  - Place
  - Time
Descriptive Studies

- Relatively inexpensive
- To evaluate trends and allow comparison among countries and subgroups within countries
- Provide basis for planning and evaluation
- Identify problems to be studied by analytic methods

Descriptive Studies

- **PERSON:** (Who gets the disease)
  - Demographic: example: sex, race, marital status...
  - Socioeconomic: occupation, education, employment...
  - Behavioral: smoking, alcohol, life style, drinking alcohol...

Descriptive Studies

- **PLACE:**
  - Is the disease confined to a certain geographical area?
  - Could geographical variations be explained by diet?
  - Could geographical variations be explained by climate?
  - Could geographical variations be explained by cultural factors?
  - Could geographical variations be explained by genetics?
**Descriptive Studies**

**TIME:**
- Do cases vary over time?
- Do cases vary at a certain time of the year?
- Are the cases related to a specific season?
  - Trends over time are affected by:
    - Changes in diagnostic techniques
    - Changes in accuracy of denominator
    - Changes in age distribution of population
    - Changes in survival from improved treatment
    - Actual change in incidence

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**Forecast of Cancer Deaths**

*Forecast of cancer deaths if present trends continue (Data from the American Cancer Society)*

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**Cancer Death Rates by Site, United States, 1930-87**

*Figure 5-1. Cancer death rates by site, United States, 1930-1987. Source: American Cancer Society (1991).*
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/ 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.

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.

**Case reports: Example 3**

A 56-year-old man with acute paralytic poliomyelitis is described. The illness started with fever and diarrhea after an overseas trip, and an enterovirus other than poliovirus was isolated from the patient's stool. The onset of weakness was rapid and asymmetric, with primary involvement of the lower extremities.

**Study Designs**

- **Experimental studies**
  - Randomized Controlled trials
  - Case control
  - Cohort

- **Observational studies**
  - Analytic studies
  - Descriptive studies
  - Case report/case series
  - Correlational
  - Cross sectional

**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.
**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>

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

Prevalence rate of outcome in exposed ($P_E$) = $a / a + b$

Prevalence rate of outcome in non-exposed ($P_{Ē}$) = $c / c + d$

Prevalence Rate Ratio (PRR) = $\frac{P_E}{P_{Ē}} = \frac{a}{a + b} \div \frac{c}{c + d}$

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**Cross Sectional Studies: Example**

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

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

Prevalence rate among exposed group = $\frac{420}{1157} = 0.36$

Prevalence rate among non-exposed group = $\frac{176}{818} = 0.22$

Prevalence rate ratio = $\frac{0.36}{0.22} = 1.64$

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**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>Physical activity</th>
<th>Parity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Nulliparous</td>
<td>123</td>
</tr>
<tr>
<td>Multiparous</td>
<td>50</td>
</tr>
</tbody>
</table>
### Cross Sectional Studies: example

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

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<td>123</td>
<td>52</td>
<td></td>
<td>175</td>
</tr>
<tr>
<td>Multiparous</td>
<td>50</td>
<td>161</td>
<td></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

**Advantages**
- Short duration
- Low cost

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

**Hypothesis**
Is Hockey associated with Asthma?

???
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.

RESULTS: Common skin conditions such as dermatitis, fungal infections, insect bites, and miliaria were found. No significantly increased risk of dermatitis or any illness in general was found with increasing levels of exposure to river water for downstream villages when compared with the upstream village.

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.