STUDY DESIGN Part I
(Cross-sectional, Cohort, Case-Control)

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Study Designs
Strength of Evidence

- Observational
- Correlational
- Quasi-Experiment
- True Experiment

Weaker
Stronger
Classification of Structures

- Observational/Correlational $\Rightarrow$ Cohort
  Cross-Sectional
- Quasi-Experiment $\Rightarrow$ Case-Control
  Multiple-Cohort
- True Experiment $\Rightarrow$ Clinical Trial
  Time-Series
  Cross-Over
Prevalence vs. Incidence

Prevalence =
\[
\frac{\text{Number who currently have characteristic}}{\text{Number currently at risk}}
\]

Incidence (1 year) =
\[
\frac{\text{Number who exhibit characteristic within 1 year}}{\text{Number at risk within 1 year}}
\]
Cross-Sectional Example (Observational)

In patients referred for antinuclear antibody testing, what is the prevalence of anti-ribonucleoprotein (anti-RNP)?

Cross-Sectional Example (Correlational)

Is self-efficacy associated with level of physical activity in persons with fibromyalgia?

Cross-Sectional Procedure

1. Select sample from population.
2. Measure all variables at the same time.
Cross-sectional
Strengths
Cross-sectional Strengths

- Short duration
- Relatively inexpensive
- Estimate prevalence
Cross-Sectional Weaknesses
Cross-Sectional Weaknesses

- No sequence to events
- Not feasible for rare events
- Cannot estimate incidence or relative risk
Cohort
Timing of Measurements

- Prospective – Measure variables currently and in the future
- Retrospective – Measure variables in the past up to current time
Prospective Cohort Example

In persons with rheumatoid arthritis, can total active joint count predict psychological disability 6 months later?

Prospective Cohort
Procedure

1. Select sample from population.
2. Measure predictor variables and confounding variables currently.
3. Measure outcome variables in the future.
Prospective Cohort
Strengths
Prospective Cohort
Strengths

- Sequence to events
- Estimate incidence and relative risk
- More control over selection of subjects
- More control over measurements
- Avoid bias in measuring predictor/confounding variables
Prospective Cohort
Weaknesses
Prospective Cohort

Weaknesses

- Large sample sizes needed
- Less feasible for rare outcomes
- More expensive
- Longer duration
Retrospective Cohort
Procedure

1. Identify sample.
2. Collect data on predictor variables and confounding variables from past.
3. Measure outcome variables currently (or more recently than predictor variables).
Retrospective Cohort
Strengths
Retrospective Cohort

Strengths

- Sequence to events
- Estimate incidence and relative risk
- Less expensive
- Shorter duration
Retrospective Cohort Weaknesses
Retrospective Cohort

Weaknesses

- Large sample sizes
- Less feasible for rare outcomes
- Less control over selection of subjects
- Less control over measurements
Multiple-Cohort Example

Following implementation of a workplace smoking ban, do employees have a higher rate of quitting smoking than employees of workplaces with no ban on smoking?

Multiple-Cohort Procedure

1. Select sample from each population. (Predictor variable is “cohort membership”.)
2. Measure outcome variable.
Multiple-Cohort
Strengths and Weaknesses

Unique Strengths:
- Feasible to study different or rare exposures.
- Cohort from census data is population-based and less expensive.

Unique Weaknesses:
- Confounding can be inflated.
Case-Control Example

Is conviction for a felony predictive of future traumatic brain injury?

Ref: Unpublished.
Case-Control Procedure

1. Select sample of cases.
2. Select sample of controls
   (Outcome variable is membership in either case or control sample.)
3. Measure predictor variables from past.
Case-Control
Selecting Controls

- Controls from same facility as cases.
- Matched controls.
- Population-based controls.
- Multiple control groups.
Case-Control
Strengths
Case-Control
Strengths

- Useful for rare conditions
- Short duration
- Less expensive
- Smaller sample size
- Estimate odds ratio (relative risk)
Case-Control Weaknesses
Case-Control
Weaknesses

- Bias and confounding
- No sequence of events
- Survivor bias
- Only one outcome variable
- Cannot estimate prevalence or incidence