

HSCC 470

Research Methods and Data Analysis in Health Sciences

Research Designs II: Experimental Designs

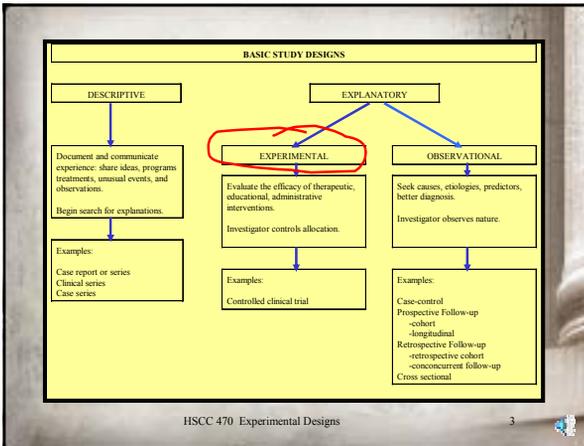
HSCC 470 Experimental Designs 1

Unit Objectives

Upon completion of this unit, the student will be able to:

- List and describe the determinants of causality.
- List and describe the components of an experimental research design.
- List and describe the procedures of control.
- Discuss the advantages and disadvantages of the following experimental designs:
 - Classical experiment
 - Solomon 4 group design
 - Post-test only control group
 - Experimental design for delayed effect
 - Factorial design

HSCC 470 Experimental Designs 2



Demonstration of causality

- Time order
- Covariation ($\Delta X = \Delta Y$)
- Non-spurious

Components of a research design

- Comparison
- Manipulation
- Control (internal validity)
 - Extrinsic factors
 - Intrinsic factors
- Generalizability (external validity)

Procedures of control

- Matching
- Randomization
 - Simple random samples
 - Systematic samples
 - Stratified samples
 - Cluster sampling
- Non-random samples
 - Convenience sample
 - Judgment sample
 - Quota samples
- Control group

Classic experimental design

| Group | Sampling | Pretest | Intervention | Post-test | Difference |
|--------------|----------|----------------|--------------|----------------|---------------------------------|
| Experimental | R | O ₁ | X | O ₂ | O ₂ - O ₁ |
| Control | R | O ₃ | | O ₄ | O ₄ - O ₃ |

- Controls for most threats to internal validity
- Weaker on external validity
- One of the strongest designs for inferring causal relationships
- Potential for reactive effects of pretest

Solomon 4-group design

| Group | Sampling | Pretest | Intervention | Post-test |
|----------------|----------|----------------|--------------|----------------|
| Experimental 1 | R | O ₁ | X | O ₂ |
| Control 1 | R | O ₃ | | O ₄ |
| Experimental 2 | R | | X | O ₅ |
| Control 2 | R | | | O ₆ |

- Same benefits and limitations of classic experiment
- Allows for measurement of pretesting effects
- Requires larger sample
- More costly
- Requires more statistical analysis

Post-test only control group design

| Group | Sampling | Intervention | Post-test |
|--------------|----------|--------------|----------------|
| Experimental | R | X | O ₁ |
| Control | R | | O ₂ |

- Eliminates possibility of pretest bias
- More Economical
- Weaker design for causality than classic experimental design
