Chapter 4
Research Design

What are the three general purposes of research?
- Although it is worthwhile to distinguish different purposes of research, keep in mind that most studies will have more than one purpose.
- Three general purposes:
  - Exploration - Explore and develop some initial rough understanding of some phenomenon.
  - Description - Precise measurement and reporting of the characteristics of some population or phenomenon under study.
  - Explanation - Discovery and reporting of relationships among different aspects of phenomenon under study.
- Answers the question of “why”.

What are the three criteria for nomothetic causality?
- Variables must be correlated.
  - Example: Education level of parents are found to be correlated to education level of their children.
- Cause takes place before the effect.
  - Example: Education level of parents usually is determined BEFORE the education level of their children. Thus the education level of parents is likely to be the cause in this relationship.
- Effect cannot be explained in terms of a third variable (nonspurious).
  - Example: A spurious relationship: Ice cream sales are positively correlated with number of people shown at the beach. And ice cream eating happens before the drowning. But is eating ice cream causing people to drown? No, because there is a third factor: hot weather. Hot weather cause ice cream consumption to go up, and number of people swimming to go up at the same time. Hot weather, in this case, has caused a spurious relationship between ice cream consumption and number of people drown.

Chapter Outline
- Three purposes of research
  - Exploration
  - Description
  - Explanation
- The logic of nomothetic explanation
  - Criteria for nomothetic causality
  - False criteria for nomothetic causality
- Necessary and sufficient causes
- Units of analysis
  - Individuals
  - Groups
  - Organizations
  - Social artifacts
  - Faulty reasoning about units of analysis - ecological fallacy and reductionism
- The time dimension
  - Cross-sectional studies
  - Longitudinal studies
  - Approximating longitudinal studies
- Elements of a research proposal

What are the two models of explanation again?
- Idiographic - aims at a complete understanding of a particular phenomena.
  - Example: Finding out what the Smith family plans on filing for personal bankruptcy. There can be 20 different reasons leading to that decision.
- Nomothetic - aims at a general understanding of a class of phenomena.
  - Example: Finding out the top 5 reasons why people file for personal bankruptcy.

What are necessary and sufficient causes?
- Necessary cause represents a condition that must be present for the effect to follow.
  - Rule: A must be true for B to be true. Thus A is a necessary cause for B.
  - Example: Being pregnant is a necessary cause for giving birth to a child.
- Sufficient cause represents a condition that if present, guarantees the effect in question.
  - Rule: If A is true, B must be true. Thus B is a sufficient cause for A.
  - Example: Not taking the final exam (thus getting 0 point on the final) is a sufficient cause for failing this class.
- Causes that are necessary and sufficient are the most satisfying outcome in research. However, in social science research, these cut and dry causal relationships are rare.
What are units of analysis?

- Units of analysis refers to what or whom to study
- Four types of units of analysis
  - Individuals
    - Examples: students, voters, female faculty members at the U.
  - Groups
    - Examples: families, communities
  - Social organizations
    - Examples: corporations, companies, grocery stores
  - Social artifacts: products or social beings or their behavior
    - Examples: newspaper, buildings, cars

What are time dimensions?

- There are two major types of time dimensions: cross-sectional vs. longitudinal
  - Cross-Sectional Studies - studies using data at a given time
  - Longitudinal Studies - designed to permit observations over an extended period of time. There are three kinds of longitudinal studies.
    - Trend: Changes in some general groups over time
      - Example: US census is done every 10 years. If one combines 1970, 1980, 1990, and 2000 census data, one can study, for example, the population growth over time.
    - Cohort: Changes of specific subgroup, typically, an age group
      - Example: baby-boomers, Generation X, those born during WWII
    - Panel: The same set of people are studied over time
      - Example: I interview a group of people in 1998. Then I interview the same people again in 2000, then again in 2002.

What are the mistakes related to units of analysis?

- The ecological fallacy - The danger of making assertions about individuals when the unit of analysis is a group
  - Example: A researcher finds that crime rates were higher in cities with large black populations than those with fewer blacks. Thus this researcher draws a conclusion that black people are more likely to commit crime than whites. The mistake here is that the unit of analysis is “city”, not “individuals”. Thus it is possible that it’s the white people living in the cities with high black population committing crimes. We just don’t know. To reach a conclusion like this is ecological fallacy.
- Reductionism - Overly restrictive as to what kind of concepts and variables can be used for explanation
  - Example: In explaining juvenile delinquency, a researcher only considers individual factors (individual level), but not social factors (peer group, social system, etc.).

What are the advantages and disadvantages of cross-sectional vs. longitudinal studies?

- Longitudinal studies have advantages over cross-sectional studies in terms of
  - The amount of information contained
  - The time order clearly established
- Longitudinal studies have disadvantages over cross-sectional studies in terms of
  - Much higher costs
  - Panel attrition: losing subjects over time and causing statistical biases
- Because longitudinal studies have more information, researchers sometimes approximate longitudinal studies with cross-sectional studies by
  - Asking people about their past (such as work history) in cross-sectional studies
  - Examining different age groups in cross-sectional studies. This is done assuming when the younger people grow up, they will behave like the older people in the sample.

An illustration of time dimensions

<table>
<thead>
<tr>
<th>Year of Birth</th>
<th>Year of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>A-10</td>
</tr>
<tr>
<td>1990</td>
<td>B-20</td>
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<tr>
<td>2010</td>
<td>F-40</td>
</tr>
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<td>2020</td>
<td>G-50</td>
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<tr>
<td>2030</td>
<td>H-60</td>
</tr>
<tr>
<td>2040</td>
<td>I-70</td>
</tr>
</tbody>
</table>

- If one conducts a study of
  - C-F-I, meaning that in 1990, one collects data on individuals born in the 60s, 50s, and 40s, the study is cross-sectional.
  - A-B-C with different subjects, the study is longitudinal cohort
  - A-B-C with the same subjects, the study is longitudinal panel
  - A through I with all subjects, the study is longitudinal trend

Think about this …

- Cross-sectional studies indicate that IQ declines with age. Longitudinal studies claim that there is either no decline or less of a decline with age than cross-sectional studies indicate. Why this difference?
What are the elements of a research proposal?

- Problem or objective (purpose)
- Literature review (what has been done on this topic)
- Subjects for study (units of analysis)
- Measurement (conceptualization+operationalization)
- Data-collection methods (sample, mode of observation)
- Analysis (statistics or qualitative methods)
- Schedule
- Budget

How to apply this to real research?

- Units of analysis
  - Article by Medina et al: individuals as units of analysis
  - Article by Parcel et al: group (families) as units of analysis
- Time dimension
  - Article by Medina et al: cross-sectional
  - Article by Parcel et al: longitudinal panel

Additional things to do

- Read two research articles: (1) Gonzales and Meyers (1993) and (2) Parcel, Nickoll & Dufur (1996). Please note again that you are not expected to understand everything in these two articles. However, please pay attention to the issue of research design, units of analysis, and time dimension.