Chapter 4: Conceptualization and Measurement

Roger Williams University
Professor Sean Varano
• Understand the relationship between theory, concepts and variables
• Analyze the concept of “operationalization” and how it impacts the research process
• Compare/contrast different levels of measurement
• Understand how issues of measurement validity and reliability impact research design.
Measurement in Social Sciences

Significance of Measurement

• Measurement lies at the heart of research methods
• Measurement is far from straightforward
• Measurement Challenges
  – Defining what it is we are measuring
  – Measuring the degrees of a problem (e.g., crime)
  – Knowing what we are “looking” for in order to measure something
  – Identifying data sources

Example

• You are charged with measuring the prevalence of drug crime in Providence
  – How would we define drug crime?
  – What types of behaviors would constitute illegal drug behavior?
  – What data sources would be used to measure these problems?
• Is giving your friend one of your pills the same as selling drugs on a street corner?
Concepts

• Concept - a mental image that summarizes a set of similar observations, feelings, or ideas

• Conceptualization - the process of specifying what we mean by a term
  – Deductive research - translates portions of an abstract theory into specific variables that can be used in testable hypotheses
  – Inductive research - important part of the process used to make sense of related observations
Concepts and Variables

• Theory is composed of *expected* relationships among *concepts*
• Many concepts are used without consistent definition
• Definitions are not agreed upon by everyone
• Meanings of concepts may change over time
• Before we start research, we *must* establish the meaning of our measures
  – How?
  – The role of prior research
• *Variables* are the *measurable counterparts* to concepts
Operationalization

- The process of specifying the operations (measures) that will indicate the value of a variable for each case
  - Process of connecting concepts to empirical observations
  - Specify what we mean by a term
  - We identify specific variables and indicators that reflect our operational definition of a term
- Options for operationalizing concepts (sources of data):
  - Using available data
  - Constructing questions
  - Making observations
  - Collecting unobtrusive measures
- Concepts can be more clearly defined with operationalized using multiple methods (triangulation)
- We have options about how we operationalize variables. How would we measure income?
Levels of Measurement

• When defining measures, **level of measurement** is one of the most important decisions.

• Level of measurement is the level of mathematical **precision** with which the values of a variable can be expressed:
  - nominal, which is qualitative, has no mathematical interpretation.
  - quantitative levels — ordinal, interval, and ratio — are progressively more precise mathematically.
Important Terminology

- **Variables** are measurable form of concepts (e.g., criminal record)
- We must identify *indicators* of variables
  - “Have you ever been arrested?”
- Indicators are composed of different **attributes**
  - If ever arrested, identify type of crime most recent: (1) *property crime*; (2) *personal crime*; (3) *drug crime*; (4) *other*

Qualities of Attributes

- **Mutually Exclusive**
  - Measure can be identified by one and only one attribute
  - No overlap between attributes/categories
- **Exhaustive**
  - All possible measures must be included in the attributes
Levels of Measurement

Nominal Level

- Often referred to as “categorical” data
- Variables whose values have no mathematical interpretation
  - Discrete categories
  - Vary in kind or quality but not in amount (e.g., gender)
- Example: Gender
  - How would you describe your gender?
    - (1) Male; (2) Female

Ordinal Level

- At this level, you specify only the order of the cases; Rank order
- We can know that one category in an ordinal measure is higher or lower than another, but we cannot know how much larger/smaller one is from another.

1= Strongly agree
2= Agree
3= No opinion
4= Disagree
5= Strongly Disagree
Levels of Measurement

Interval Level

• Numbers represent fixed measurement units but have no absolute zero point
  – Example: Concept = Socio-Economic Status
  – Variable: Household annual income
  – Attributes
    1 = <$25,000
    2 = $25,001 to $34,999
    3 = $35,000 - $49,999
    4 = $50,001 - $64,999
    5 = $65,000 +

Ratio Level

• Fixed measuring units with an absolute zero point.
  – Zero = absolutely no amount of whatever the variable indicates
  – Ratios can be formed between the numbers
  – Example: How many times have you been arrested?
Selecting the Level of Measurement

• It is possible to measure most concepts at more than one level of measurement
  – Hierarchy:
    • All concepts that can be measured at the ratio level can also be measured at interval, ordinal, and nominal
    • BUT it cannot necessarily go the other direction
• General rule of thumb:
  – A researcher should choose the highest level of measurement possible
• Serious attention should be given to level of measurement – has big implications
Overview

- How would we measure “problem-drinking?”
- Data/research is only has the quality of the measured used to represent complex ideas
- Critical Questions?
  - Are we measuring what we really think we are measuring?
  - Are we measuring it correctly?

Validity

- Measurement validity – asks “are we measuring what we think we are measuring?”
- Four Different Approaches
  - Face Validity
  - Content Validity
  - Criterion Validity
  - Construct Validity
Face Validity

- We can say that a measure is *face valid* if it appears to measure the concept of interest, that is, if it obviously pertains to the meaning of the concept of interest.
  - For example, a count of the number of drinks people had consumed in the past week would be a face valid measure of their alcohol consumption.
  - ... but people who drink heavily tend to underreport the amount they drink
A measure has content validity if it covers the **full range** of the concept’s meaning. Counting how often someone drank beer or wine would not be a content valid measure of alcohol consumption because it doesn't include the full range of alcoholic beverages.
Reliability

- Reliability is achieved when a measure yields consistent scores or observations on different occasions
- **Methods for assessing reliability**
  - Test-retest – measure obtains same results at two different times
  - Interobserver – use more than one observer to measure same thing
  - Interitem (Internal consistency) – use multiple items to measure single concept
  - Alternate forms – compare slightly different versions of measures
• Measurement lies at the heart of research
• As researchers, we must focus attention to what might seem like unimportant details
  – Levels of measurement
• Focused attention to the “quality” of measures will result in higher quality research