Introduction to Social Science Methods: An Overview of Quantitative and Qualitative Methods

D-Lab
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Introduction to Social Science Methods: An Overview of Qualitative and Quantitative Methods

- Part I: Research Design
- Part II: Quantitative Research
- Part III: Qualitative Research
Research Design

- Identify the problem to be studied
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  - Transform problem into a testable hypothesis/hypotheses
  - An idea that will be tested through systematic investigation
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- Collect data
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- Collect data

- Analyze data

- Interpret results
Research Design

- Unit of analysis/observation
  - Individuals or aggregates
    - Groups, institutions, organizations
Research Design

- Unit of analysis/observation
  - Individuals or aggregates
    - Groups, institutions, organizations

- Primary v. secondary data
Research Design

- Unit of analysis/observation
  - Individuals or aggregates
    - Groups, institutions, organizations

- Primary v. secondary data
  - Will you be collecting your own data or using preexisting data?
    - Often easier to use secondary data:
      - International data
      - Can’t get a large enough sample size
      - Can’t get nationally representative sample
      - Time constraints
Methods

- Depending on:
  - Type of data you want/need
  - Sample size
  - Access
  - Location
  - Time
  - Resources
Methods

- Depending on:
  - **Type of data you want/need**
    - Cross-sectional, longitudinal
    - Quantitative or qualitative
  - Sample size
  - Access
  - Location
  - Time
  - Resources
Methods

- Depending on:
  - Type of data you want/need
  - Sample size
    - Generalizability
    - Small- or large-N
  - Access
  - Location
  - Time
  - Resources
Methods

- Depending on:
  - Type of data you want/need
  - Sample size
  - **Access**
    - Is it a protected population? (e.g. minors/students)
    - Can you gain access?
    - Human subjects
  - Location
  - Time
  - Resources
Methods

- Depending on:
  - Type of data you want/need
  - Sample size
  - Access
  - **Location**
    - local, state, national, international
  - Time
  - Resources
Methods

- Depending on:
  - Type of data you want/need
  - Sample size
  - Access
  - Location
  - **Time**
    - Timeline for data collection
  - Resources
Methods

- Depending on:
  - Type of data you want/need
  - Sample size
  - Access
  - Location
  - Time

- Resources
  - Are you conducting the research alone? (do you have RAs)
  - Cost of instrument design
  - Cost of data collection
  - Cost of analysis
Quantitative Research

- Systematic empirical investigation of observable phenomena using statistical (computational) techniques

- Aims at causal explanation - answering “Why”

- Numeric analysis and measurement are the key parts of quantitative research that state the fundamental connection between observation and analytic statement(s)

- Quantitative methods are mostly used to justify the hypotheses and draw a general conclusion on selected hypotheses

- Statistics, tables and graphs, are often used to present the results of these methods.
Quantitative Research

- Based on the idea that aspects of environment can be quantified, measured and expressed numerically.

- The information about a phenomenon of environment is expressed in numeric terms that can be analysed by statistical and spatial methods.

- The observations can be directly numeric information or can be classified into numeric variables.
Quantitative Research

- Systematic empirical investigation of observable phenomena using statistical (computational) techniques

- Aims at causal explanation
  - Primarily answering “Why”

- Characteristics of quant research
  - Scientific
  - Positivist
  - Objective
  - Experimental
  - Macros (events/processes/relations)
  - Deductive
  - Hard/factual
  - Representative/generalizable
  - Apolitical
  - Realist
<table>
<thead>
<tr>
<th>Designs &amp; Techniques</th>
<th>Methods</th>
<th>Details</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experimental Designs</strong></td>
<td>Lab Experiment</td>
<td>Applying scientific method to experimentally examine an intervention in a controlled setting</td>
<td>2 or more groups</td>
</tr>
<tr>
<td></td>
<td>Field Experiment</td>
<td>Applying the scientific method to experimentally examine an intervention in a real world setting</td>
<td>2 or more groups</td>
</tr>
<tr>
<td></td>
<td>Quasi-Experimental</td>
<td>Selecting a group to test a variable w. out random pre-selection processes</td>
<td>2 or more groups</td>
</tr>
<tr>
<td><strong>Descriptive Designs</strong></td>
<td>Survey/Questionnaire</td>
<td>Series of ques &amp; other prompts to gather info from respondents</td>
<td>Large (most often), representative, often random sample</td>
</tr>
<tr>
<td></td>
<td>Meta-Analysis</td>
<td>Statistical method for combining the results from a set of studies that address related hypotheses</td>
<td>2 or more pre-existing studies</td>
</tr>
<tr>
<td></td>
<td>Case Study</td>
<td>In-depth investigation of an individual, group or event</td>
<td>At least 1 individual, group or event</td>
</tr>
<tr>
<td></td>
<td>Applied Behavioral Analysis</td>
<td>An examination of individual responses to an intervention(s)</td>
<td>At least 1 individual</td>
</tr>
<tr>
<td><strong>Longitudinal</strong></td>
<td>Experiments, surveys, case-study, applied-behavioral analysis</td>
<td>Applying a specific method &amp; corresponding instruments to a sample over time</td>
<td>Individuals, groups or institutions over time (may be the same or similar)</td>
</tr>
<tr>
<td><strong>Pre-Test Designs</strong></td>
<td>Pilot Study</td>
<td>Small scale preliminary study conducted before main research to check feasibility of research design, time line, instruments, etc … &amp; make necessary changes</td>
<td>Small group who can inform/comment on research design</td>
</tr>
<tr>
<td></td>
<td>Usability Testing</td>
<td>Evaluating a product (i.e. instrument) by testing it on a sample of potential uses</td>
<td>Small group who can inform/comment on validity and reliability of instrument</td>
</tr>
</tbody>
</table>
EXPERIMENTAL DESIGNS
Experimental Research

- Compare two or more groups that are similar except for one factor or variable
- Can occur in lab or field (natural setting)
- Conditions can be highly controlled; variables can be manipulated by the researcher
- Tend to use randomized samples
- 2 groups – treatment & control
How does a factor influence the behavior of an individual or a group?

- **Lab experiments**
  - Require lab settings
  - Controlled environment
  - Results highly reliable
  - Develop cause & effect relationships
  - Can only use small samples – often too costly for large-N
  - Can only study snapshot of present (not past)

- **Field experiments**
  - Occur in naturally occurring environments
  - Examining an intervention in the real world
  - Subjects don’t always know they are involved in experiment
  - Seen as having higher degree of external validity since occur in real world
Experiments - Examples

- Lab
  - Milgram exp
  - Zimbardo Prison exp

- Field
  - Drug/pharmaceutical trials
  - Poyner on reducing theft in public spaces
DESCRIPTIVE DESIGNS
DEScriptive DESigns
SURVEYS
Survey Research

- Use set of predetermined, standardized, questions
- Collect answers from representative sample
- Answers are categorized and analyzed so tendencies can be discerned
Quant Research - Survey

- Used to assess thoughts, opinions, feelings, habits, activity logs

- Primary v. secondary data
  - Developing survey instruments to conduct primary data can be difficult – may require piloting questionnaire
  - Order of the questions is v. important
  - Often easier to use secondary survey data or instruments
    - Instruments have been proven reliable

- Can be issues or reliability & validity relating to self-reports
  - Response bias
  - Can be checked/corrected by test-retest of questions and standardization procedures
Survey - Examples

- General Social Survey
- US Census

The GSS Data Explorer
A New Gateway to Data from the General Social Survey
DESCRIPTIVE DESIGNS
META-ANALYSIS
Meta-Analysis

- Numerous experimental studies with reported statistical analysis are compared
- Distinguishes trends
- Effect size (the influence of the independent variable on the dependent variable) can be compared
- Similar studies can yield a common truth
- Conducting research about previous research
Quant Research – Meta-Analysis

- Using a statistical approach to combine the results from multiple studies in an effort to increase power (vs. individual studies)
- Improves estimates of effect size
- Can also resolve uncertainty when reports disagree
- Can only be used if a common statistical measure is included across studies
- Results generalizable to larger population
- Precision & accuracy of estimates can be improved as you add more data
- Hypothesis testing can be applied to summary estimates
- Does not predict the results of a single, larger study
- Can’t control for sources of bias – a meta-analysis of badly designed studies will produce bad statistics
Meta-Analysis - Examples

Meta-Analysis

Study 1  Study 2  Study 3  Study 4

Overall Effect Size
Meta-Analysis - Examples

**Keyword Search**

- 1,570 publications identified by original keyword search
  - 22 publications tentatively met study inclusion criteria
    - 8 excluded, 14 coded

**Hand Search**

- About 15,000 titles identified in bibliographies of coded publications
  - 254 publications tentatively met study inclusion criteria
    - 145 excluded, 109 coded

- 22,115 titles citing an eligible publication
  - 473 publications tentatively met study inclusion criteria
    - 256 excluded, 211 coded

Total pool of 334 publications for meta-analyses of stressful life events and all-cause mortality

- 95 publications included in meta-analysis of singlehood and mortality
- 74 publications included in meta-analysis of group participation and mortality
- 262 publications included in meta-analysis of network size and mortality
- 103 publications included in meta-analysis of social contact and mortality
- 50 publications included in meta-analysis of emotional support and mortality
DESCRIPTIVE DESIGNS
CASE STUDIES
Quant Research - Case Study

- Also called single case design
- Describes numerically a specific case (can be organization, group, event, action or individual)
- May test or generate hypotheses
- Results often presented with tables and graphs
Quant Research – Case Study

- Up-close, detailed examination of a subject & related contextual conditions
  - an empirical inquiry that investigates a phenomenon within its real world contexts

- Holistic approach

- Not to be confused w. qualitative research – can be a mix of quantitative and qualitative data

- No random sample – information oriented sampling
  - Outlier cases may reveal more than a representative case

- 3 types of cases:
  - explanatory
  - exploratory
  - Multiple-case study
  - Intrinsic
  - Instrumental
  - collective
## Case Study - Examples

<table>
<thead>
<tr>
<th>Case study type</th>
<th>Details</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanatory</td>
<td>Seeking an answer to a question on the causal links in real life interventions that may be too complex for survey or experimental strategies</td>
<td>Analyzing a web-based e-commerce site in Colombia</td>
</tr>
<tr>
<td>Exploratory</td>
<td>Explore situations when intervention has no clear, single set of outcomes</td>
<td>An observational study of the development and implementation of a teacher-student relationship</td>
</tr>
<tr>
<td>Multiple-case</td>
<td>Explore differences btwn &amp; within cases – goal is to replicate findings across cases</td>
<td>Applying the multiple case study method to different social services available to violent crime victims</td>
</tr>
<tr>
<td>Intrinsic</td>
<td>When intent is to better understand the case, it’s particularities and ordinariness</td>
<td>An examination of how Alzheimer’s effects couplehood/couples</td>
</tr>
<tr>
<td>Instrumental</td>
<td>Provides insight into an issue or helps to refine a theory – the actual case is of secondary interest (unlike intrinsic)</td>
<td>Examining the components of individual behavior that indicate the potential for domestic violence</td>
</tr>
<tr>
<td>Collected</td>
<td>Similar to multiple-case</td>
<td>A collective case study of stress among HS math teachers</td>
</tr>
</tbody>
</table>
DESCRIPTIVE DESIGNS
APPLIED BEHAVIORAL ANALYSIS
Quant Research - Applied Behavior Analysis

- Developing and analyzing procedures that produce effective and beneficial changes in behavior
- Examine the individual’s responses in different situations (conditions) across time
- Usually conducted in experimental form
- Also known as behavior modification
Quant Research – Applied Behavioral Analysis

- All studies require:
  - At least 1 participant
  - At least 1 behavior (dependent variable)
  - At least 1 setting
  - A system for measuring the behavior
  - At least 1 treatment/intervention
  - Manipulations of the independent variable so that its effects on the dependent variable may be analyzed
  - A beneficial intervention (for the participant)

- Usually small-N studies

- Require manipulation and control of method
Applied Behavior Analysis - Example

- **Testing interventions for autistic students**

<table>
<thead>
<tr>
<th>Structured Teaching Techniques (DTT = Discrete Trial Teaching)</th>
<th>Naturalistic Teaching Techniques (PRT = Pivotal Response Treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teaching motor imitation:</strong></td>
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</tr>
<tr>
<td>Prompt imitation of actions (e.g. clap hands)</td>
<td>A child likes cars. Prompt imitation of actions using preferred toy (e.g. drive car)</td>
</tr>
<tr>
<td>reinforce correct response with edible or preferred toy</td>
<td>reinforce correct response with car toy</td>
</tr>
<tr>
<td><strong>Teaching identification of colours:</strong></td>
<td><strong>Teaching identification of colours:</strong></td>
</tr>
<tr>
<td>Using shapes in different colours</td>
<td>A child likes manipulating play-dough</td>
</tr>
<tr>
<td>reinforce correct colour with edible or preferred toy</td>
<td>Use play-dough with different colour pieces</td>
</tr>
<tr>
<td></td>
<td>reinforce correct colour by offering the playdough of the colour identified</td>
</tr>
<tr>
<td><strong>Teaching identification of familiar people:</strong></td>
<td><strong>Teaching identification of familiar people:</strong></td>
</tr>
<tr>
<td>Using flashcards with photos of familiar people</td>
<td>Play with familiar people</td>
</tr>
<tr>
<td>reinforce correct name with edible or preferred toy</td>
<td>reinforce correct name with tickles or cuddles from that person</td>
</tr>
</tbody>
</table>
LONGITUDINAL DESIGNS
Quant Research - Longitudinal

- Individual or group research conducted across time, often decades
- Cohort Study: data is gathered from the same subjects repeatedly, over time
- Panel study: data is gathered from similar subjects, over time
- May be conducted using other methods (surveys, case studies)
- Studying developmental trends, the lifespan
Subject attrition is major problem
  “missing data”
  Replacing with participants w. similar characteristics

Preserving confidentiality is also difficult

Specific standardized tools may change over time

Mostly observational – observe the state of things w.out manipulation → may have less causal power than experiments

**BUT** the inclusion of repeated observations at the individual level → more power than cross-sectional observational studies

Exclude time invariant unobserved differences

Include temporally ordered events

Allow researchers to distinguish short v. long term phenomena
Longitudinal - Example

- Survey Data
  - National Longitudinal Survey of Youth (ages 12-16 in 1997)

- Case Study
  - “UP” – British documentary of 14 British children starting in 1964
Quant Methods - Instruments

- Online
  - Survey Monkey
  - Zoomerang
  - Poll Daddy
    - Additional online survey instruments

- Printed images, paper/pencil

- Electronic devices: Smart phones, ipads, bio-physio readers, computers
Measurement Criteria

- **Objectivity** - researchers stand outside the phenomena they study. Data collected are free from bias.

- **Accuracy** – Are the methods adequate to answer your questions; reveal credible information; convey important information?

- **Precision** – How trustable are the measure; how confident is the result?

  - Pilot testing & Usability testing
Measurement Criteria

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- Reliability - if something was measured again using the same instrument, would it produce the same or nearly the same results?
  - Yielding consistent results over time or under similar conditions
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- **Validity** – do the measures reflect all the facets you are attempting to study?
Content Validity

- The extent to which the items on a testing tool (that being used to measure the dependent variable) reflect all of the facets being studied
- All aspects are sampled (e.g. aural skills final exam)
Criterion-Related Validity

- Also called predictive validity
- The extent to which a testing tool yields data that allow the researcher to make accurate predictions about the dependent variable
Construct Validity

- The extent to which the testing tool measures what it is supposed to measure

- Relationship between the items on the tool and the dependent variable

- Also relates to actual (physical) construction of a written tool (e.g. Dean’s Survey) and how this impacts the accuracy of the results
Internal Validity

- Relates to the internal aspects of a study and their effect on the outcome:
  - Researcher planning and preparation
  - Judgment – participants should feel free of judgement
  - Control for potential confounding variables
External Validity

- Relates to the extent to which findings can generalize beyond the actual study participants

- “How valid are these results for a different group of people, a different setting, or other conditions of testing, etc.?”
+ Quantitative Research

- Summarizing data
  - variables; simple statistics; effect statistics and statistical models; complex models
Quantitative Research

- Summarizing data
  - variables; simple statistics; effect statistics and statistical models; complex models

- Generalizing from sample to population
  - precision of estimate, confidence limits, statistical significance, p value, errors
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- Data are a set of values of one or more variables
Quantitative Research

- Summarizing data
  - variables; simple statistics; effect statistics and statistical models; complex models

- Generalizing from sample to population
  - precision of estimate, confidence limits, statistical significance, p value, errors

- Data are a set of values of one or more variables
  - A variable is something that has different values.
  - Values can be numbers or names, depending on the variable:
    - Numeric – year of birth
    - Counting - number of natural disasters
    - Ordinal – highest level of education (values are numbers or names/labels)
    - Nominal – gender (values are names/labels)
Independent Variable

- The variable that is controlled or manipulated by the researcher
- The variable that is thought to have some effect upon the dependent variable
- The one difference between the treatment (experimental) and control groups
Dependent Variable

- That which is measured
- The outcome
- That which is influenced or affected by the dependent variable
## Quantitative Research

<table>
<thead>
<tr>
<th>Y (dep variable)</th>
<th>X (ind variable)</th>
<th>Model/Test</th>
<th>Effect statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numeric</td>
<td>Numeric</td>
<td>Regression</td>
<td>Slope, intercept, correlation</td>
</tr>
<tr>
<td>Numeric</td>
<td>Nominal</td>
<td>T-test, ANOVA</td>
<td>Mean difference</td>
</tr>
<tr>
<td>Nominal</td>
<td>Nominal</td>
<td>Chi-square</td>
<td>Frequency difference or ratio</td>
</tr>
<tr>
<td>Nominal</td>
<td>Numeric</td>
<td>Categorical</td>
<td>Frequency ratio per ...</td>
</tr>
</tbody>
</table>
Analysis Programs

- Software (all except SAS available on D-Lab machines)
  - Stata
  - SPSS
  - SAS
  - R
  - Python
  - GIS
  - Excel
Pros of Quantitative Research?

- Clear interpretations
- Make sense of and organize perceptions
- Careful scrutiny (logical, sequential, controlled)
- Reduce researcher bias
- Results may be understood by individuals in other disciplines
Cons of Quantitative Research?

- Can not assist in understanding issues in which basic variables have not been identified or clarified

- Only 1 or 2 questions can be studied at a time, rather than the whole of an event or experience

- Complex issues (emotional response, personal values, etc.) can not always be reduced to numbers

- Difficulties in distinguishing opinions and facts from surveys

- Results from surveys sometime have serious limitations

- People’s perceptions and scientific observation may contradict
Quantitative vs. Qualitative

- There is/shouldn’t be a rivalry between quantitative and qualitative methods
  - Each can be used to confirm the other

- Quantitative data and findings have underlying qualitative dimension
  - Qualitative data can also add description, detail and texture to quantitative data

- Quite often availability of data and its characteristics determine the method and what is possible – not a preference for one over the other
Quantitative vs. Qualitative

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- Both quantitative and qualitative research can aim at description of built environment

- Complementary - not contradictory
  - different kinds of research questions and objects of research
  - different perspectives on the same research objects / questions (methodological triangulation)
Best Practices – Sample Size

- Sample size
  - Data collection – a large enough sample so that missing data won’t become an issue
  - Sample size calculator - how to generalize to population
Best Practices – Things to Consider

- Time constraints
  - Choose the method that best suits your research time
    - 1 year is not enough for a longitudinal study

- Resource constraints
  - Choose the method that best suits your budget and resources available
    - If you don’t have access to a lab, a lab experiment is unrealistic

- Access
  - Do you have access to a generalizable sample?
Best Practices

- Ethics
  - Maintaining respect for participants
  - Can participants opt out at any point?
  - Balancing benefit & harm
    - Will participation cause harm?
    - Does the potential benefit outweigh any potential harm (psychological effects, stress, anxiety, time)
  - Will the method allow protection of anonymity?
    - Anonymity – pseudonyming is key!!
  - How involved will the researcher be – will he/she bias results?
Thank You!

References/Resources
- *The Practice of Social Research* – Earl Babbie
- *Statistical Methods for the Social Sciences* – Agresti & Finlay
- Sage Research Methods - [http://srmo.sagepub.com/](http://srmo.sagepub.com/)
- Ethics: [Guidelines for Research Ethics](#)
- Best Practices: [NIH Office of Behavioral and Social Sciences Research](#)
- Statistics – [www.ats.ucla.edu](http://www.ats.ucla.edu)
- Workshops & consulting – [www.dlab.berkeley.edu](http://www.dlab.berkeley.edu)

If you have any further questions or comments, please feel free to email me, nbroege@berkeley.edu