QUANTITATIVE DESIGN AND ANALYSIS

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QUANTITATIVE METHODS OVERVIEW

- Quantitative methods are those which generate numerical data
- Quantitative analysis involves using statistics to improve numerical data
- Like all data collection and analysis, choice of quantitative method should be driven by a question

SOURCES OF QUANTITATIVE DATA

- Existing institutional data
- Survey methods – ex: Questionnaires
- Numerical data from observations – counts and tallies
- Scoring of rubrics and portfolios

DESCRIPTIVE STATISTICS

- Central tendency (i.e. mean, median, mode)
  - What is the average response?
- Variability/Dispersion (i.e. range and standard deviation)
  - How consistent or spread out were scores/responses?
- Distribution
  - How many responses were there in each category?
  - Frequencies – show the count and proportion (%) of cases in each category of a variable
  - Crosstabs – a combination of two or more frequency tables – shows the count and proportion of cases for each combination of responses

CORRELATIONAL STATISTICS

- Measures of relationships between variables
- Correlation coefficient – measure of the relationship between two variables
- Multiple regression – shows degree to which multiple measures (independent variables) "predict" change in an outcome (dependent variable)

INFERENTIAL STATISTICS

- Used to compare groups and to generalize from the sample to the population
- Often referred to as tests of "statistical significance"
  - Statistical significance is the measure of confidence you can have that the differences in the groups were not due to chance. Represented by a p-value ($p<.05$ is the most commonly used)
- Chi-square test – used to analyze data reported in categories, test is interested in seeing if two or more groups differ with respect to nominal variables (i.e. whether the relationship between gender and kind of disability is statistically significant)
- T-test – test used to see whether a difference between the means of two samples is significant
- ANOVA (analysis of variance) – technique which helps researchers discover if there is a significant difference between the means of more than two groups

VARIABLE RELATIONSHIPS

- CROSSTAB: If I know which category you are in on X (e.g. are you female or male) can I predict which category you are probably in on Y (e.g. are you short or tall).

- *ANOVA: If I know which category you are in on X (e.g. are you female or male) can I predict your score on Y (what is your actual height—in this case, the researcher uses the mean height for females and males in making that guess).

- *REGRESSION: If I know your score on X (e.g. number of years of education) can I predict your score on Y (e.g. annual household income).

TYPES OF SAMPLING

- *Simple random sampling*: one in which each and every member of a population has an equal chance of being selected for the study (larger the sample is in size, more likely it will represent the population)
- *Stratified random sampling*: process where certain subgroups (strata) are selected for the sample in the same proportion as they exist in the population (increases the likelihood of representativeness but requires great effort by researcher)
- *Cluster sampling*: the selection o groups (clusters) of subjects rather than individuals (advantage is that it can be used when it is difficult to select a random sample of individuals but there is a far greater chance of selecting a sample that is not representative of the population)
- *Systematic sampling*: process where every nth individual in the population list is selected for inclusion in the sample (is a form of non-random sampling but if the population list is randomly ordered, then the systematic sample drawn is a random sample)
- *Convenience sampling*: simply selecting any group of individuals who are available for a study (are non-random samples as they are biased and not considered representative of population)
- *Purposive sampling*: researchers use their judgment to select a sample that they believe, based on prior information, will provide the data they need (is a non-random sample where major disadvantage is that researcher's judgment may be in error)

VALIDITY AND RELIABILITY

- **Validity:** refers to the degree to which evidence supports any inferences a researcher makes based on the data (examines the extent to which instrument results permit researchers to draw warranted conclusions about the characteristics of the individuals studied – a reliable instrument gives consistent results)
- **Reliability:** refers to the consistency of the scores obtained and how consistent they are for each individual from one administration of the instrument to another

QUALITATIVE V. QUANTITATIVE

Area	Qualitative	Quantitative
Purpose of Research	Exploratory	Directed
Research Paradigm	Holistic, Process-focused	Positivist, Outcome-focused
Sample Selection	Purposeful	Random
Research Protocol	Not Structured	Structured
Data Collection	Richly Descriptive	Precise and Numerical
Validity/Reliability	Uses Methods in Research	Focused on Instrument
Data Analysis	On-going	Statistical

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