What is Quantitative Research?

How is Qualitative Research different than Quantitative Research?

The general process for Quantitative Research involves:
1. Creating a question
    Conceptualization

    Feasibility

    Social Importance

    Scientific Relevance

2. Literature Review -

3. Creating a Hypothesis and Null Hypothesis:
A Hypothesis is:

There are two forms of hypothesis:
    Two-tailed (non-directional):

One-tailed (directional):

From the two-tailed or the one-tailed hypothesis, a null hypothesis is created. The null hypothesis:

4. Identifying variables for the study -
Independent vs. Dependent Variables:

The way that a variable is conceptualized will impact the level of measurement used in a study. Levels of measurement in research categorize the degree of precision that can be obtained about a given phenomenon. There are four levels of measurement (think of them as a continuum from lowest level to highest level)

1. Nominal:

2. Ordinal:

3. Interval:

4. Ratio:

It is important to know the measurement level before Operationalization occurs for a study (as measurement level can impact statistical analysis and comparison).
Operationalization is:

Creating Research Objectives:

5. Selecting a research design -
The most basic research designs are known as “pre-experimental”. These designs are most appropriate for exploratory and descriptive level research studies.

One group post-test only (“one shot” case study):

One group pretest / post-test:

Static group comparison:

“Quasi-experimental” designs are more complex types of research and address more threats to internal and external validity than pre-experimental designs.

Interrupted time series:

Pretest / post-test comparison:

“Experimental” designs attempt to control for threats to internal validity more accurately than quasi-experimental designs do - by allowing for better manipulation and isolation of the independent variable. Because of this, the researcher can make the strongest claims of causality using experimental designs.

Experimental designs use random assignment to groups. Randomly assigned groups are called “control” groups.

Pretest / Post-test control group ("classical design"):

Post-test only control group:

Solomon Four group:

6. Selecting participants and getting a sample -
Terms to know:

Element

Population

Sampling Frame

Unit of Analysis

Sampling Error:

Confidence Levels:

The ultimate purpose of sampling is to select a set of elements from a population in such a way that the descriptions of the elements (units of observation, statistical representation...) accurately portray the parameters of the population. Random selection is the key to this process. Random selection allows equal opportunity for an element to be chosen for the sample.

There are two main methods of sampling: probability and non-probability

Probability sampling:

There are four main types of probability sampling techniques:

Simple random sampling:

Systematic Random sampling:

Stratified random sampling:

Cluster sampling:

Non-probability sampling (also called purposive):

There are many types of non-probability sampling techniques, we will focus specifically on four.

Availability sampling:

Quota sampling:

Snowball sampling:

Key informants:

What influences the sample size needed for a research study?

When to use which type of sampling:

7. Collecting Data -
Use of interviews as a data collection technique:
unstructured:

semi-structured:

structured:

If possible, interviews should be conducted face-to-face, why?
Advantages of interviews:

Disadvantages of interviews:

Use of questionnaires as a data collection technique:
Advantages of Mailed:

Disadvantages of Mailed:

Advantages of Face-to-face:

Disadvantages of Face-to-face:

Advantages of Group:

Disadvantages of Group:

Use of observation(s) as a data collection technique:
Unstructured:

Structured:

Participant observation:

Use of logs and journals as a data collection technique:

Use of scales as a data collection technique:

Likert scale:

Thurstone scale:

Semantic differential scale:

Guttman scale:

Use of secondary data:

When more than one form of data collection is used in a study it is referred to as “triangulation.” Triangulation is especially common in validating data from qualitative research techniques.

8. Determining Validity and Reliability

There are two types of validity: internal and external. Each type of validity has threats to the confidence one has in the outcome of the measurement.

Internal validity is:

There are nine threats to internal validity.
1. History:

2. Maturation:

3. Testing:

4. Instrumentation error:

5. Statistical regression:
6. Selection bias:

7. Mortality:

8. Diffusion:

9. Reactive effects:

External validity is:

There are six threats to external validity:
1. Pretest - treatment interaction:

2. Selection - treatment interaction:

3. Multiple - treatment interference:

4. Researcher bias:

5. Reactivity (the Hawthorne effect):

6. Placebo effect:

Reliability is:

Reliability can be determined through a variety of methods the most common include:

Test-retest (stability):

Alternate form:

Split-half:

Representative:

Observer reliability (interrater):

* In measurement, reliability can exist without validity. You can consistently measure the wrong thing.... but validity CAN NOT occur without reliability. You will not be accurate in your measurements if you are not consistent.
Sources of measurement error include:

Random error:

Systematic error:

- demographic variables:

- response set errors:

Response set errors due to personal styles of respondents:

Social desirability:

Acquiescence:

Deviation:

Response set errors due to reactions of observers:

Contrast error:

Halo effect:

Error of leniency:

Error of severity:

Error of central tendency:

9. Organizing the Data

Once the data has been collected the next step in the research process is to organize the information. To quote Christine Marlow in her book Research Methods for Generalist Social Work, p.204, "you need to be thinking about how the data will be organized as early in the research process as possible. This is especially important when you use a questionnaire to collect data, because the way questions are structured can influence the way data can ultimately be organized."

Organizing quantitative data:

Coding the data:

The coding procedures for quantitative research studies are often developed before any data collection takes place. Once coding has taken place the next step in quantitative research is to do a statistical analysis.

There are two basic types of statistical analysis, descriptive and inferential.
Descriptive Statistics:

Inferential Statistics:

10. Analysis of the Data
One of the easiest ways to describe numerical data is to use a frequency distribution. Things to consider for a frequency distribution include:

At times you may want to look at the average of a value and to summarize information into a single perspective - this can be done by using the measures of central tendency.

Mode:

Median:

Mean:

If the values form a normal distribution it will present as a “bell-shaped” curve. In a normal distribution, the three measures of central tendency are equal.

If the values are not equal the result is a skewed distribution. (skewed distribution is “a distribution in which most of the scores are concentrated at one end of the distribution rather than in the middle” -Marlow definition).

The measures of central tendency summarize the characteristics of the middle of the distribution, other characteristics of a distribution include the spread, dispersion and deviation. These characteristics are referred to as the measures of variability or measures of dispersion.

Range:

Percentile:

Standard deviation:

Z score:

We have been discussing data analysis with research involving one variable (called univariate) to this point, but what kind of analysis occurs when the data involves two or more variables (called bivariate or multivariate analysis)?

Cross-tabulation:

Correlation:

In using descriptive statistics (whether univariate or multivariate) the most effective way to describe them is to display the results visually.

Interpreting graphs:

Level:

Stability:

Trends:

In graphing data - the X axis =

the Y axis =

Graphs and statistics can be deceiving. Be aware of any graph that does not have an absolute zero point for "Y" or that has a discontinuous scale.

Going beyond simply describing the data with descriptive statistics, you will use inferential statistics to test a hypothesis.

A finding is considered to be statistically significant when the null hypothesis can be rejected and the probability that the result is due to chance falls at or below the study's given significance level. The power of a statistical test is its ability to reject the null hypothesis, and the power to reject the null hypothesis increases with the sample size.

Errors in judgment concerning the acceptance or rejection of the null hypothesis are referred to as Type I and Type II errors.

Type I error:

Type II error:

There are many types of statistical tests to determine which hypothesis is correct, and we will look at a few of the most common.

When a research study has a normal distribution and the dependent variable is measured at least at the interval level and the independent variable has been measured at the nominal level - the differences between the groups of data can be found using a T-Test.
A T-Test:

To calculate a T-Test (and many other statistical tests) you must know the degrees of freedom in your data (df).

The T-Test is a very efficient method of testing the significance of the difference between two means. However, not all research has hypothesis involving means that can be simplified to just two samples of scores. In social work, it is common for research to involve three or more samples of data to compare. This is when an analysis of variance is used (ANOVA).

An ANOVA:

Even though ANOVA looks at the differences between two or more groups - do not lose the fact that we are still involved with bivariate analysis at this point (one dependent variable and one independent variable).

Another way to analyze bivariate data is to examine the strength of the relationships between variables using correlation coefficients.
Correlation coefficients:

Pearson's r:

The regression line in a scatterplot graph is used to show how much change has occurred in the dependent variable is due to changes in the independent variable (prediction of change). Multiple regression analysis produces a coefficient that allows each particular outcome (interaction between variables) to be evaluated in direction and the amount of change.

Chi-Square analysis (X):

As a descriptive statistic:

As an inferential statistic:

To use chi-square:

What is effect size (magnitude) and why is it important?

Meta-analysis involves:

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