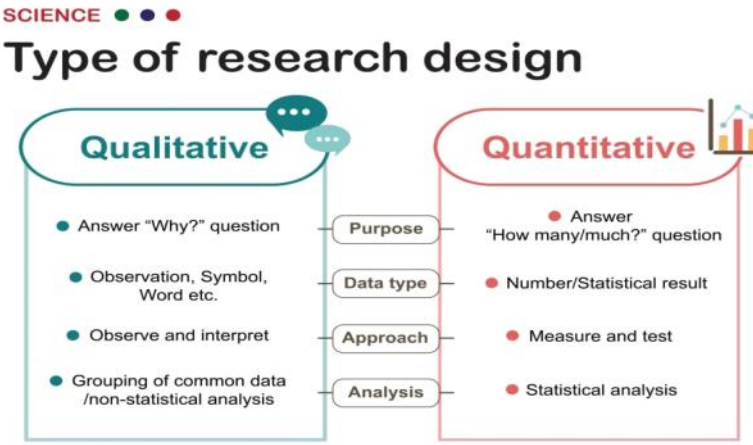
Module 3: Introduction to graphs

26 August 2023 13:44

Quantitative vs. Qualitative data

When it comes to conducting data research, you'll need different collection, hypotheses and analysis methods, so it's important to understand the key differences between quantitative and qualitative data:

- Quantitative data is numbers-based, countable, or measurable. Qualitative data is interpretation-based, descriptive, and relating to language.
- Quantitative data tells us how many, how much, or how often in calculations. Qualitative data can help us to understand why, how, or what happened behind certain behaviors.
- Quantitative data is fixed and universal. Qualitative data is subjective and unique.
- Quantitative research methods are measuring and counting. Qualitative research methods are interviewing and observing.
- Quantitative data is analyzed using statistical analysis. Qualitative data is analyzed by grouping the data into categories the data into categories and themes.



(Non-numerical type of data)
Examples
observations, words, sound
Images

Examples
→ Numbers, graphs, statistical Results

>

Examples

Here are some examples of qualitative data:

1. **Interview transcripts**: Verbatim records of what participants said during an interview or focus group. They allow researchers to identify common themes and patterns, and draw conclusions based on the data. Interview transcripts can also be useful in providing direct quotes and examples to support research findings.
2. **Observations**: The researcher typically takes detailed notes on what they observe, including any contextual information, nonverbal cues, or other relevant details. The resulting observational data can be analyzed to gain insights into social phenomena, such as human behavior, social interactions, and cultural practices.
3. **Unstructured interviews**: generate qualitative data through the use of open questions. This allows the respondent to talk in some depth, choosing their own words. This helps the researcher develop a real sense of a person's understanding of a situation.
4. **Diaries or journals**: Written accounts of personal experiences or reflections.
5. Notice that qualitative data could be much more than just words or text. Photographs, videos, sound recordings, and so on, can be considered qualitative data. Visual data can be used to understand behaviors, environments, and social interactions.

Limitations of Qualitative Research

- Because of the time and costs involved, qualitative designs do not generally draw samples from large-scale data sets.
- The problem of adequate validity or reliability is a major criticism. Because of the subjective nature of qualitative data and its origin in single contexts, it is difficult to apply conventional standards of reliability and

validity. For example, because of the central role played by the researcher in the generation of data, it is not possible to replicate qualitative studies.
- Also, contexts, situations, events, conditions, and interactions cannot be replicated to any extent, nor can generalizations be made to a wider context than the one studied with confidence.
- The time required for data collection, analysis, and interpretation is lengthy. Analysis of qualitative data is difficult, and expert knowledge of an area is necessary to interpret qualitative data. Great care must be taken when doing so, for example, looking for mental illness symptoms.

Advantages of Qualitative Research

- Because of close researcher involvement, the researcher gains an insider's view of the field. This allows the researcher to find issues that are often missed (such as subtleties and complexities) by the scientific, more positivistic inquiries.
- Qualitative descriptions can be important in suggesting possible relationships, causes, effects, and dynamic processes.
- Qualitative analysis allows for ambiguities/contradictions in the data, which reflect social reality (Denscombe, 2010).
- Qualitative research uses a descriptive, narrative style; this research might be of particular benefit to the practitioner as she or he could turn to qualitative reports to examine forms of knowledge that might otherwise be unavailable, thereby gaining new insight.

What Is Quantitative Research?

Quantitative research involves the process of objectively collecting and analyzing numerical data to describe, predict, or control variables of interest.

The goals of quantitative research are to test causal relationships between variables, make predictions, and generalize results to wider populations.

Quantitative researchers aim to establish general laws of behavior and phenomenon across different settings/contexts. Research is used to test a theory and ultimately support or reject it.

Quantitative Methods

Experiments typically yield quantitative data, as they are concerned with measuring things. However, other research methods, such as controlled observations and questionnaires, can produce both quantitative information.

For example, a rating scale or closed questions on a questionnaire would generate quantitative data as these produce either numerical data or data that can be put into categories (e.g., "yes," "no" answers).

Experimental methods limit how a research participant can react to and express appropriate social behavior.

Findings are, therefore, likely to be context-bound and simply a reflection of the assumptions that the researcher brings to the investigation.

Examples

There are numerous examples of quantitative data in psychological research, including mental health. Here are a few examples:

1. Standardized psychological assessments: One example of a standardized psychological assessment of IQ that uses quantitative data is the Wechsler Adult Intelligence Scale (WAIS).
   Another example is the Experience in Close Relationships Scale (ECR), a self-report questionnaire widely used to assess adult attachment styles.
   The ECR provides quantitative data that can be used to assess attachment styles and predict relationship outcomes.
2. Neuroimaging data: Neuroimaging techniques, such as MRI and fMRI, provide quantitative data on brain structure and function.
   This data can be analyzed to identify brain regions involved in specific mental processes or disorders.

3. Clinical outcome measures: The use of clinical outcome measures provides objective, standardized data that can be used to assess treatment effectiveness and monitor symptoms over time, helping mental health professionals make informed decisions about treatment and care.
   For example, the Beck Depression Inventory (BDI) is a clinician-administered questionnaire widely used to assess the severity of depressive symptoms in individuals.
   The BDI consists of 21 questions, each scored on a scale of 0 to 3, with higher scores indicating more severe depressive symptoms.

What are the advantages and disadvantages of quantitative data?

Each type of data set has its own pros and cons.

Advantages of quantitative data (Benefits of quantitative data)

- It's relatively quick and easy to collect and it's easier to draw conclusions from.
- When you collect quantitative data, the type of results will tell you which statistical tests are appropriate to use.
- As a result, interpreting your data and presenting those findings is straightforward and less open to error and subjectivity.

Another advantage is that you can replicate it. Replicating a study is possible because your data collection is measurable and tangible for further applications.

Disadvantages of quantitative data (Limitations of quantitative data)

- Quantitative data doesn't always tell you the full story (no matter what the perspective).
- With choppy information, it can be inconclusive.
- Quantitative research can be limited, which can lead to overlooking broader themes and relationships.
- By focusing solely on numbers, there is a risk of missing larger focus information that can be beneficial.

Types of Quantitative data

Quantitative data is split into two types of data: discrete one, which represents countable items. And continuous data, which outlines data measurement. The continuous numerical data is further subdivided into interval and ratio data, known for measuring certain items.

The discrete data fundamentals

Discrete data is a count that involves integers — only a limited number of values is possible. This type of data cannot be subdivided into different parts. Discrete data includes discrete variables that are finite, numeric, countable, and non-negative integers. In many cases, discrete data can be prefixed with "the number of". For example:

o/p → Integer values

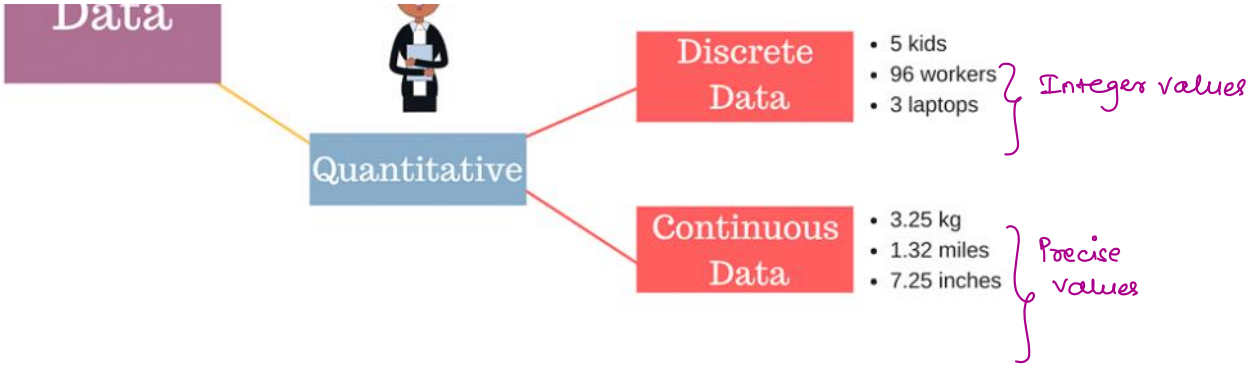
- The number of students who have attended the class; → o/p → Number of students = 25 → Integers
- The number of customers who have bought different products;
- The number of groceries people are purchasing every day;

This data type is mainly used for simple statistical analysis because it's easy to summarize and compute. In most of the practices, discrete data is displayed by bar graphs, stem-and-leaf-plot and pie charts.

Continuous data — it's all about accuracy

Continuous data is considered the complete opposite of discrete data. It's the type of numerical data that refers to the unspecified number of possible measurements between two presumed points.
The numbers of continuous data are not always clean and integers, as they are usually collected from very precise measurements. Measuring a particular subject is allowing for creating a defined range to collect more data.
Variables in continuous data sets often carry decimal points, with the number stretching out as far as possible. Typically, it changes over time. It can have completely different values at different time intervals, which might not always be whole numbers. Here are some examples:

- The weather temperature;
- The wind speed;
- The weight of the kids;



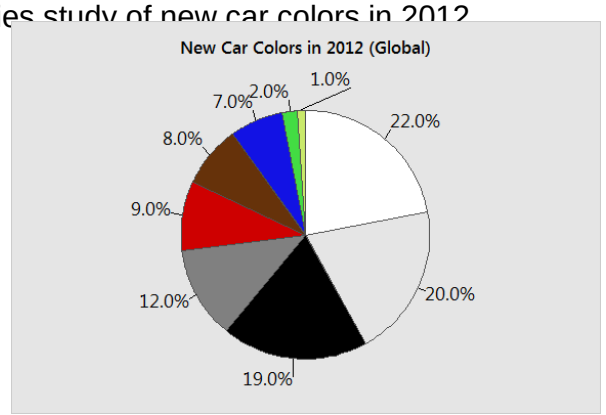
Types of Qualitative data: Categorical data, Binary data, Ordinary data

Qualitative Data: Categorical, Binary, and Ordinal

When you record information that categorizes your observations, you are collecting qualitative data. There are three types of qualitative variables—**categorical, binary, and ordinal**. With these data types, you're often interested in the proportions of each category. Consequently, bar charts and pie charts are conventional methods for graphing qualitative variables because they are useful for displaying the relative percentage of each group out of the entire sample.

Categorical data

Categorical data have values that you can put into a countable number of distinct groups based on a characteristic. For a categorical variable, you can assign categories, but the categories have no natural order. Analysts also refer to categorical data as both **attribute and nominal variables**. For example, college major is a categorical variable that can have values such as psychology, political science, engineering, biology, etc. Categorical data is also known as nominal data.The categorical data in the pie chart are the results of a PPG Industries study of new car colors in 2012.



Binary data

Binary data can have only two values. If you can place an observation into only two categories, you have a binary variable. Statisticians also refer to binary data as both dichotomous and indicator variables. For example, pass/fail, male/female, and the presence/absence of a characteristic are all binary data.

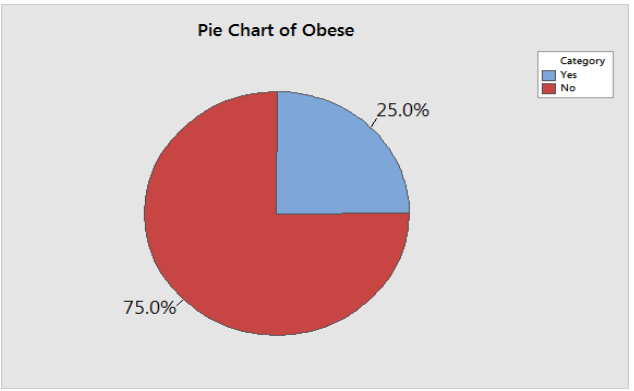
Binary variables are helpful for calculating proportions or percentages, such as the proportion of defective products in a sample. You just take the number of faulty products and divide by the sample size.

→ 2 categories — Binary data

and divide by the sample size.

The binary yes/no data for the pie chart are based on the continuous body fat percentage data in the histogram above. Compare how much we learn from the continuous data that the histogram displays as a distribution compared to the simple proportion that the binary version of the data provides in the pie chart below.

Obese
Yes
No
No
Yes
No



Ordinal data

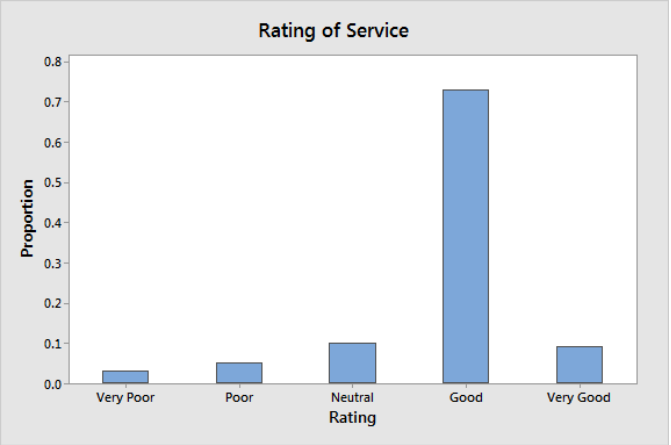
Rating
Very Poor
Poor
Neutral
Good
Very Good

Ordinal data have at least three categories, and the categories have a natural order. Examples of ordinal variables include overall status (poor to excellent), agreement (strongly disagree to strongly agree), and rank (such as sporting teams).

Analysts often consider ordinal variables to have a combination of qualitative and quantitative properties. Analysts often represent ordinal variables using numbers, such as a 5-point Likert scale that measures satisfaction. In number form, you can calculate average scores as with quantitative variables. However, the numbers have limited usefulness because the differences between ranks might not be constant. Learn more in-depth about Ordinal Data: Definition, Examples & Analysis.

For example, first, second, and third in a race are ordinal data. The difference in time between first and second place might not be the same the difference between second and third place.

The bar chart below displays the proportion of each service rating category in their natural order.


Rating of Service
Proportion
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Very Poor
Poor
Neutral
Good
Very Good
Rating