Data Analysis

Data analysis is a critical stage in the research process, where raw data is systematically examined to extract meaningful insights and answer research questions. It involves organising, interpreting, and presenting data to reveal patterns, trends, and relationships. Quantitative analysis focuses on numerical data using statistical techniques, while qualitative analysis explores themes and narratives from non-numerical data. Understanding these methods helps researchers ensure the validity and reliability of their findings. In this session, we will explore key techniques and tools for analysing both types of data.

Analysing Qualitative Data

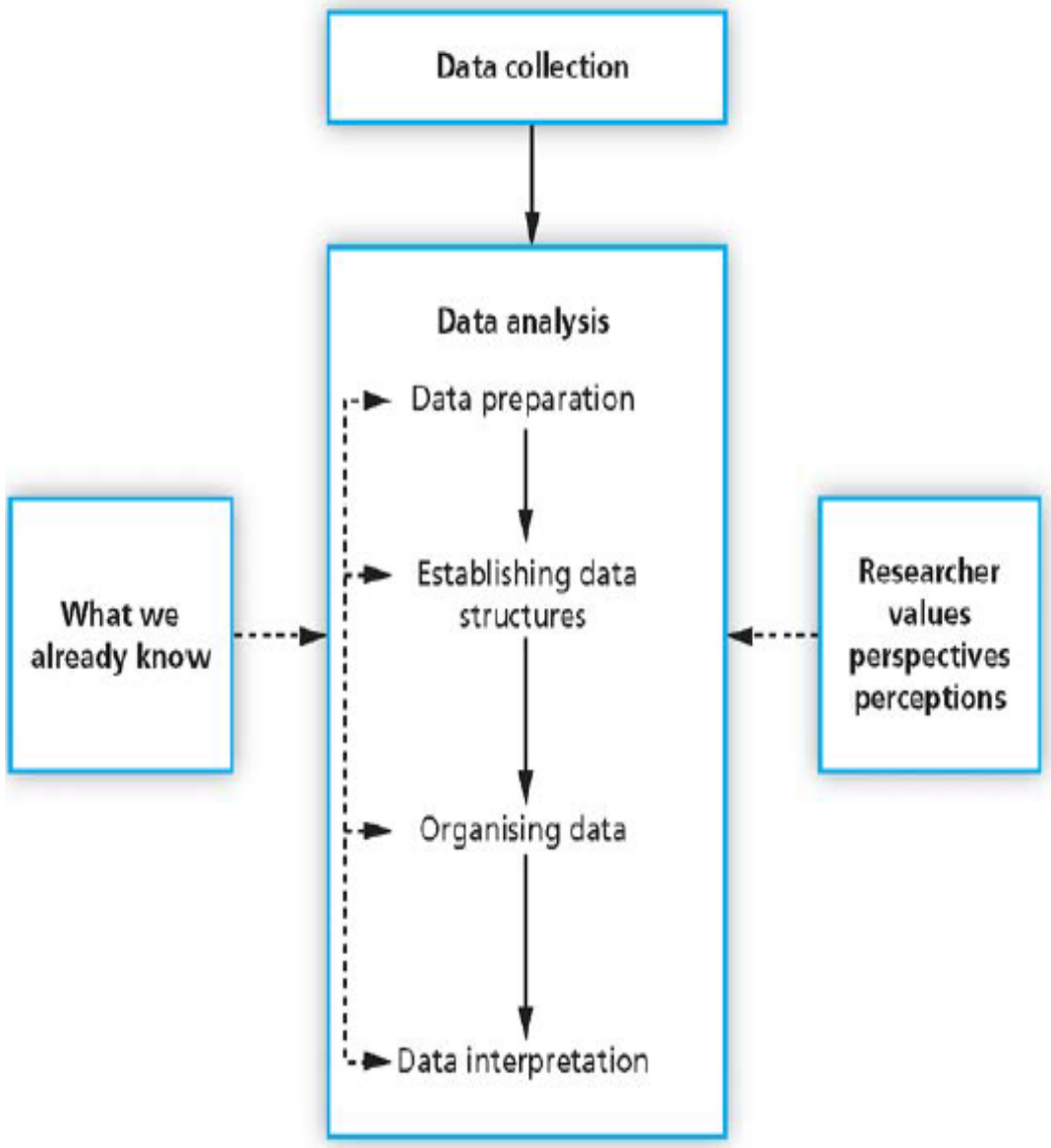
According to Newby (2014), Qualitative analysis is about organising data so it can be understood and help explain the research issue, even if it doesn't fully answer the research question. The interpretation should also make sense to some of the professional audience. This process has four steps:

1. **Preparing the data** by putting it into a form that can be manipulated.

2. **Identifying basic units of data** by grouping and naming categories that are important to the research issue.

3. **Organising data** by creating connections between data units, reviewing them, and sometimes redoing the process.

4. **Interpreting data** by checking if the organisation and grouping of data make sense.

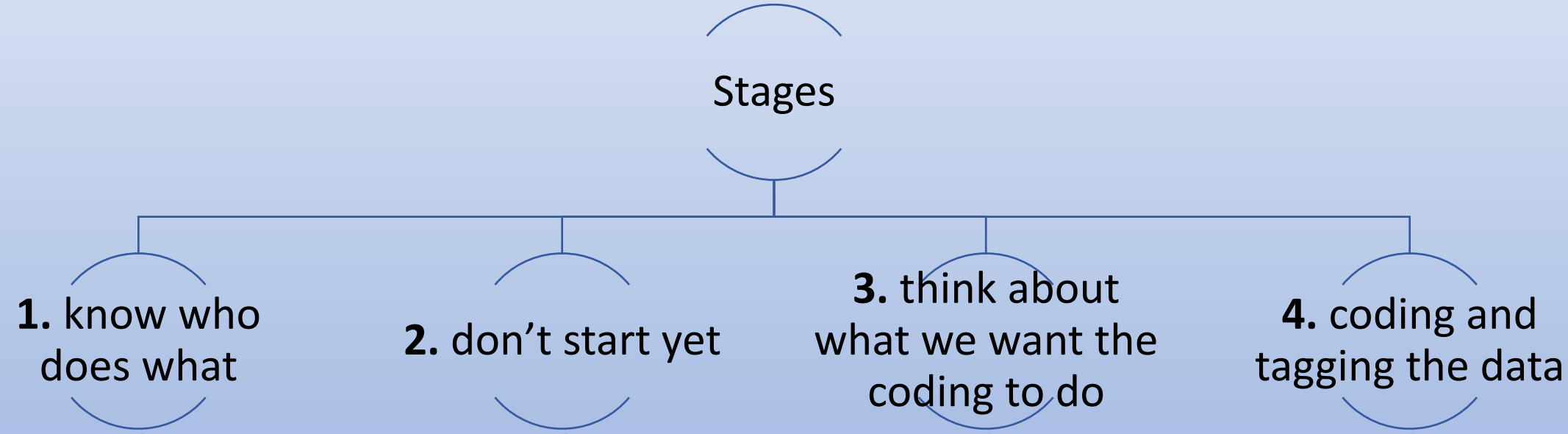


Coding Qualitative Data

The purpose of coding is to assign names to units of data. These names or codes should relate to the research issue so that when they are combined (which may involve removing some data or merging codes), they provide new insights that weren’t obvious from the raw data. But where do these codes come from?

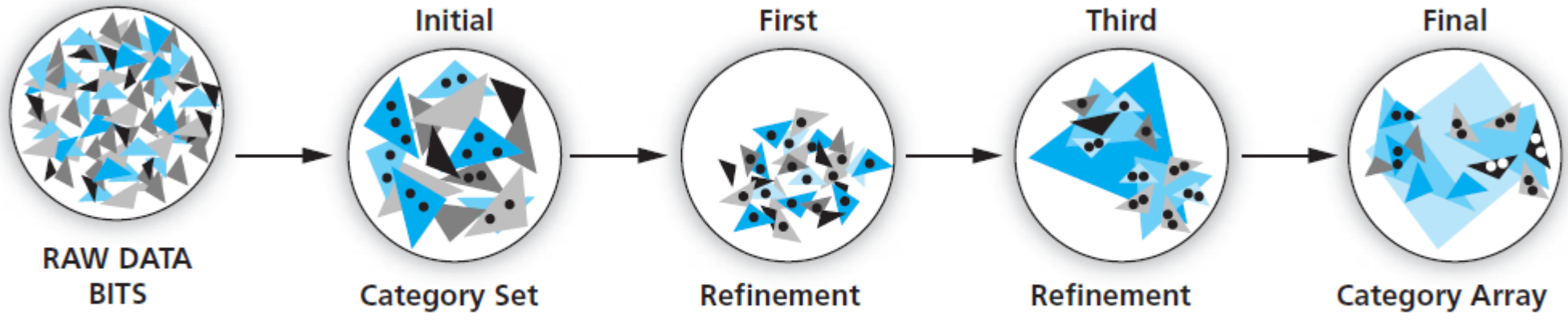
The coding process can be broken down into six activities. It's important to remember that this process isn't always a simple step-by-step journey from start to finish. Instead, we'll often start, make some progress, reflect on what we're doing, and then go back to refine things with new ideas. We’ll likely repeat this several times.

Stages of Coding Qualitative Data



Creating Themes

The next step, after coding, is to connect the categories by finding similarities and differences between the codes the researcher has created. This would help form themes that group related ideas together. By doing this, the researcher starts organising the data and identifying patterns and meanings.



The process of creating themes

Source: From Dye et al. (2000).

Software for Qualitative Data Analysis

Examples of NVivo software Output

NVivo word cloud

NVivo word tree

Analysing Quantitative Data

Research based on quantitative data includes numbers, graphs, and tables. Researchers use them to provide an overall picture of the data or the collected evidence.

Data gathered quantitatively using the previously discussed “data collection methods” consist of numerical data. These numbers represent variable values, measuring characteristics of subjects, respondents, or cases. Initially, these data exist in raw form, i.e., on questionnaires, notes, recording sheets, or tests. Researchers then organise them for computer use, create charts or graphs to summarise key aspects, and finally interpret the results, providing theoretical context and meaning.

Data Organisation

- The way researchers structure their data depends on several factors: research design (such as a survey, observational study, or experiment), the number of variables measured and recorded, and how observations were grouped or categorised.

- Computer software analysis is normally used for the process of analysing the data, and data should be carefully prepared for the purpose of the analysis.

- The researcher needs to have some skills and knowledge on how to choose and use the software and statistical techniques

Categories for data coding

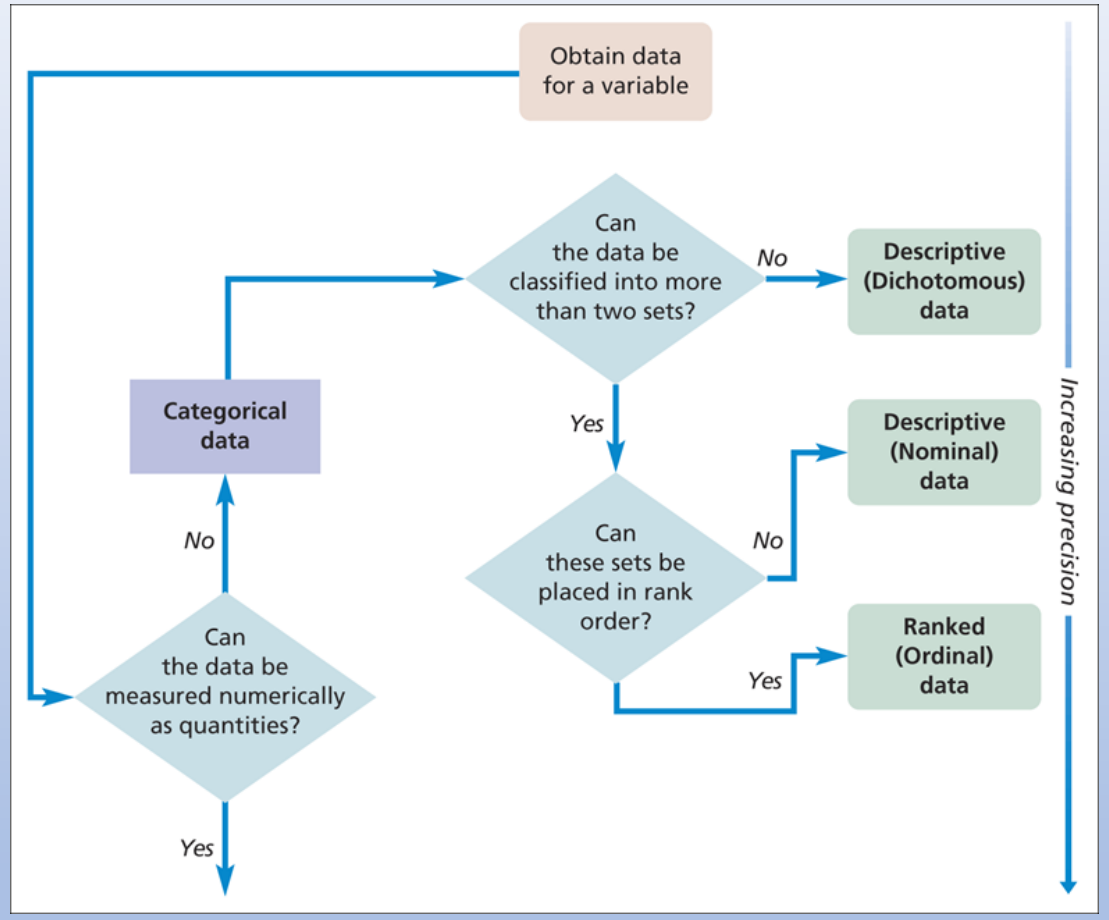
Categorical

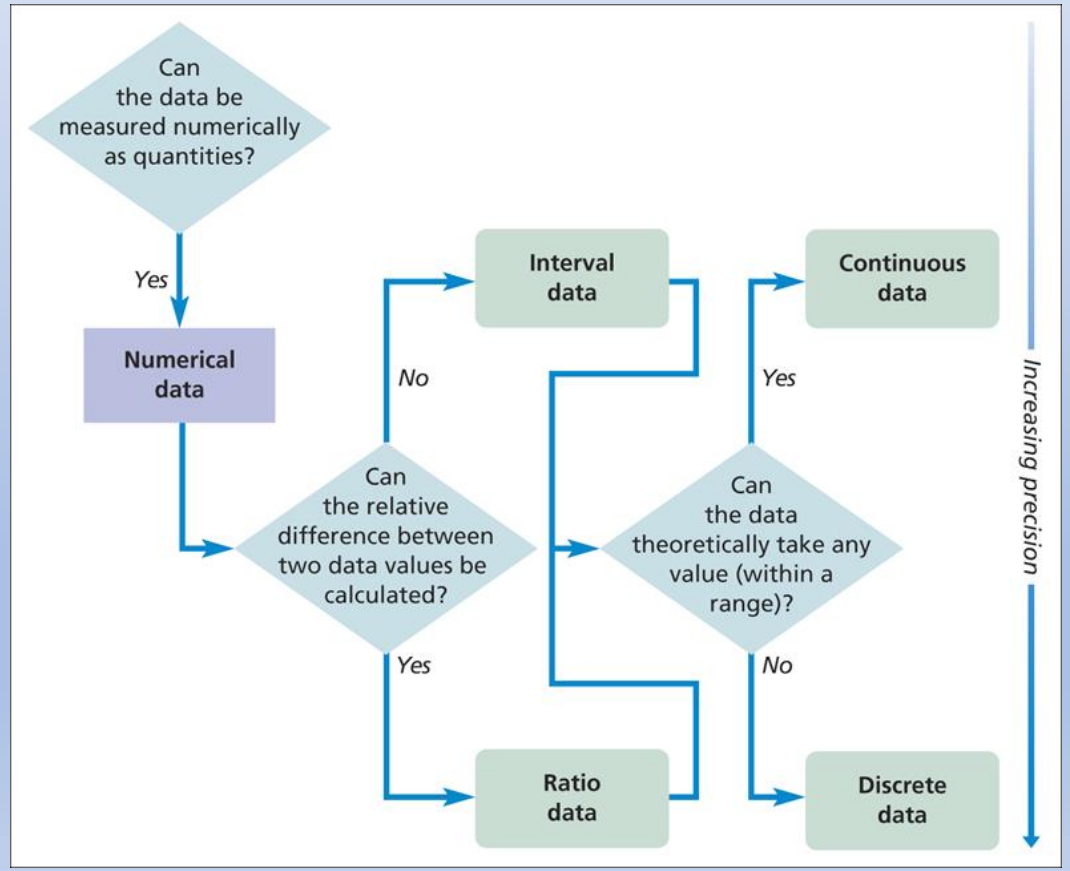
- Nominal (names & labels; e.g., gender)
- Ordinal (rankings; e.g., educational level)

Numerical

- Discrete (e.g., number of students in a class)
- Continuous (students' test scores)

Defining the data type (Saunders et al., 2009)





Exploring and Describing Data

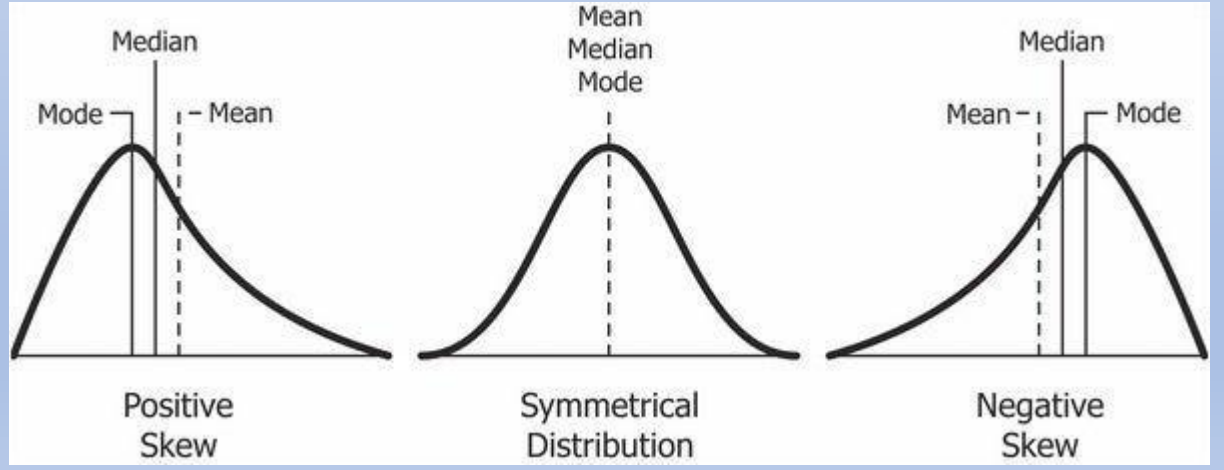
Describing data is the first critical step in data analysis. Before jumping into complex analyses or making predictions, it's important to understand the basic characteristics of your data. Descriptive statistics help summarize and visualize key features of data sets in a concise and easily interpretable way.

1. What is Descriptive Statistics?

They are methods for summarising and describing the features of a data set. The goal is to reduce a large amount of data into simpler summaries that allow us to better understand the distribution, central tendency, and variability of the data.

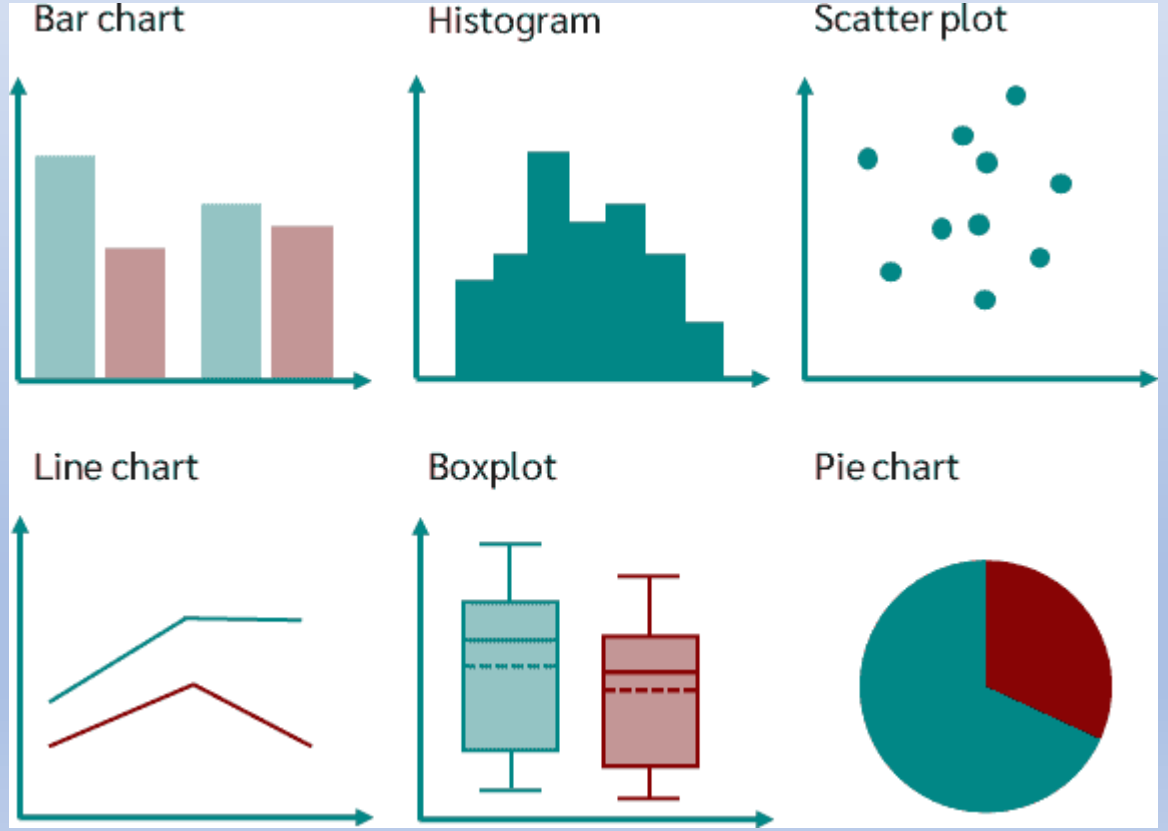
2. Key Measures in Descriptive Statistics

a. Measure of central tendency: mean, median, mode.
b. Measures of variability (spread): range, variance, standard deviation.
c. Measures of distribution shape: skewness, kurtosis



3. Visualising Descriptive Statistics?

In addition to numerical summaries, it's often helpful to visualize data. Some common ways to do this include: Histograms, Box Plots, Bar Charts, Pie Charts



4. Why is Descriptive Statistics Important?

a. Understanding Data: Before applying more complex statistical methods or models, it's essential to understand basic characteristics such as the mean, spread, and shape of the data.

b. Comparing Data Sets: Descriptive statistics help compare multiple data sets, identify patterns, and see the relationship between variables.

c. Identifying Outliers: Outliers or extreme values can be identified through descriptive statistics, helping you decide whether they should be investigated or removed.

Examining relationships, differences and predictions

1. What is Inferential Statistics?

They are used to make predictions or draw conclusions about a population based on a sample. While descriptive statistics help summarize data, inferential statistics help answer questions like "What does this data mean for the larger population?" or "What are the probabilities of certain outcomes?"

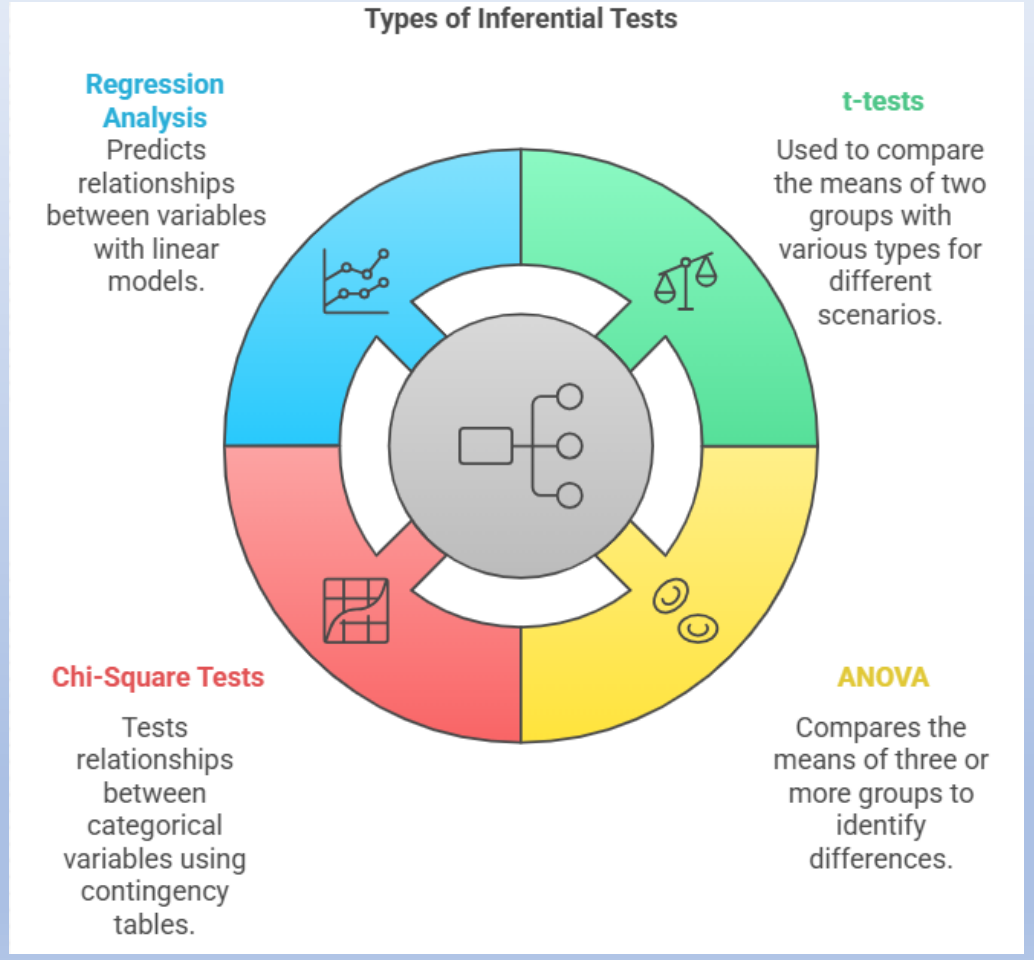
2. Why is Inferential Statistics Important?

a. Generalising Results: By using a sample to make inferences about a population, inferential statistics enable researchers to draw conclusions without studying every single individual.

b. Testing Theories: Inferential methods help in hypothesis testing, allowing researchers to validate or reject theories based on sample data.

c. Making Predictions: Inferential statistics allow predictions to be made based on data, helping decision-makers in fields like marketing, economics, and healthcare.

Inferential Tests



Software for Quantitative Data Analysis