

The Statistical Process

What is statistics?

Statistics is the science of collecting, organising, analysing, and interpreting data in order to make informed decisions. Rather than simply performing calculations, statistics provides a systematic process for turning raw data into useful information.

Statistics can be thought of as:

Data → Information → Decisions

The big picture

Statistics is not a collection of separate topics. Each stage depends on the previous stage.

1. Producing Data

Collect data that accurately represents the population by:

- Defining the population
- Selecting a representative sample
- Choosing an appropriate study design
- Minimising bias

2. Exploratory Data Analysis (EDA)

EDA, also known as descriptive statistics, summarises and explores data to:

- Identify patterns and trends
- Detect errors and outliers
- Explore relationships between variables

4. Inference

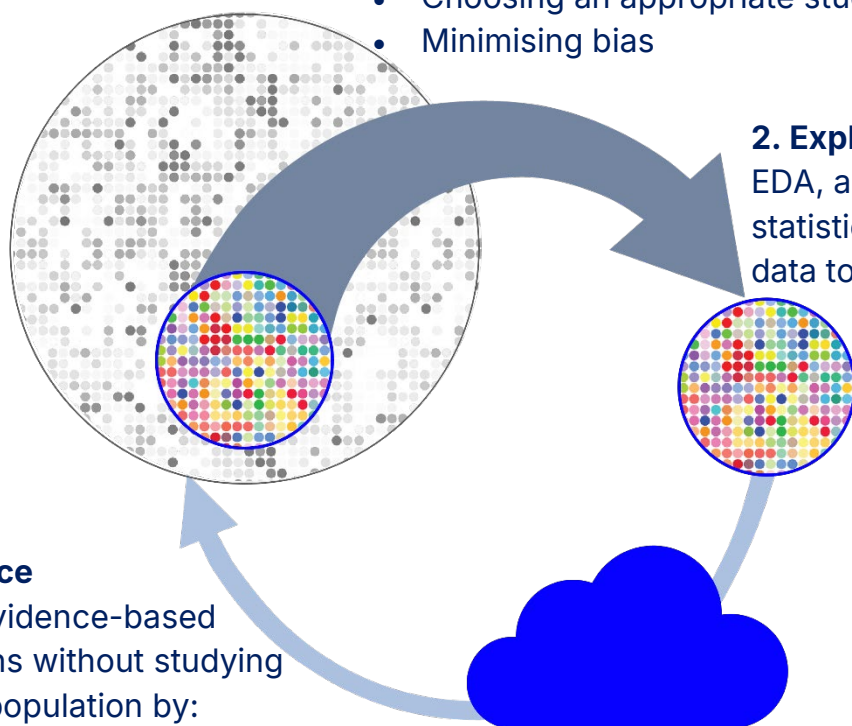
Enables evidence-based conclusions without studying an entire population by:

- Estimating population values
- Constructing confidence intervals
- Testing hypotheses

3. Probability

Probability underpins a statistical conclusion, measuring uncertainty and helps us to:

- Estimate likelihood
- Assess risk
- Evaluate reliability
- Determine confidence in results



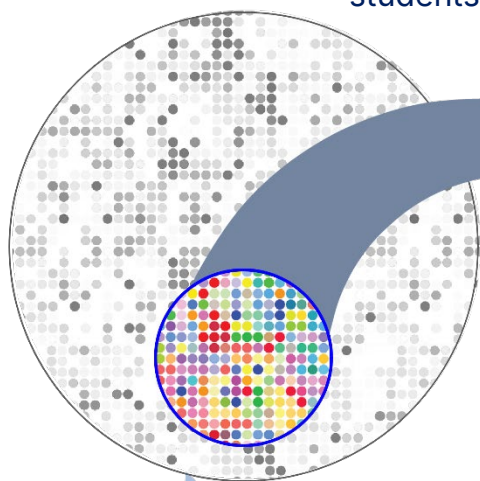
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Worked example

Research question: How many hours do university students study each week?

1. Producing Data

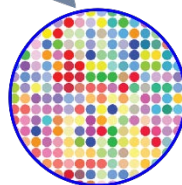
A researcher surveys a random sample of 500 university students and asks how many hours they study each week



2. Exploratory Data Analysis (EDA)

Results show:

- Mean study time = 10 hours per week
- Most students study between 8 and 12 hours



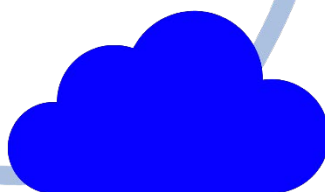
4. Inference

We are 95% confident that the average study time for all university students is between 9.5 and 10.5 hours per week

3. Probability

Calculate:

- The standard error
- Confidence levels
- The reliability of the sample estimate



Related helpsheets

- Overcoming Maths Anxiety
- Statistics: Measures of Data



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