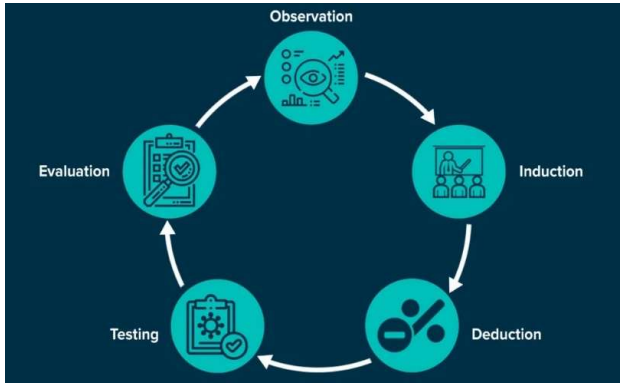
Empirical research in management and economics

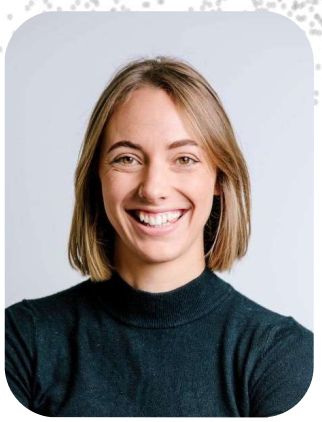
Thorsten Pachur

Technical University of Munich
School of Management
Chair of Behavioral Research Methods



Behavioral Research Methods @TUM

Thorsten Pachur
Professor



Rebecca West
Postdoctoral researcher

Sebastian Hellmann
Postdoctoral researcher

Linus Hof
Predoctoral researcher

Nuno Busch
Predoctoral researcher

Visit us at: https://www.msl.mgt.tum.de/en/brm/home/

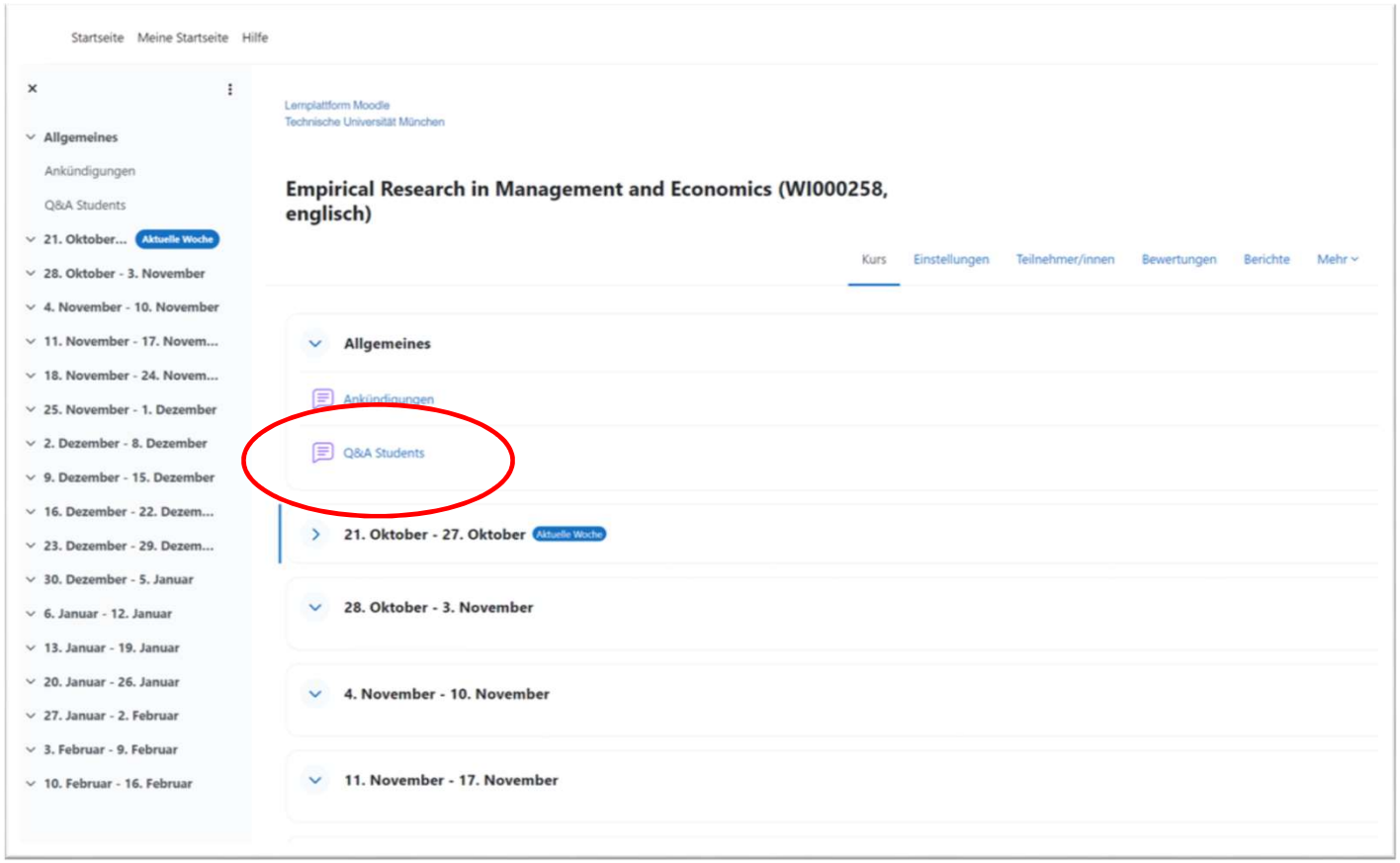
Some organizational issues

- **Lecture**: Mondays, 4:45–6:15 pm; Wilhelm-Nusselt-Hörsaal, N 1179 (0101.02.179)
- **Exercise**
  - Hands-on experience with research methods and data-analytic techniques, group discussions
  - Four groups (→ check TUMonline for your group assignment!)
    - Tuesdays, 8:00–9:30 am: **Group 1** (Linus Hof), **Group 2** (Thorsten Pachur)
    - Tuesdays, 1:15–2:45 pm: **Group 3** (Sebastian Hellmann)
    - Wednesdays, 4:45–6:15 pm: **Group 4** (Nuno Busch, Rebecca West)

Module website:
https://sites.google.com/view/empirical-research-methods/home

- Slides (for both lecture and exercise)
- Data files and other material for the exercise
- **Background readings (with pdfs) (!)**
- Mock exam

Discussion forum on Moodle



A brief survey about you and your background knowledge …

https://forms.gle/fMVitdWbyK99TuXv8

Goals of empirical research

Description

Explanation

Prediction

Control

Understanding causal relationships with empirical data

Dependent variables

Sales

Good leadership

Employee satisfaction

Independent variables

Advertising strategy, product placement

Personality, intelligence, experience, leadership style

Flexibility of working hours, team size, responsibility, feedback cycles

How to understand the world?

Rationalism

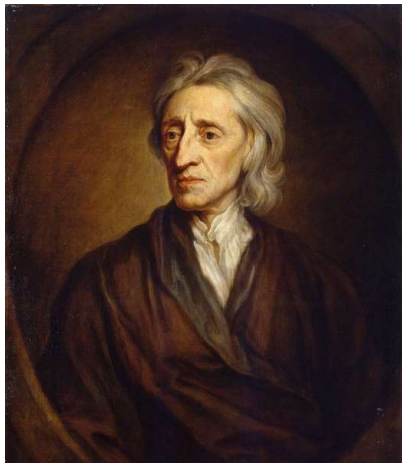
Reason alone can help understand the workings of the world

René Descartes

Gottfried Wilhelm Leibniz

Empiricism

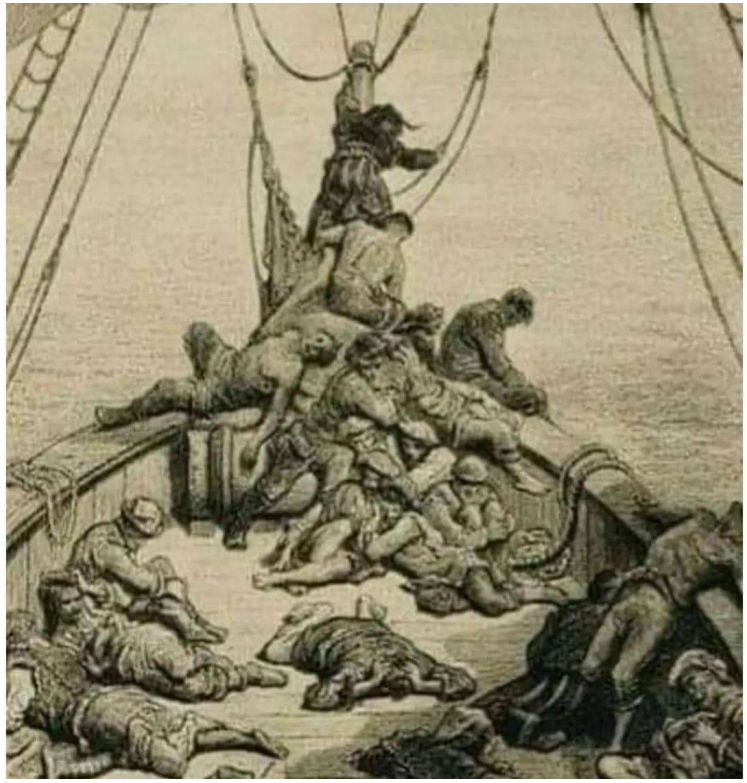
The mind is a tabula rasa but learns about the world through experience

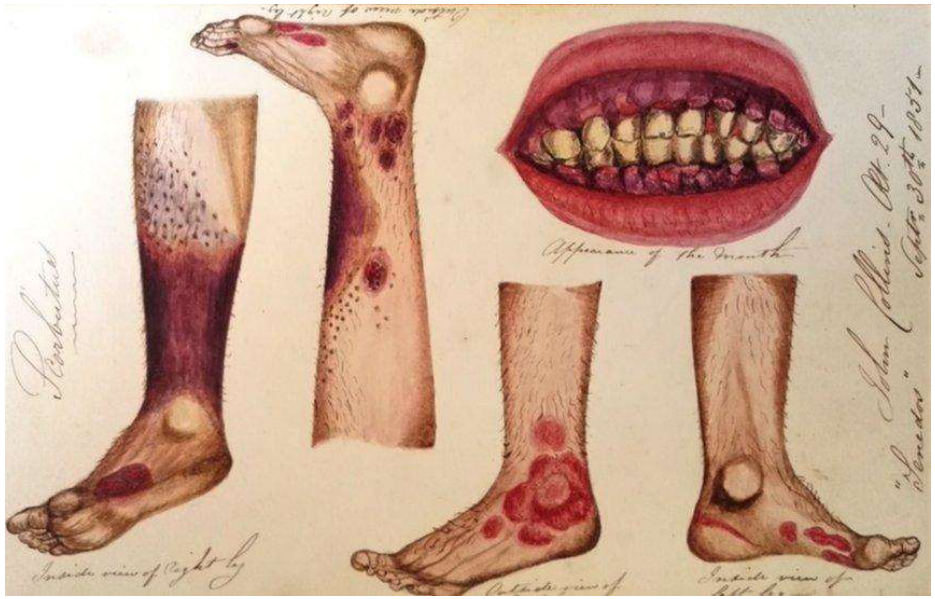


John Locke

David Hume

Scurvy: Sailors‘ curse





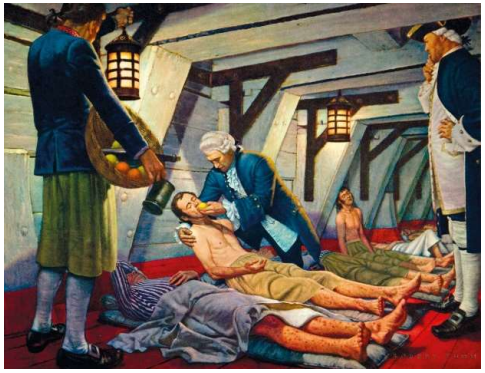
The first clinical trial

James Lind

6 groups of patients (2 patients in each group) receiving different treatments (all else kept the same)

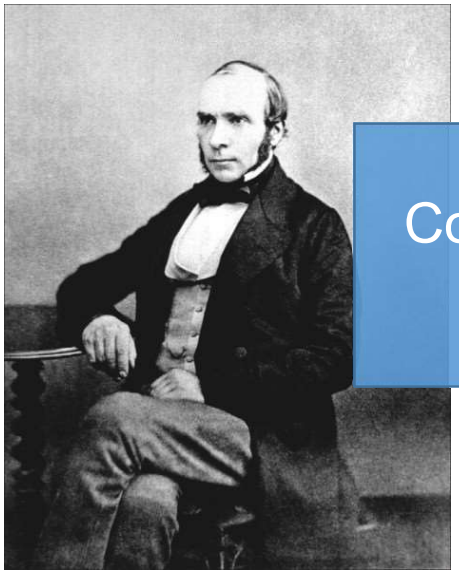
Identification of effective treatment by having groups that differed only with regard to the treatment

- A quart of cider a day
- Elixir of vitriol, three times a day
- Half a pint of sea water a day
- A nutmeg-sized paste of garlic, mustard seed, horse-radish, balsam of Peru, and gum myrrh three times a day
- Two spoonfuls of vinegar, three times a day
- Two oranges and one lemon a day

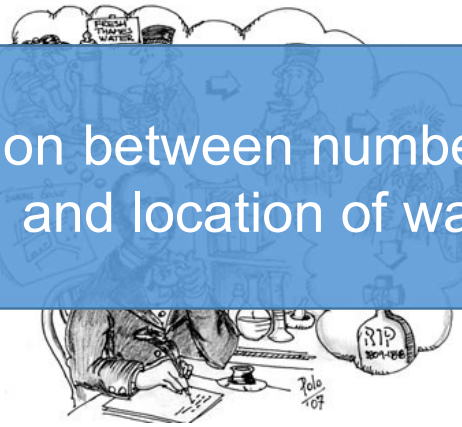


Cholera outbreak in London in 1854

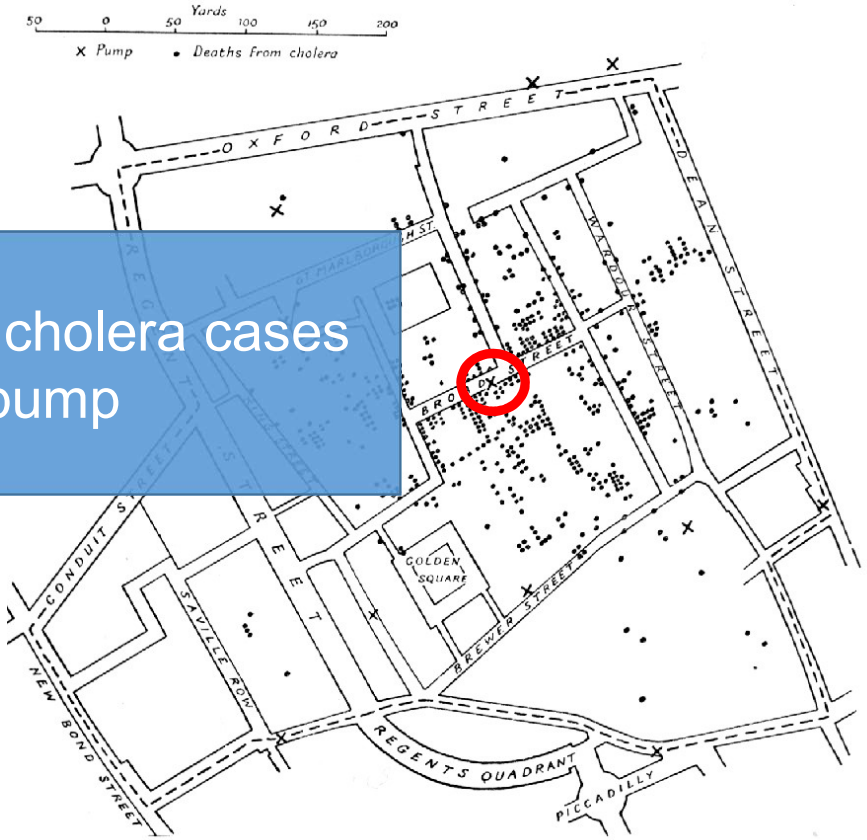
Cholera outbreak in London in 1854



Dr. John Snow



Correlation between number of cholera cases and location of water pump

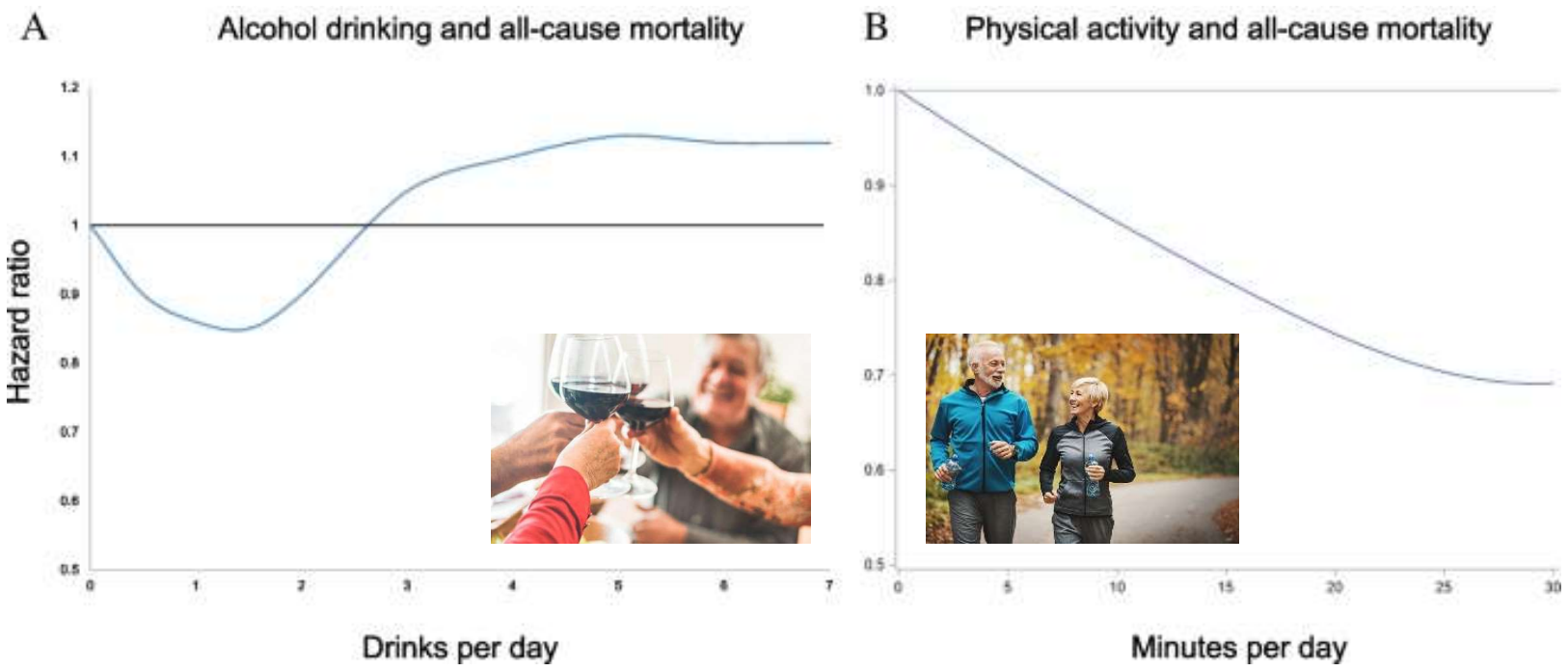


Research competence: Why does it matter?

- Acquire skills to plan and conduct an empirical study and analyze the data for your Master‘s thesis
- Acquire *scientific literacy* as citizens
  → Ability to evaluate claims derived from empirical findings

Empirical claims abound

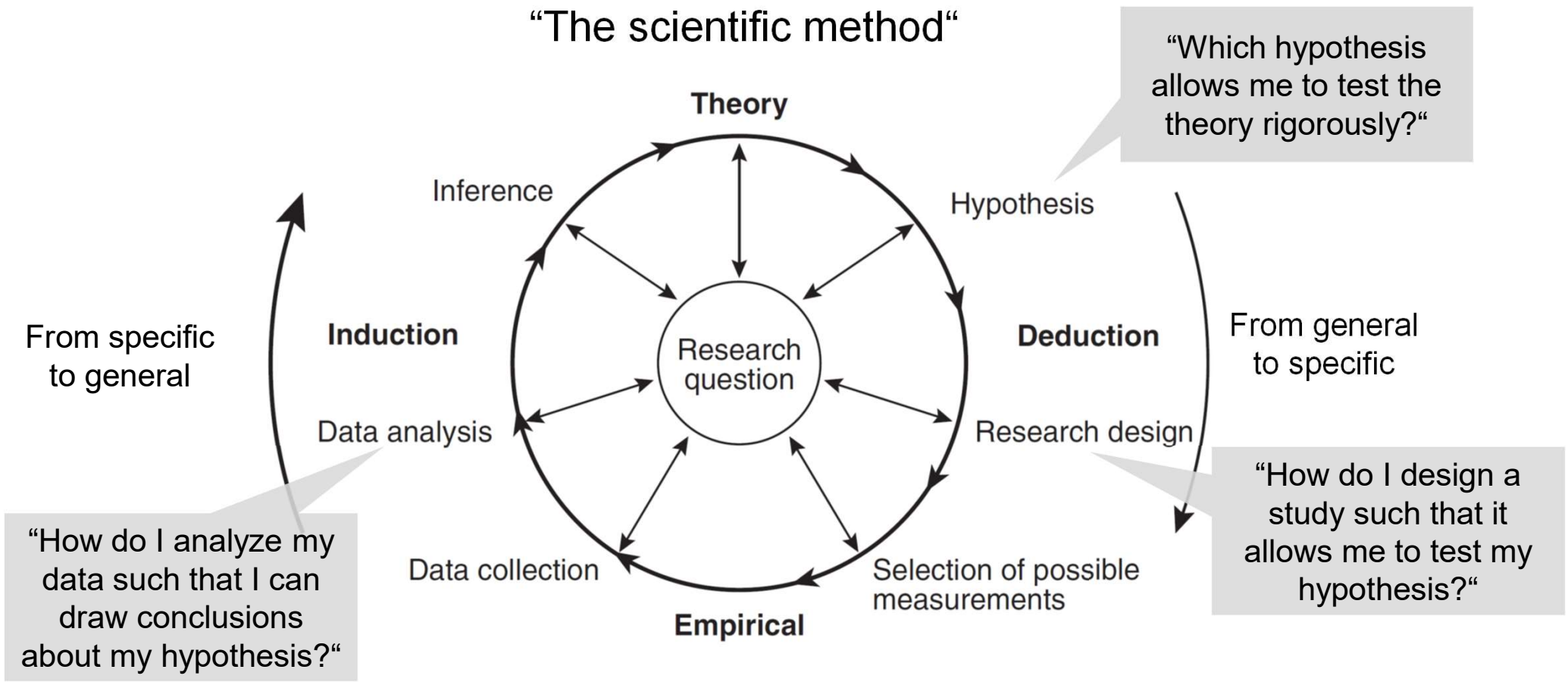
Empirical claims abound



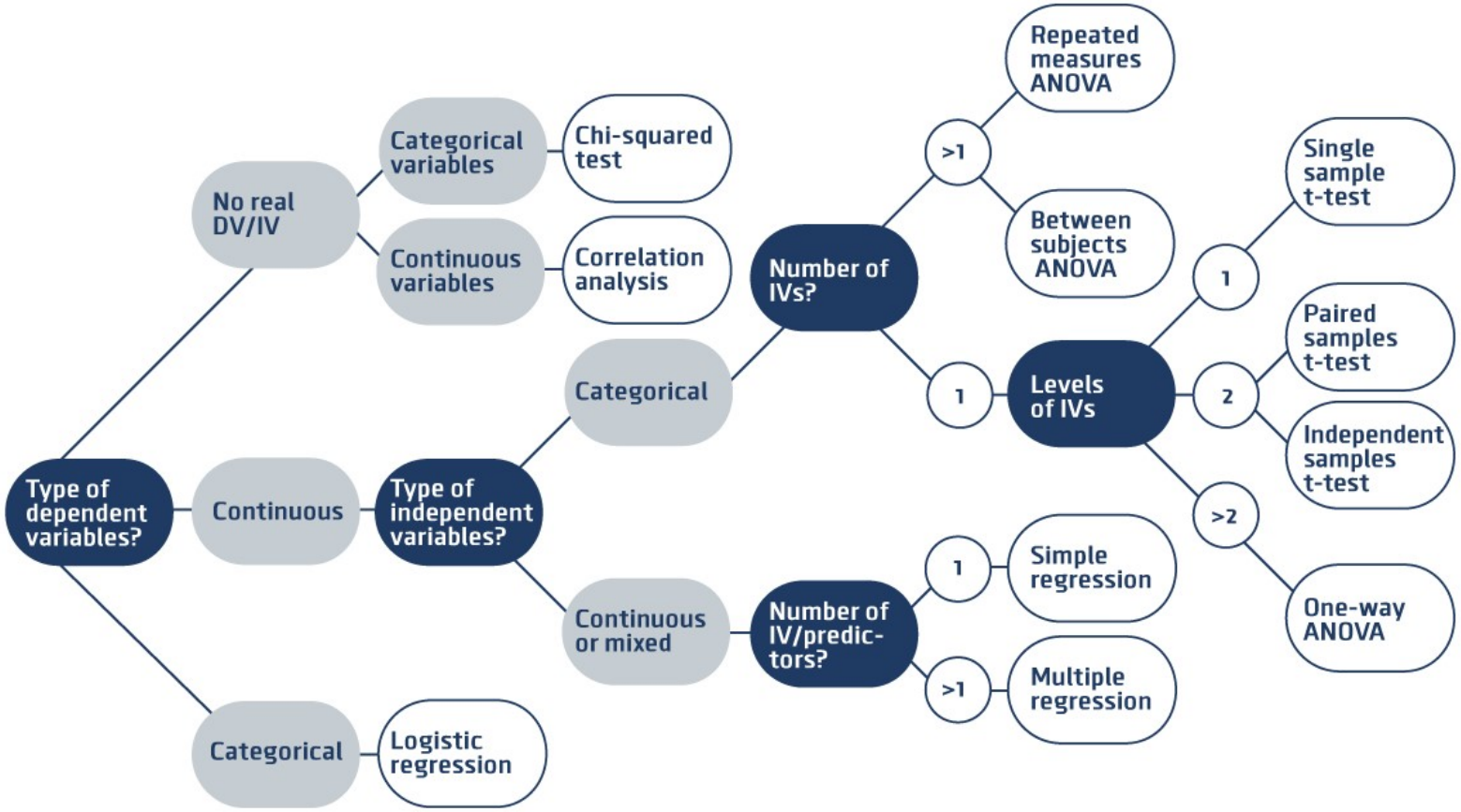
Research competence: Why does it matter?

- Acquire skills to plan and conduct an empirical study and analyze the data for your Master‘s thesis
- Acquire *scientific literacy* as citizens
  → Ability to evaluate claims derived from empirical findings
- Collect and learn from empirical data in professional contexts
  → Good practice is based on empirical evidence

Hypothetico-deductive model



Data analysis: The statistical toolbox


Type of dependent variables?
No real DV/IV
Categorical variables
Chi-squared test
Continuous variables
Correlation analysis
Continuous
Type of independent variables?
Categorical
Number of IVs?
>1
Repeated measures ANOVA
1
Between subjects ANOVA
Levels of IVs
1
Single sample t-test
2
Paired samples t-test
Independent samples t-test
>2
One-way ANOVA
Continuous or mixed
Number of IV/predic-tors?
1
Simple regression
>1
Multiple regression
Categorical
Logistic regression

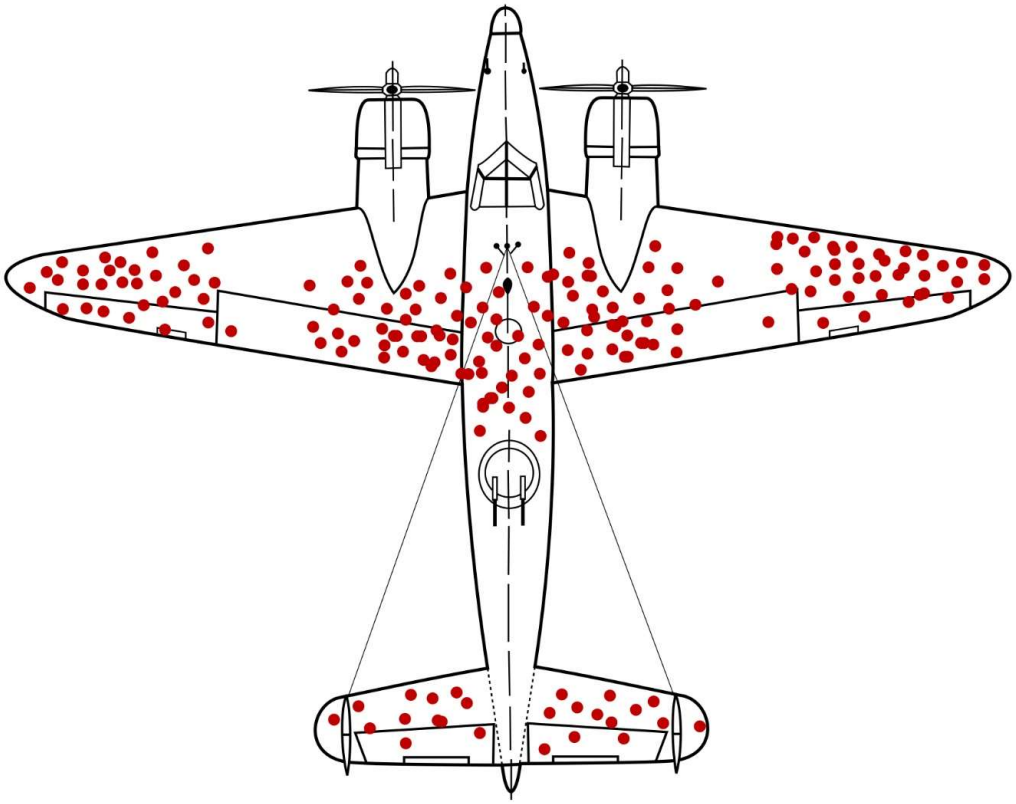
Agenda for the semester

Session	Date	Topic
1	13 October	Introduction
2	20 October	Descriptive data analysis
3	27 October	Hypothesis development and research design
4	3 November	Inferential data analysis I
5	10 November	Inferential data analysis II
6	17 November	Simple regression
7	24 November	Multiple regression
8	1 December	Logistic regression
9	8 December	Factor analysis
10	15 December	Cluster analysis
11	12 January	Conjoint analysis
12	19 January	The replication crisis and open science
13	26 January	Summary and questions
	11 February	**Exam** (multiple-choice format)

Challenges when working with empirical data

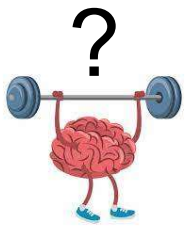
Systematically missing data

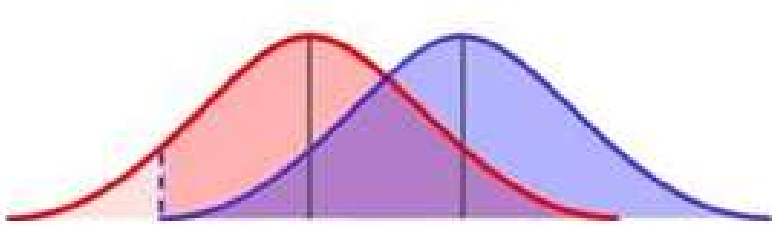
Abraham Wald



→ Bias in sample due to self-selection ("survivorship bias")

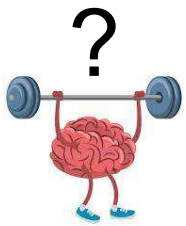
Observations are noisy

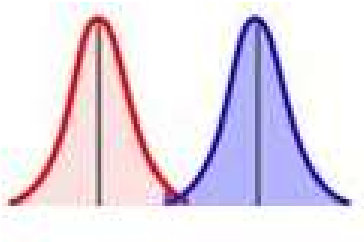




IQ

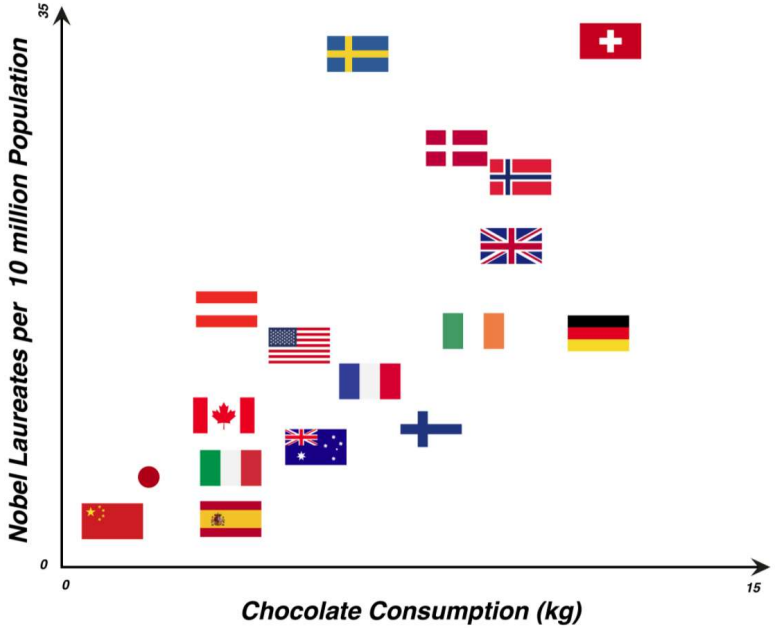
Observations are noisy

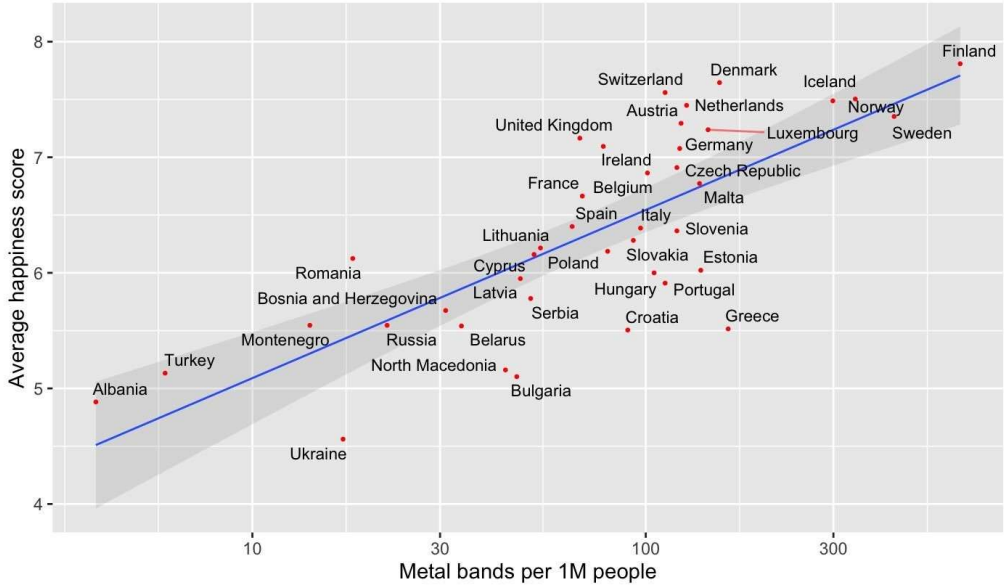




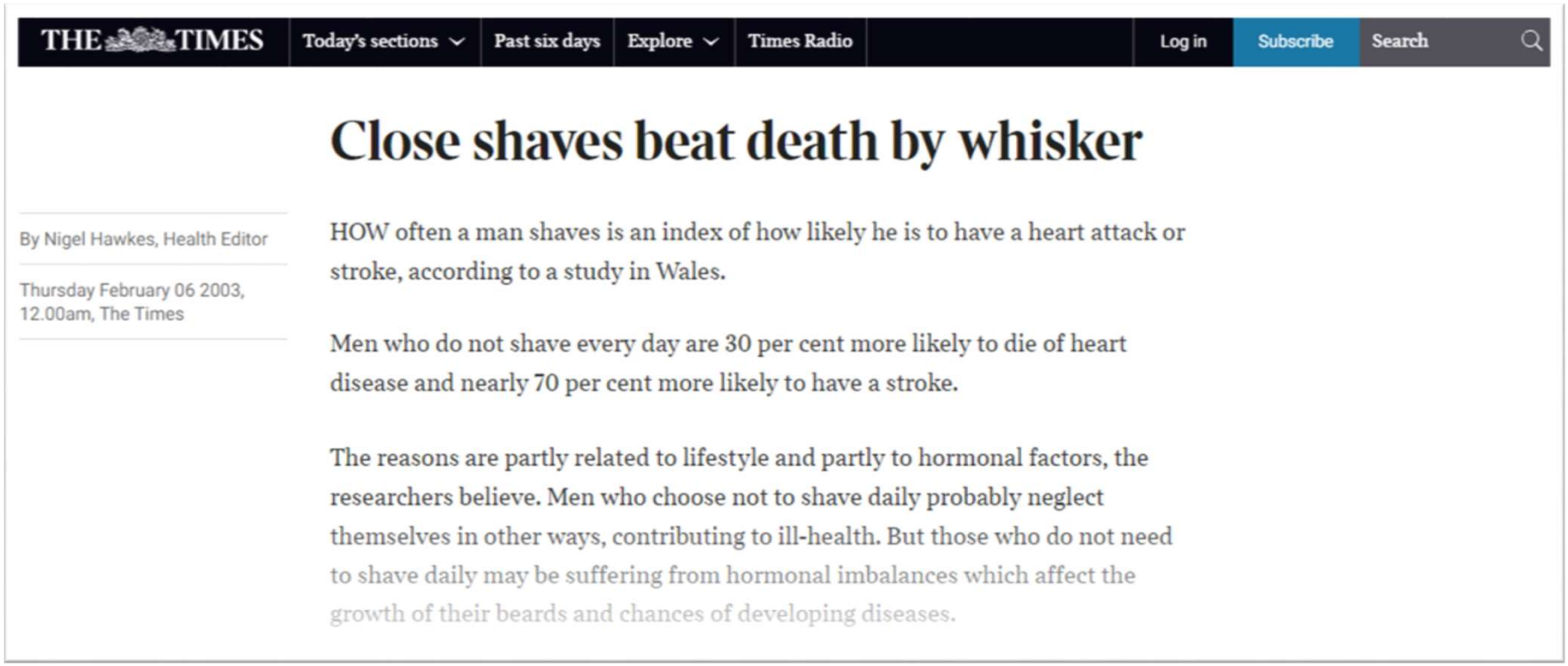
IQ

Correlation and causation





Correlation and causation



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Close shaves beat death by whisker

By Nigel Hawkes, Health Editor

Thursday February 06 2003, 12.00am, The Times

HOW often a man shaves is an index of how likely he is to have a heart attack or stroke, according to a study in Wales.

Men who do not shave every day are 30 per cent more likely to die of heart disease and nearly 70 per cent more likely to have a stroke.

The reasons are partly related to lifestyle and partly to hormonal factors, the researchers believe. Men who choose not to shave daily probably neglect themselves in other ways, contributing to ill-health. But those who do not need to shave daily may be suffering from hormonal imbalances which affect the growth of their beards and chances of developing diseases.

Correlation and causation

- In observational data causal relationships between variables are usually difficult to establish

- Necessary conditions for inference of causality
  (Shadish, Cook, & Campbell, 2002)
  - **Covariance rule**: The cause and the effect co-vary
  - **Temporal precedence rule**: The cause precedes the effect in time
  - **Internal validity rule**: No plausible alternative explanation exists for the co-variation

Correlational vs. experimental research

- Correlational

  → Observing the natural variation of variables to see whether they are associated

  Example: Collect data on self-chosen mode of work (onsite vs. home office) and see how this is associated with differences in productivity

- Experimental

  → Manipulating one or several variables (everything else is kept constant) to see whether this is leads to a difference on another variable

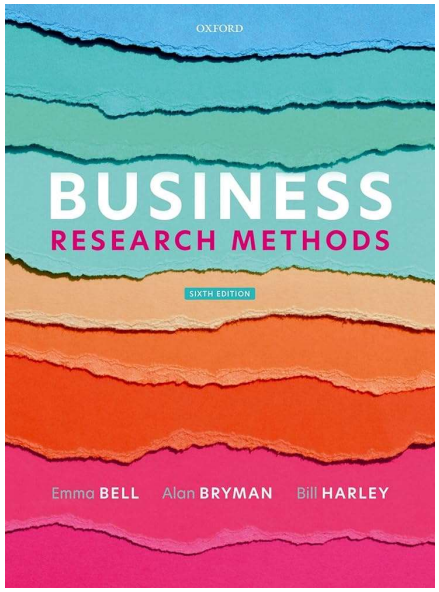
  Example: Assign employees randomly to a onsite vs. home-office condition and see how this leads to differences in productivity

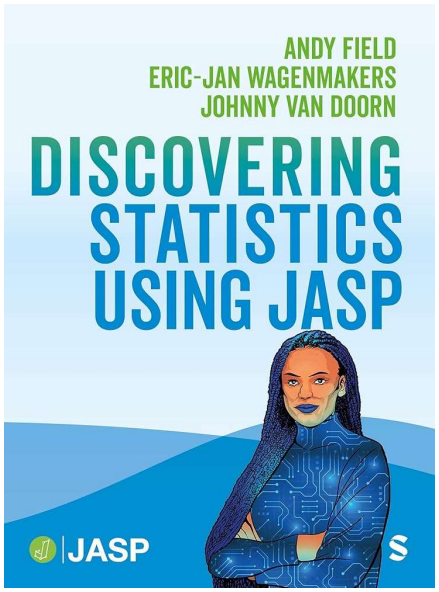
What can compromise the quality of empirical data?

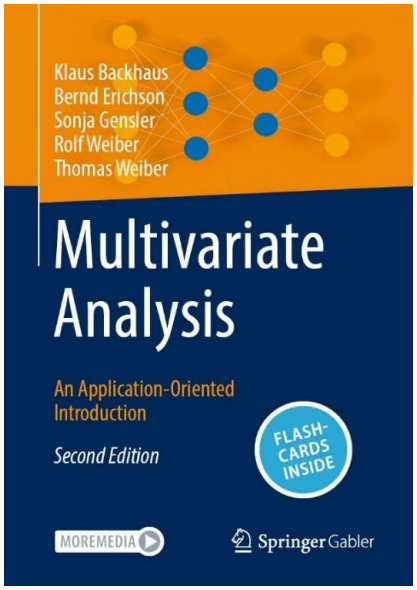
- Representativeness of sample (e.g., self-selection)
- Small sample size
- Confounding variables

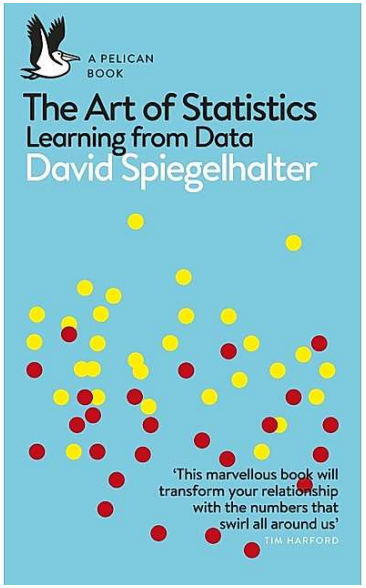
  → Can (to some extent) be controlled
  - Statistical control
  - Experimental control

Some recommended books







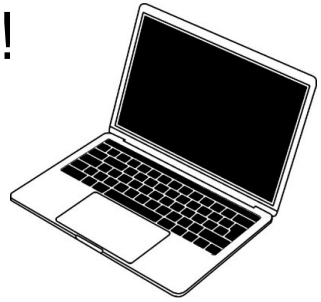


For the Exercise

- Download & install JASP

  https://jasp-stats.org/download/

- Please bring a **laptop** to the exercise session!
- Download **Materials folder** from the module website!



Self-quiz questions

- Give four goals of empirical research
- What are the steps of the hypothetico-deductive model?
- What is the difference between deduction and induction?
- What are three criteria for establishing a causal relationship between two variables?
- Give three methodological challenges when working with empirical data
- What is the difference between correlational and experimental research?

Background readings for next week

Tharenou, P., Donohue, R., & Cooper, B. (2007). The research process (p. 3–29). In: *Management research methods.* Cambridge University Press.

Spiegelhalter, D. (2019). Chapters 1–2 (p. 19–72). *The art of statistics.* Pelican.