

Quantitative methods

Lesson 8

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- 2 Averages
 - Examples
 - Case studies
- 3 Statistical dispersion
 - Examples
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Computation

Results

$$X = \{30, 90, 90, 60, 30\}$$

$$\bar{x} = \frac{30 + 90 + 90 + 60 + 30}{5} = 60$$

$$\text{median} = 60$$

$$\text{mode} = \{30, 90\}$$

$$\sigma = \sqrt{\frac{(30 - 60)^2 + (90 - 60)^2 + (90 - 60)^2 + (60 - 60)^2 + (30 - 60)^2}{5}} =$$

$$= \sqrt{\frac{720}{5}} = \sqrt{144} = 12$$

$$SE = \frac{12}{\sqrt{5}} = \frac{12}{2.236} = 5.366$$

The expected value can vary between 49.26 and 70.73 at 95% CI.

Descriptive statistics

Averages

There are several different averages (measures of central tendency) - with all different advantages and disadvantages:

- 1 **arithmetic mean:** $\frac{1}{n} \sum_{i=1}^n x_i = \frac{x_1 + x_2 + \dots + x_n}{n}$
- 2 **geometric mean:** $\sqrt[n]{\prod_{i=1}^n x_i} = \sqrt[n]{x_1 x_2 \dots x_n}$
- 3 **mode:** the most frequently occurring number/category in the sample
- 4 **median:** the middle number of the ranked variable
- 5 **midrange:** $\frac{\max x + \min x}{2}$

Descriptive statistics

Examples

Which of the above would you choose to describe . . .

- 1 your grades in this semester,
- 2 the average number of students in the library,
- 3 the central tendency of hair color at the university,
- 4 the salary of people living in Budapest,
- 5 loss of money in a pub at Saturday night.

Descriptive statistics

Case studies

Judge the following statements:

- 1 „The average weekly earnings went up 107 percent between 1940 and 1948 in the United States Steel Corporation.”
- 2 „The average salary in the same corporation was \$ 5.000 in 1942.”
- 3 „The probability of dying in a car accident is twice as much than being hit by an airplane.”
- 4 „Peter’s IQ is 98 and Linda’s is 101. A nice evidence of girls beeing smarter than boys.”
- 5 „This year I sleep twice as much than I used to last year. Should I feel happy?”

Descriptive statistics

Case studies

What average would you choose to describe the following variable asked in the European Values Study (Hungary, 2008):

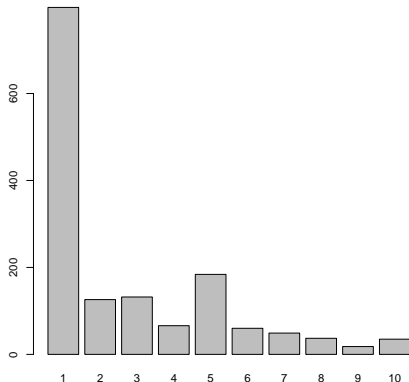
„Please tell me for each of the following statements whether you think it can always be justified (10), never (1) be justified, or something in between!”

- 1 Claiming state benefits which you are not entitled to
- 2 Abortion
- 3 Divorce
- 4 Avoiding a fare on public transport
- 5 Homosexuality

Descriptive statistics

Case studies

„Please tell me whether you think **Avoiding a fare on public transport** can always be justified (10), never (1) be justified, or something in between!”



Mean: 2.751

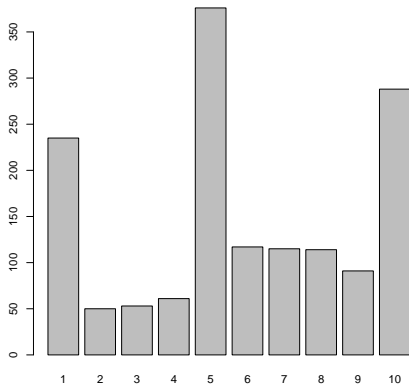
Mode: 1

Median: 1

Descriptive statistics

Case studies

„Please tell me whether you think **divorce** can always be justified (10), never (1) be justified, or something in between!”



Mean: 5.824

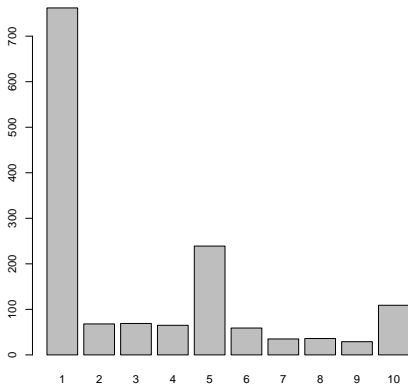
Mode: 5

Median: 5

Descriptive statistics

Case studies

„Please tell me whether you think **homosexuality** can always be justified (10), never (1) be justified, or something in between!”



Mean: 3.261

Mode: 1

Median: 1

Descriptive statistics

Case studies

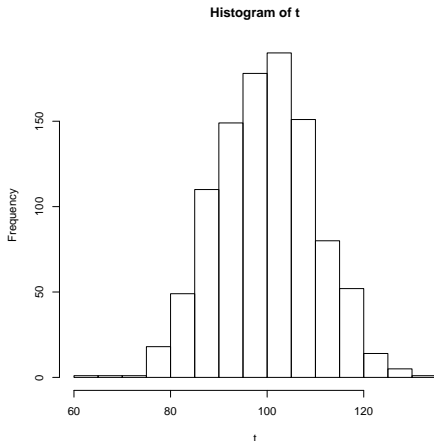
Research on intelligence (quotient) among students:



Descriptive statistics

Case studies

Research on intelligence (quotient) among students:



Mean: 99.6

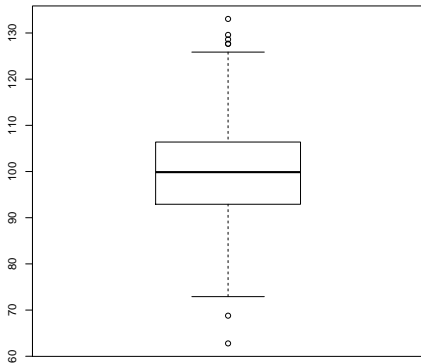
Mode: 89.2

Median: 99.8

Descriptive statistics

Case studies

Research on intelligence (quotient) among students:



Mean: 99.6

Mode: 89.2

Median: 99.8

Descriptive statistics

Case studies

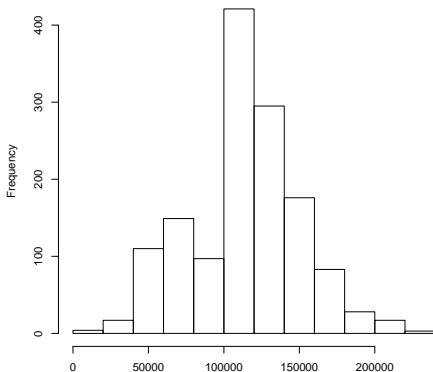
Research on salary of Hungarian people:



Descriptive statistics

Case studies

Research on salary of Hungarian people:



Mean:
113721

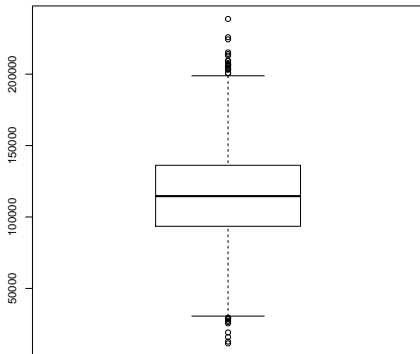
Mode: 72554

Median:
114613

Descriptive statistics

Case studies

Research on salary of Hungarian people:



Mean:
113721

Mode: 72554

Median:
114613

Descriptive statistics

Case studies

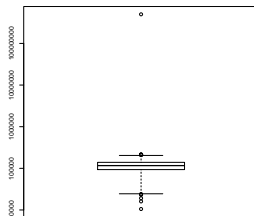
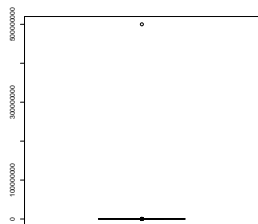
What happens when we have a really rich person in the sample?



Descriptive statistics

Case studies

What happens when we have a really rich person in the sample?



Mean:
471150

Mode: 72554

Median:
116299

Descriptive statistics

Statistical dispersion

There are several different statistical measures of variability or variation - with all different advantages and disadvantages:

① **range:** $\max x - \min x$

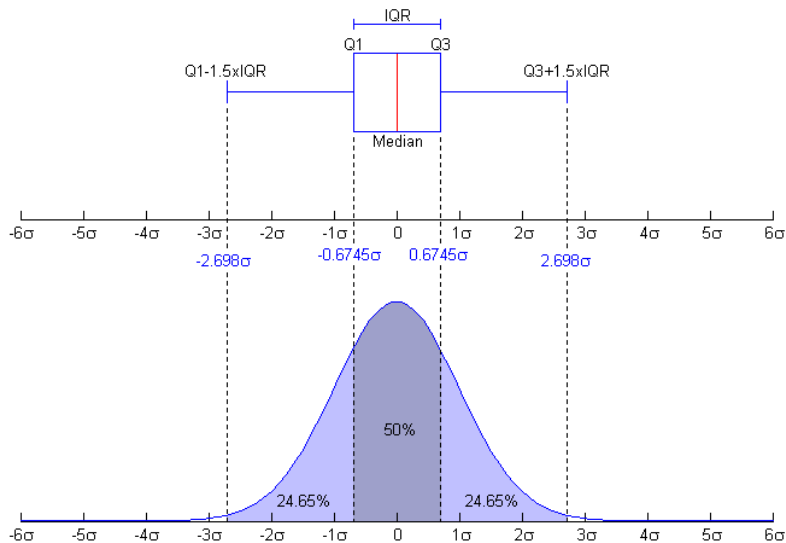
② **standard deviation:** $\sigma = \sqrt{\frac{\sum_{i=1}^N (x_i - \bar{x})^2}{n-1}}$

③ **variance:** σ^2

④ **interquartile range (IQR):** the difference between the third and first quartiles

Descriptive statistics

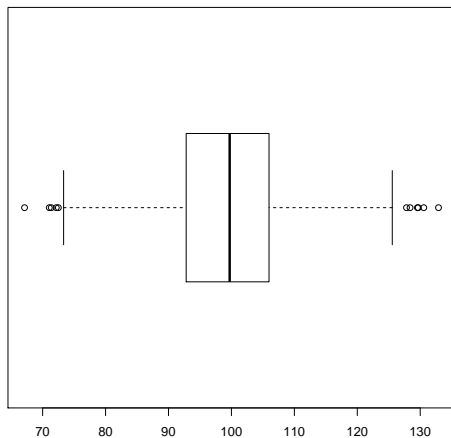
Interquartile range



Descriptive statistics

Interquartile range

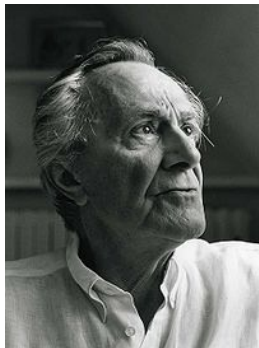
Research on intelligence (quotient) among students:



Descriptive statistics

Case study

Lyotard : The Postmodern Condition. A Report on Knowledge (1979)



- „end of 'grand narratives' or metanarratives”
- „anything goes”
- „postmodern and postmodern culture”

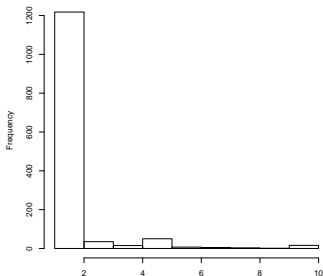
What about norms?

Descriptive statistics

Case studies

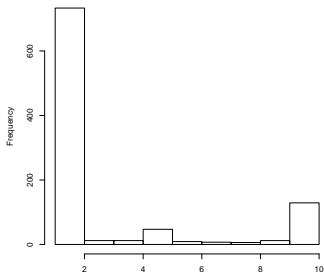
„Please tell me whether you think **homosexuality** can always be justified (10), never (1) be justified, or something in between!” – Hungary (1982-1991)

Hungary (1982)



$$\bar{x} = 1.447407; \sigma = 1.419384$$

Hungary (1991)

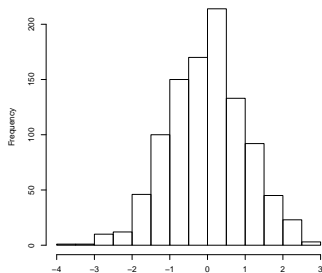


$$\bar{x} = 2.713547; \sigma = 3.230236$$

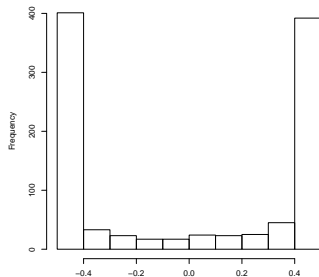
Descriptive statistics

Case studies

Check the mean and standard deviation of the following variables!



$$\bar{x} = -0.1; \sigma = 1.019$$

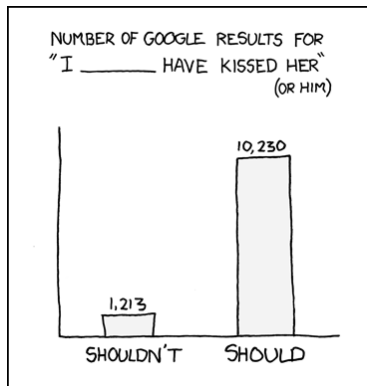


$$\bar{x} = 0; \sigma = 0.453$$

Descriptive statistics

Case studies

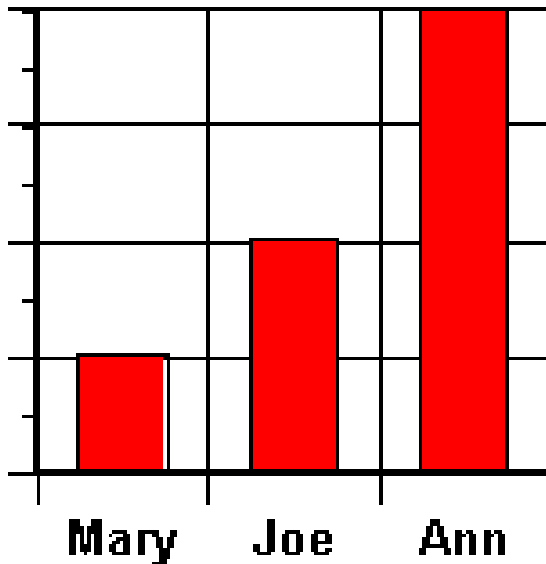
A new index of measurements: **sum**



What is the problem with this descriptive in this study?

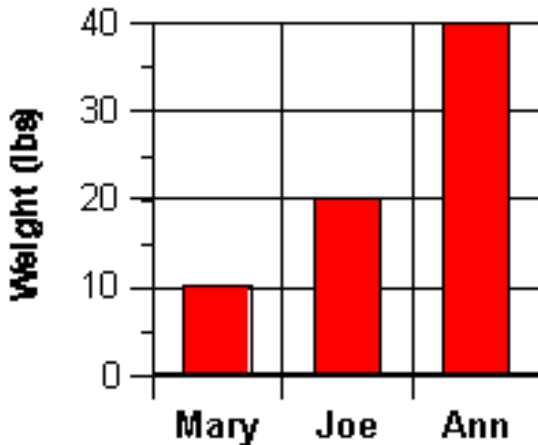
A small note on graphics

Pumpkins



A small note on graphics

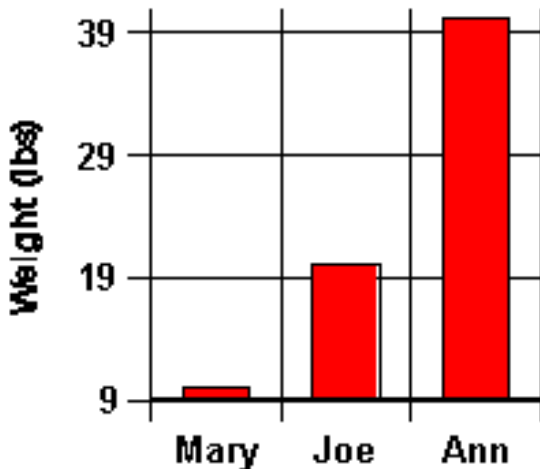
Pumpkins



Source: <http://faculty.washington.edu/chudler/stat3.html>

A small note on graphics

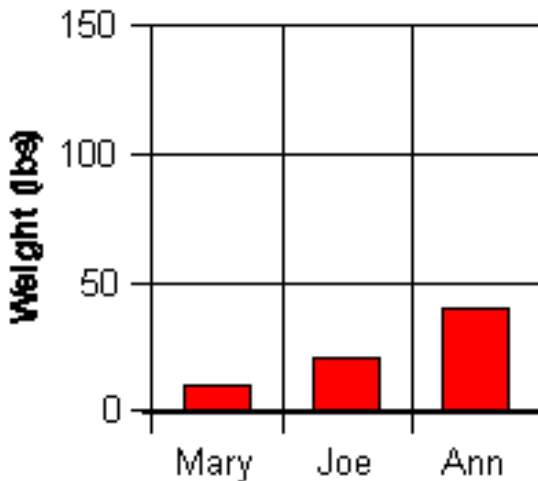
Pumpkins



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A small note on graphics

Pumpkins



Source: <http://faculty.washington.edu/chudler/stat3.html>

It was a pleasure!

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