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ADTRANS
ADVANCED DATA ANALYSIS FOR TRANSPORTATION AND MOBILITY ACADEMIC TEACHERS

Creating Graphs

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Co-funded by the European Union

THE IMPORTANCE OF GRAPHS

Data visualization

When to choose a graph, when a table, when just a verbal description?

THE IMPORTANCE OF GRAPHS

Data visualization

Chart

- Comparison of values, relationships between values

Table

- Displaying exact values

Verbal description

- Too small values, data without interesting trends or relationships

TYPES OF CHARTS

By purpose

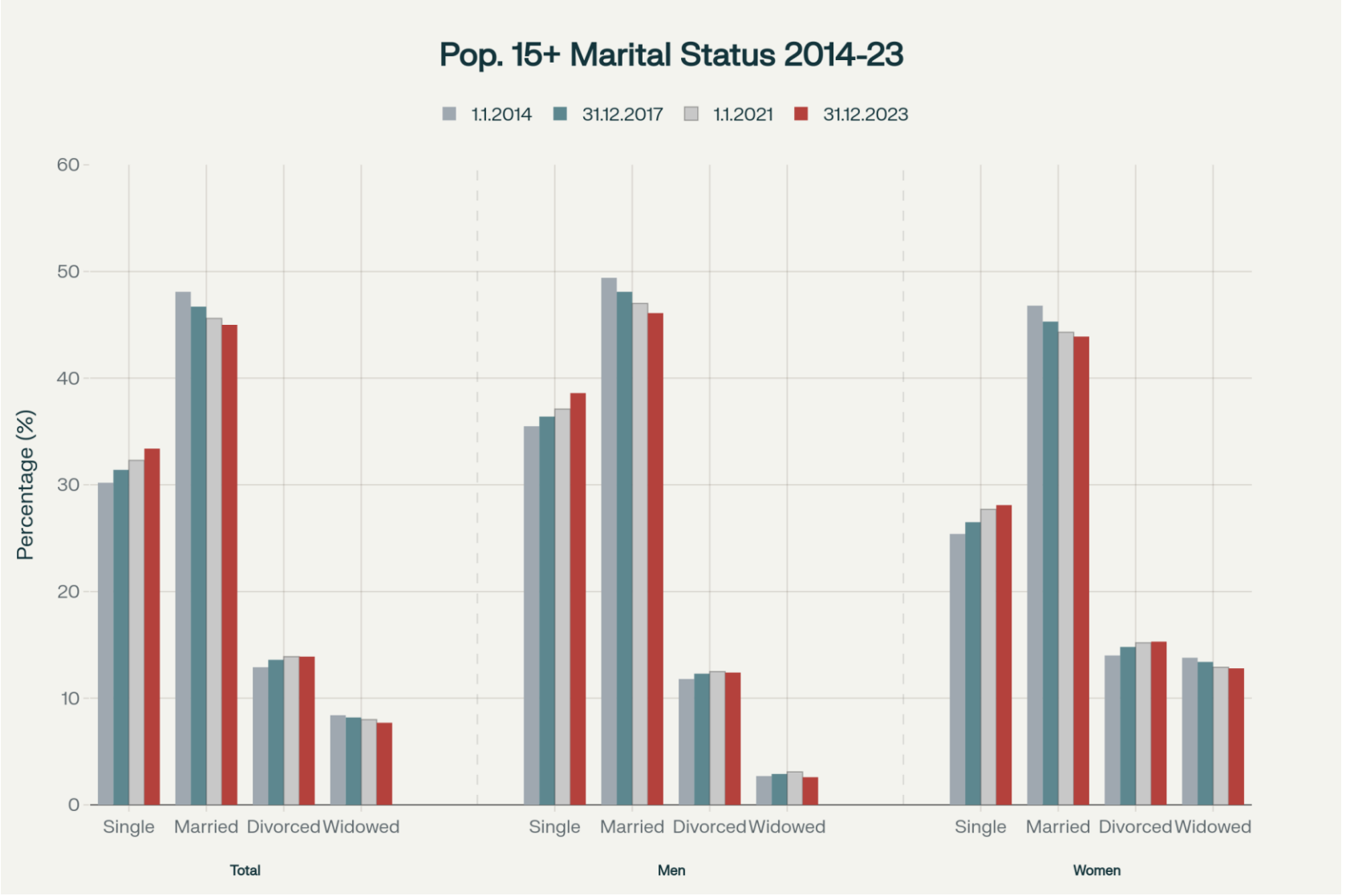
- I want to compare values

TYPES OF CHARTS

By purpose

- I want to compare values
  - Column/bar chart
    - Data values expressed as columns/bars, the length of which is proportional to the size of the values they represent
    - Relatively accurate, able to accommodate larger volumes of data

TYPES OF CHARTS



https://csu.gov.cz/produkty/vyvoj-obyvatelstva-ceske-republiky-3dxmkcjk5d

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TYPES OF CHARTS

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- I want to compare values
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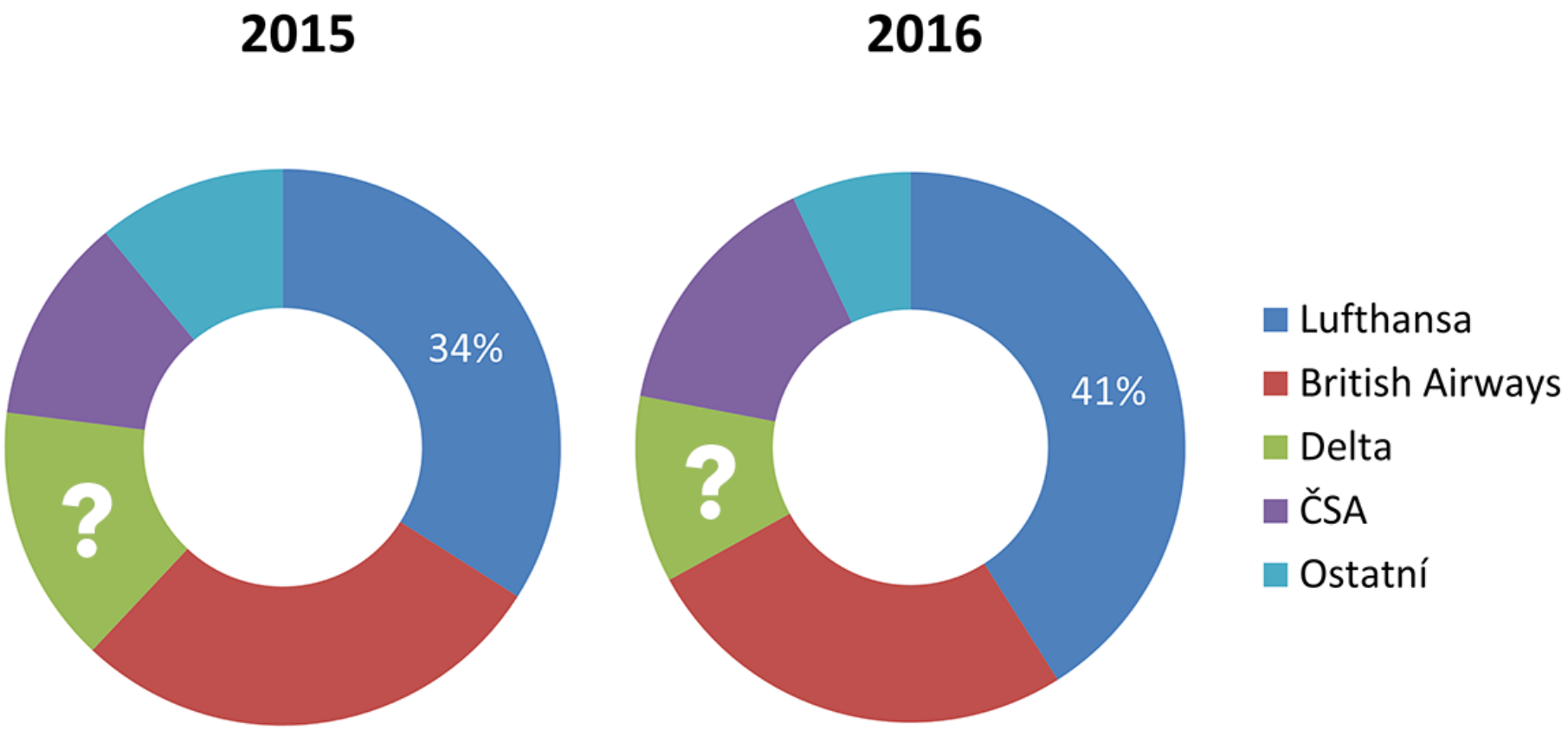
- I want to show the ratios of values
  - Pie (pie chart)
    - It expresses the share of individual elements in the whole using so-called sectors.
    - The sum of all shares in the graph always equals 100%.
    - One chart = always only one data series, but can include multiple categories – each as one slice
    - Recommendation: max. 8 slices – otherwise the graph will be unclear, better, e.g., a bar graph

TYPES OF CHARTS



https://www.odprezentuj.cz/blog/3-chyby-ktere-pri-tvorbe-grafu-delate-i-vy/

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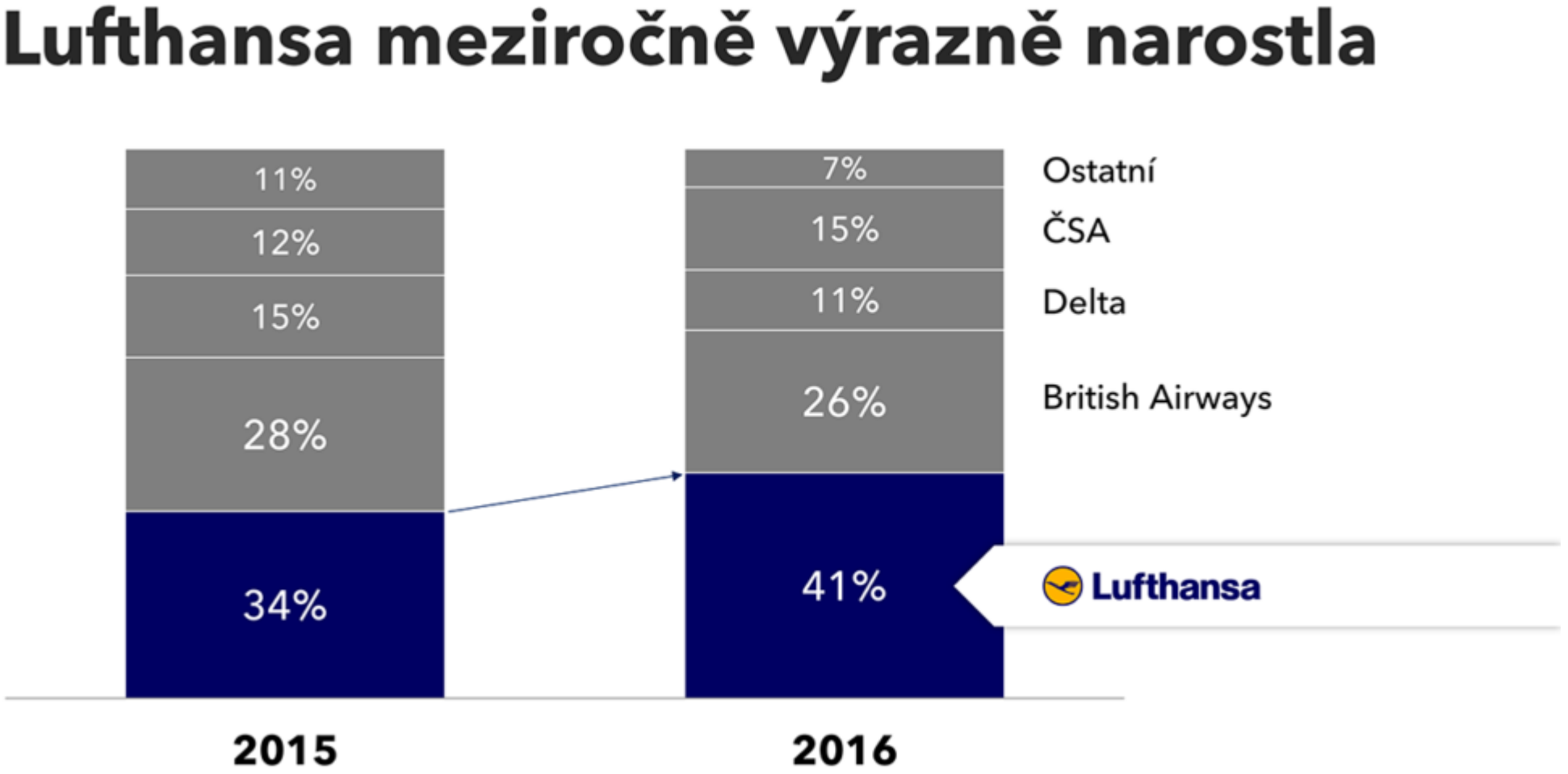

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TYPES OF CHARTS

By purpose

- I want to compare values
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  - Pie (pie chart)
- I want to show the development of values over time

TYPES OF CHARTS

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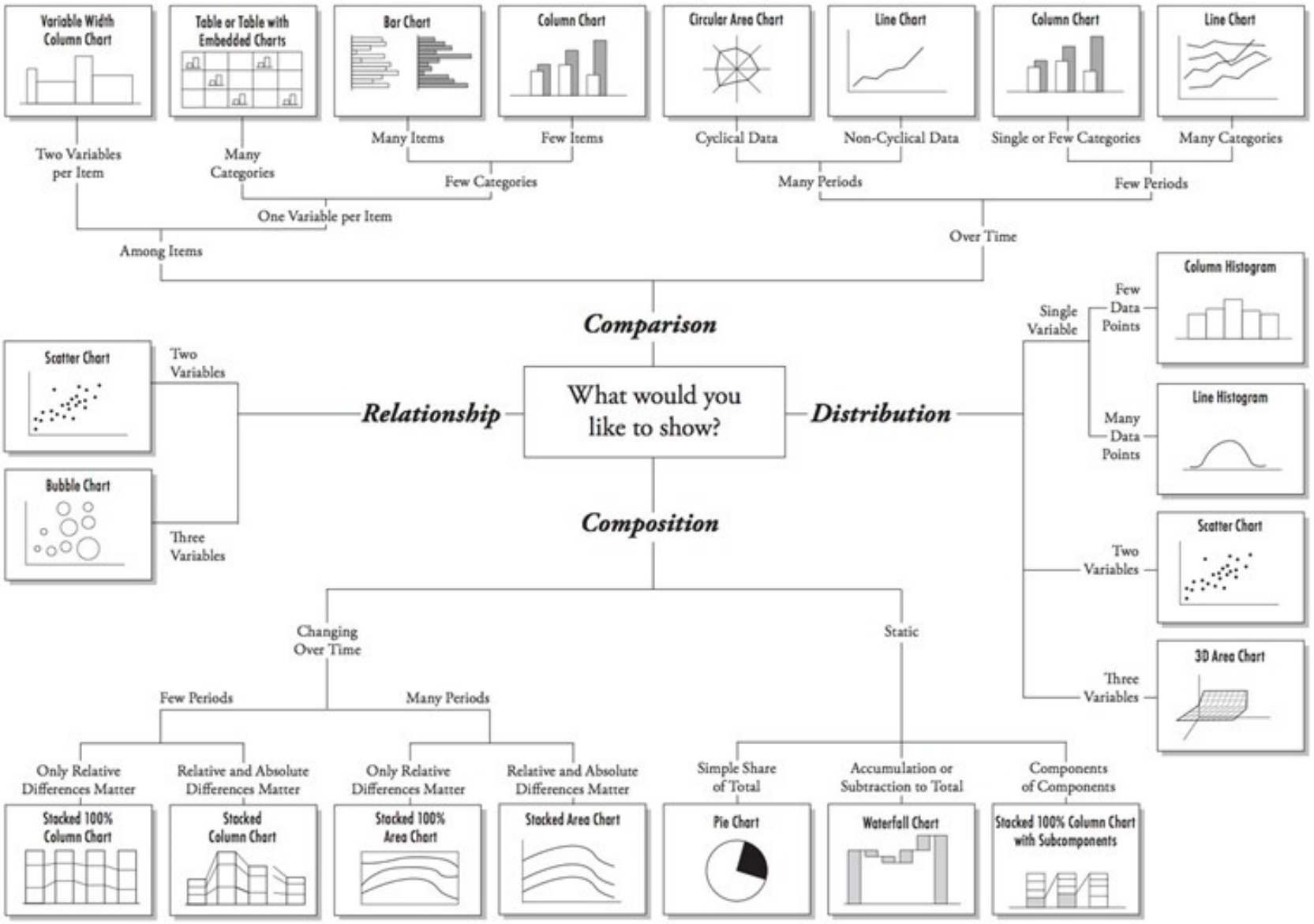
- I want to compare values
  - Column/bar chart
- I want to show the ratios of values
  - Pie (pie chart)
- I want to show the development of values over time
  - Line chart
    - Values entered using so-called data points connected by lines – better comparison of values, easier to assess increases and decreases
    - Ability to visualize multiple data series at once

Chart Suggestions—A Thought-Starter



https://kisk.phil.muni.cz/media/3125662/kisk.phil.muni.cz/kpi/formalni-zpracovani-textu/tvorte-dobre-grafy.html

PRINCIPLES OF CREATING GRAPHS

Clear input data

- Data complete, without duplication and consistent (e.g. units used, scale)
- Arrange into a simple grid of rows and columns
- Do not insert spaces between rows and columns
- Choose names appropriately, include them when creating

PRINCIPLES OF GRAPH CREATION

Chart name

- A concise title
- Often in a text editor

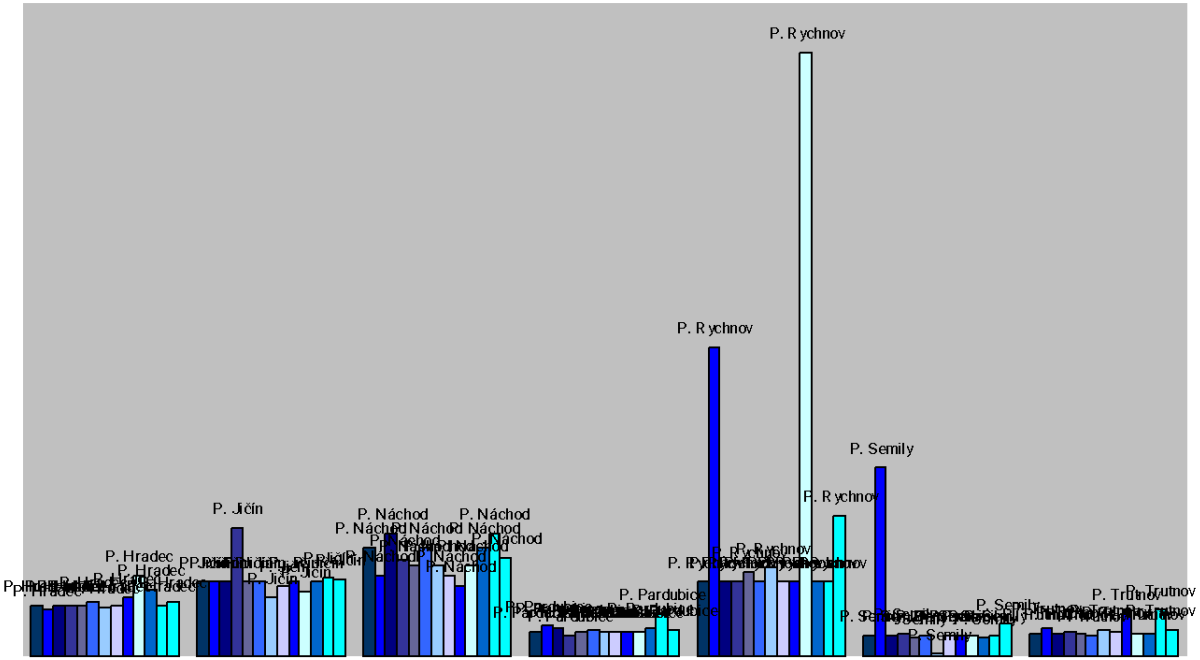
Axis description

- Always a description with units of measurement
- Horizontal axis – independent variable
- Vertical axis – dependent variable

Legend

- Most often placed at the top, right, directly in the graph, but can be placed as needed and for clarity

EXAMPLE OF AN UNSUITABLE GRAPH



PRINCIPLES OF GRAPH CREATION

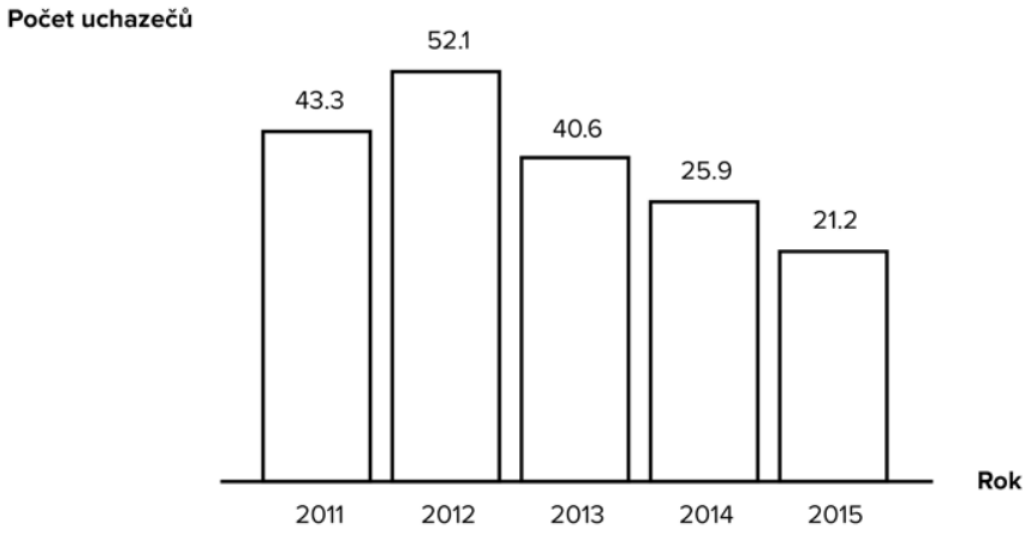
Functionality above all

- Key clarity
- Do not overcrowd the chart with animations, effects, or colors.
- Key color
  - How will the chart be used in the future (e.g. printing, resolution even in black and white)?
  - Sufficiently contrasting colors

PRINCIPLES OF GRAPH CREATION AVOID MANIPULATION

The most common forms of graph manipulation

- Failure to observe proportions
  - The size of each graph element should correspond to the value measured on the axis – If the axis is missing, it is difficult to verify proportions



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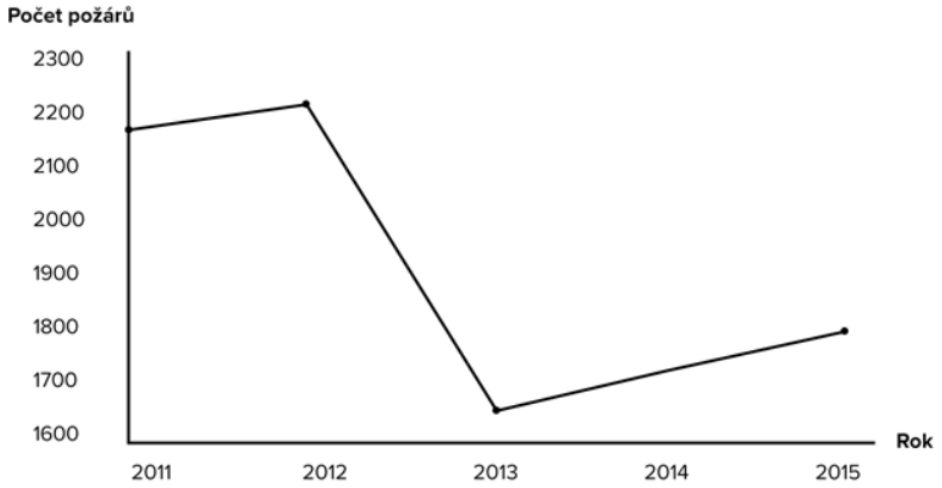
PRINCIPLES OF GRAPH CREATION AVOID MANIPULATION

The most common forms of graph manipulation

- Axes undercutting
  - When displaying high values in a graph, many tools automatically place the origin of the *y- axis* higher – making potential differences in values more obvious – a fine procedure, often necessary, but the reader needs to be warned



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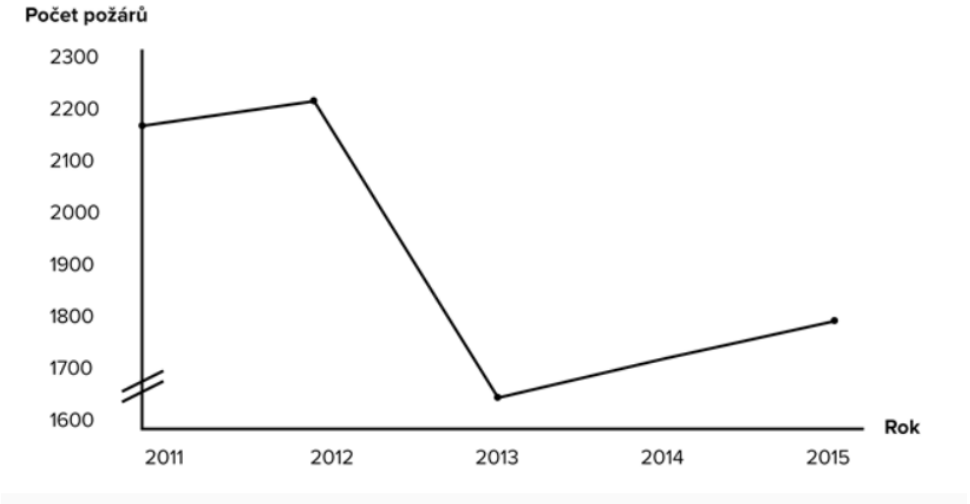

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AGE STRUCTURE ASSESSMENT

Use of indicators – e.g.?

Graphic

AGE PYRAMID

Graphical representation of the age structure of the population by gender

Double histogram

X-axis – population numbers in age groups

Y-axis – age groups

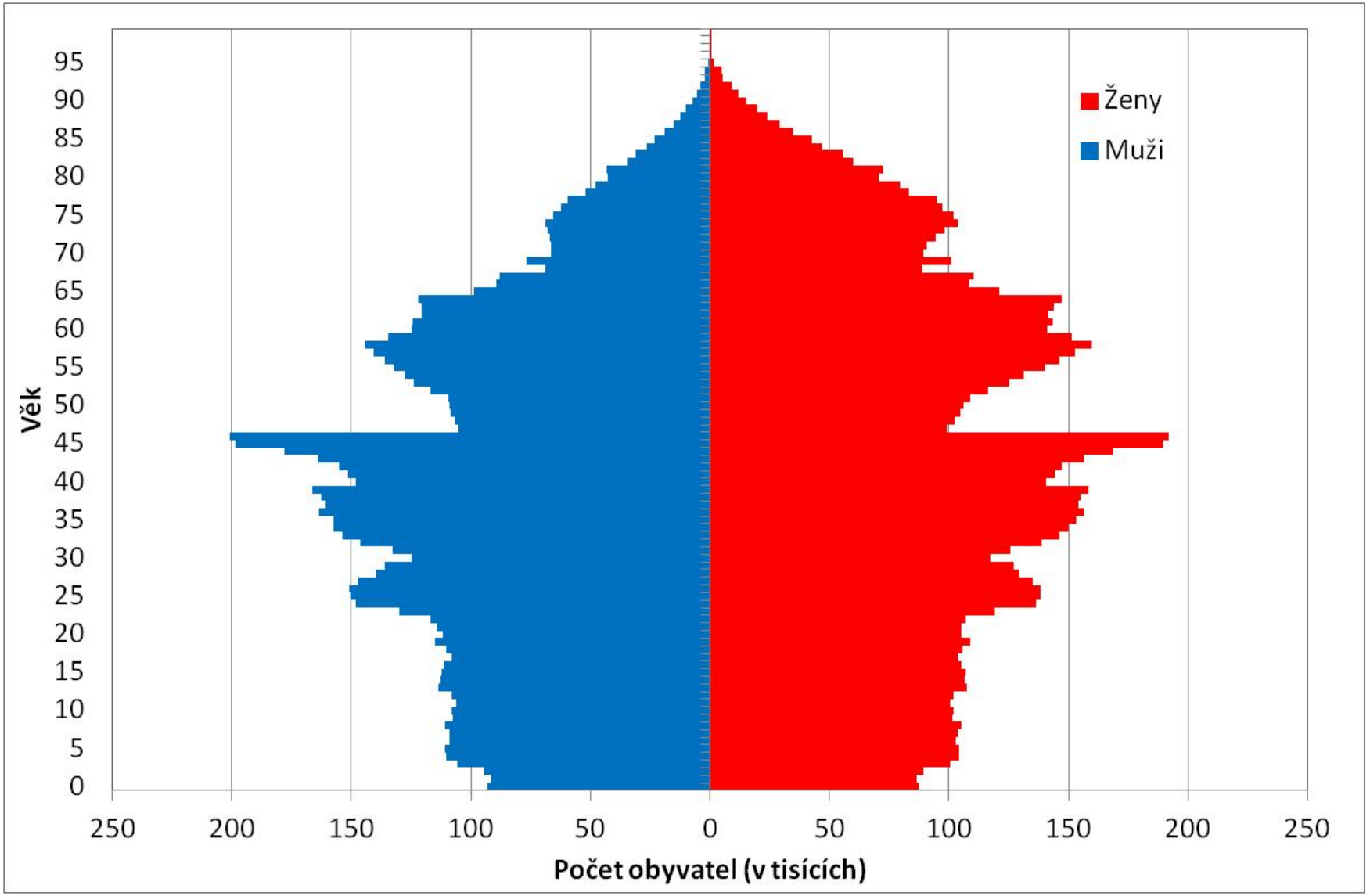
Men on the left, women on the right

All age groups must be the same width!

Relative or absolute representation

https://www.ined.fr/en/everything_about_population/population-games/world-population-me/

EXAMPLE: AGE PYRAMID, ROMANIA, 2014



Data source: Eurostat, 2016

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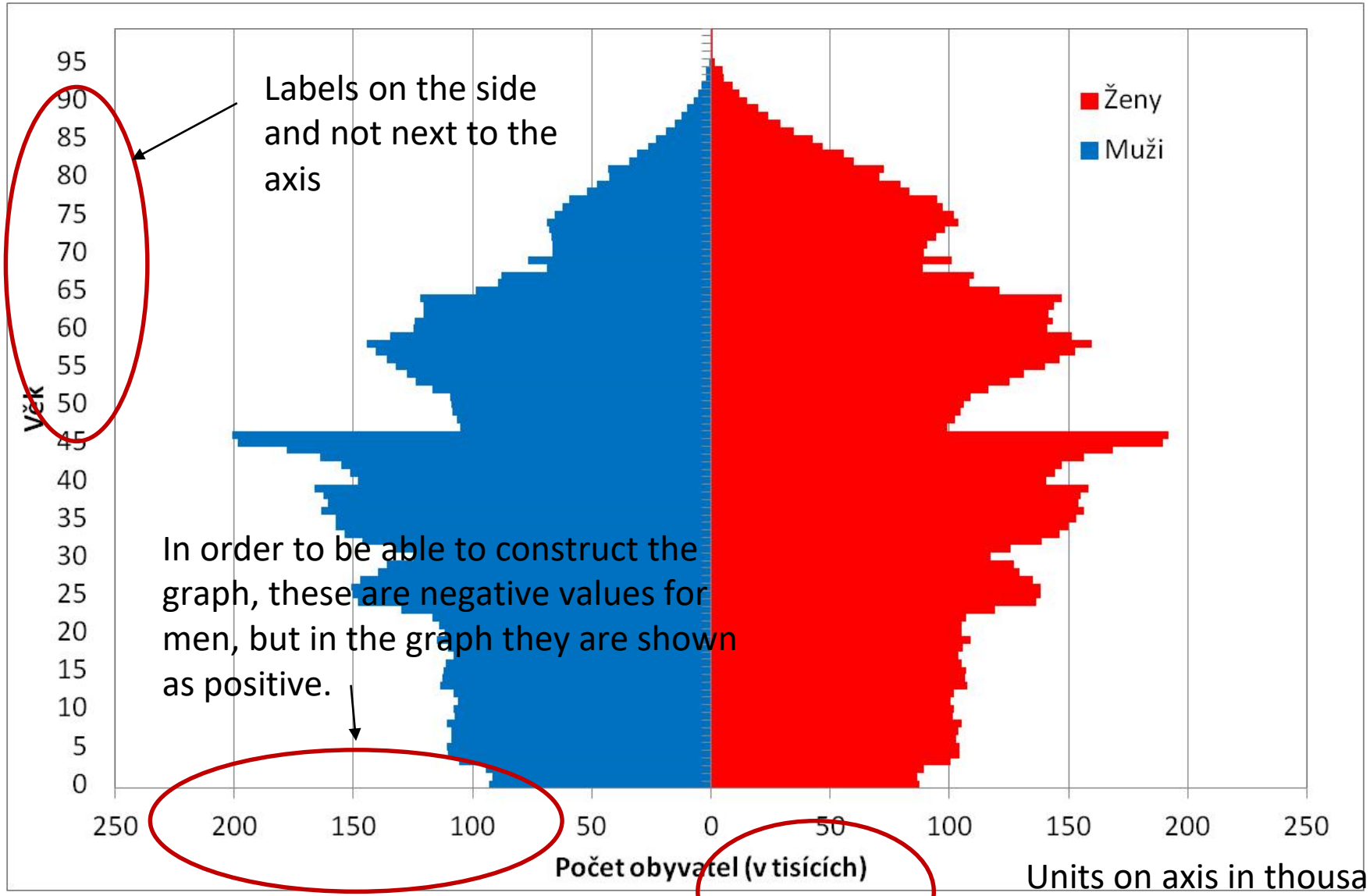


Data source: Eurostat, 2016

CREATION OF THE AGE PYRAMID

Data editing

- Men mostly on the left, women on the right

  Input data → modified input data

	Muži	Ženy
0	93 050	87 597
1	91 563	86 688
2	94 561	89 496
3	105 680	100 306
4	110 282	104 052
5	110 992	104 453
6	108 779	102 827
7	108 996	103 746
8	110 736	104 959

	Muži	Ženy
0	-93 050	87 597
1	-91 563	86 688
2	-94 561	89 496
3	-105 680	100 306
4	-110 282	104 052
5	-110 992	104 453
6	-108 779	102 827
7	-108 996	103 746
8	-110 736	104 959

  - E.g.

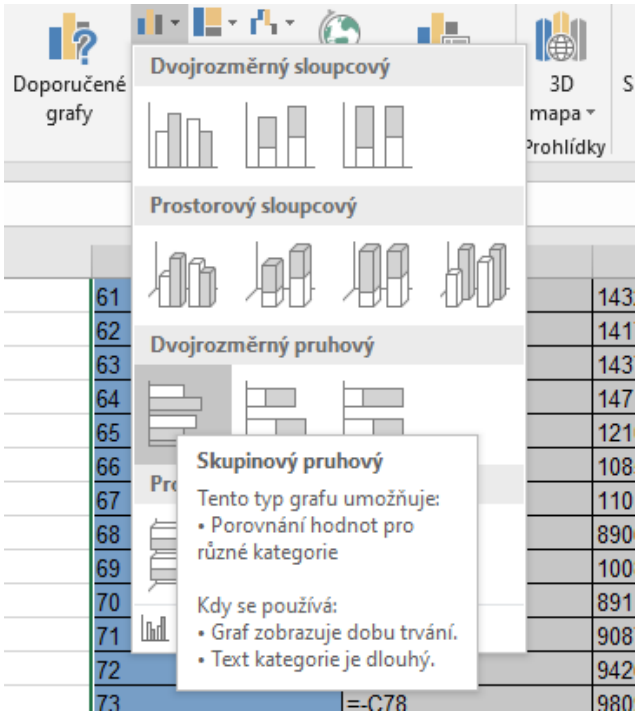
    - So just type =-a reference to the cell with the original value in the new cell

	B	C	D	E	F	G	H
		Muži	Ženy			Muži	Ženy
0	0	93050	87597		0	=-C5	87597
1	1	91563	86688		1	=-C6	86688
2	2	94561	89496		2	=-C7	89496

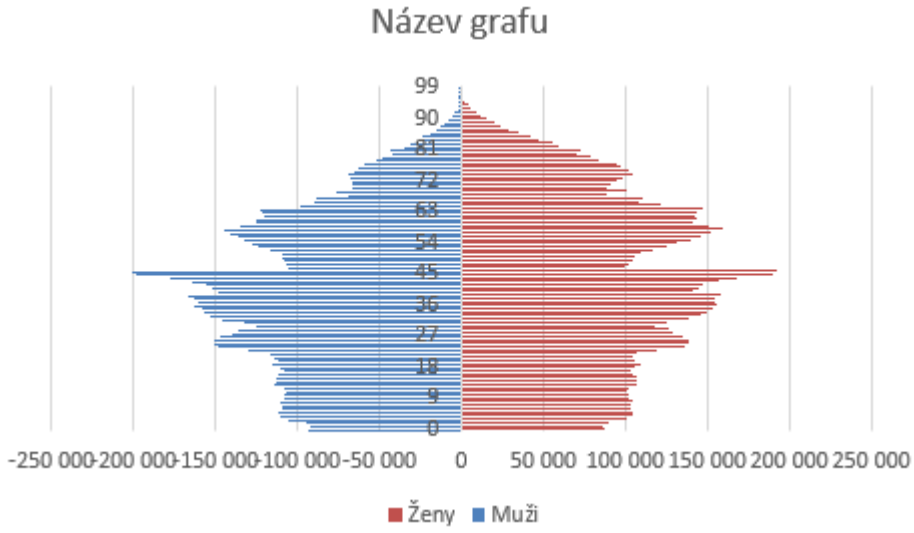
CREATION OF THE AGE PYRAMID

Insert chart from edited data

- Bar chart



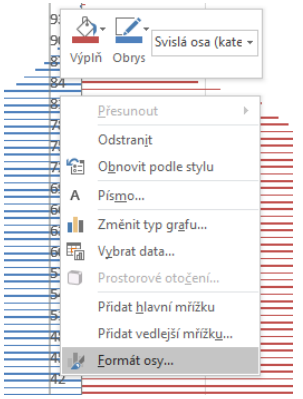
The inserted graph will look something like this:



CREATION OF THE AGE PYRAMID

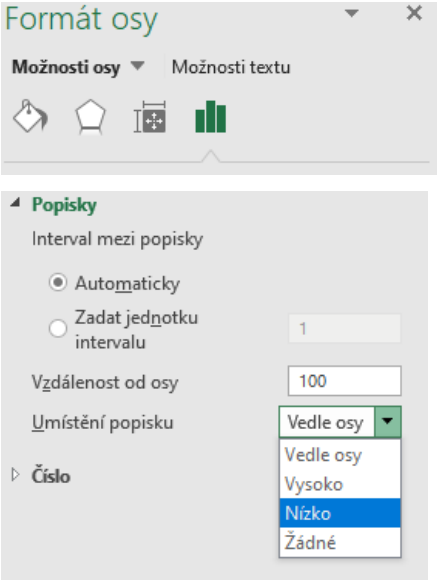
Y-axis labels

- Right-click on the y-axis
  - Select Axis Format option



  - In the Axis Format menu – Axis Options

  - At the bottom - the Labels category
    - Label Position - Low



CREATION OF THE AGE PYRAMID

Positive values for men on the x-axis

- Right-click on the x-axis → select Format Axis again
- Axis options – at the very bottom of the Number category
  - In the format code field, write 0;0
  - Click on the button
  - In the graph, negative values for men are "changed" to positive (the data was not edited, only displayed)

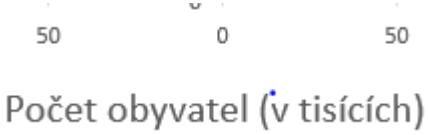
CREATION OF THE AGE PYRAMID

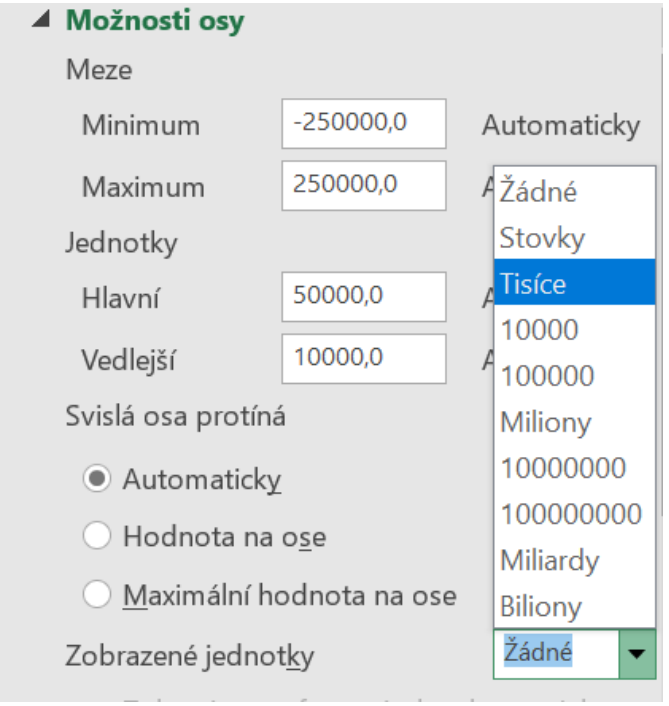
Setting thousands on the x-axis

- Or a suitable change of units so that there is not an unnecessarily large number of zeros in the labels
- Right-click on the x-axis → select Format Axis again
- Top Axis options
  - Displayed units - Thousands

    → also inserts a label into the graph –

    but it is more appropriate to enter the information about units in the axis name



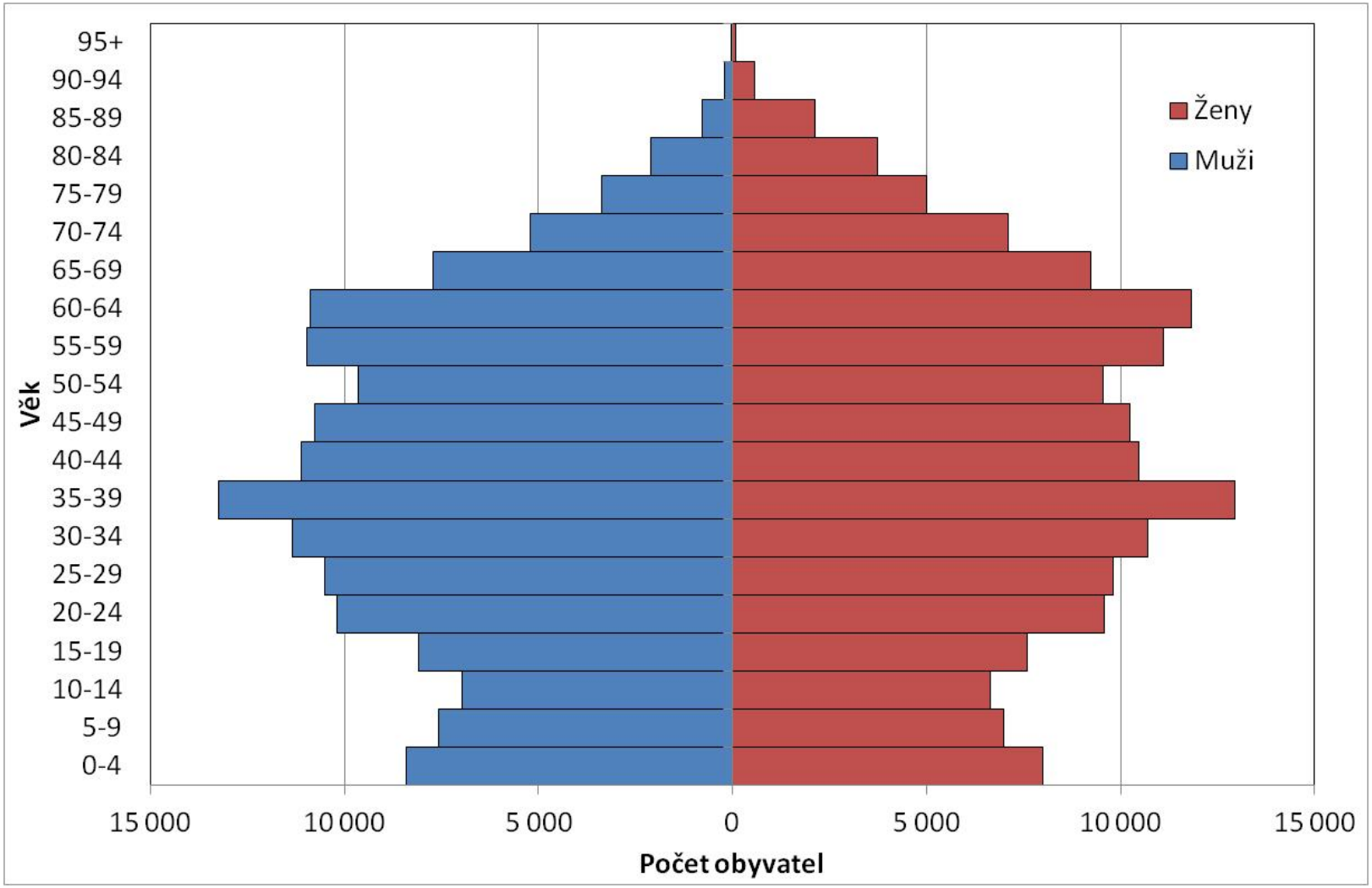


CREATION OF THE AGE PYRAMID

Other modifications

- Font size and color
- Row colors – but in the pyramid, men often have a shade of blue and women have a red/pink shade
- Overlapping rows and columns
- Axis names

AGE STRUCTURE OF POPULATION, KARLOVY VARY REGION, 2012



Source: Czech Statistical Office. 2015