Descriptives, Crosstabs, Correlation

Methodology of Conflict and Democracy Studies

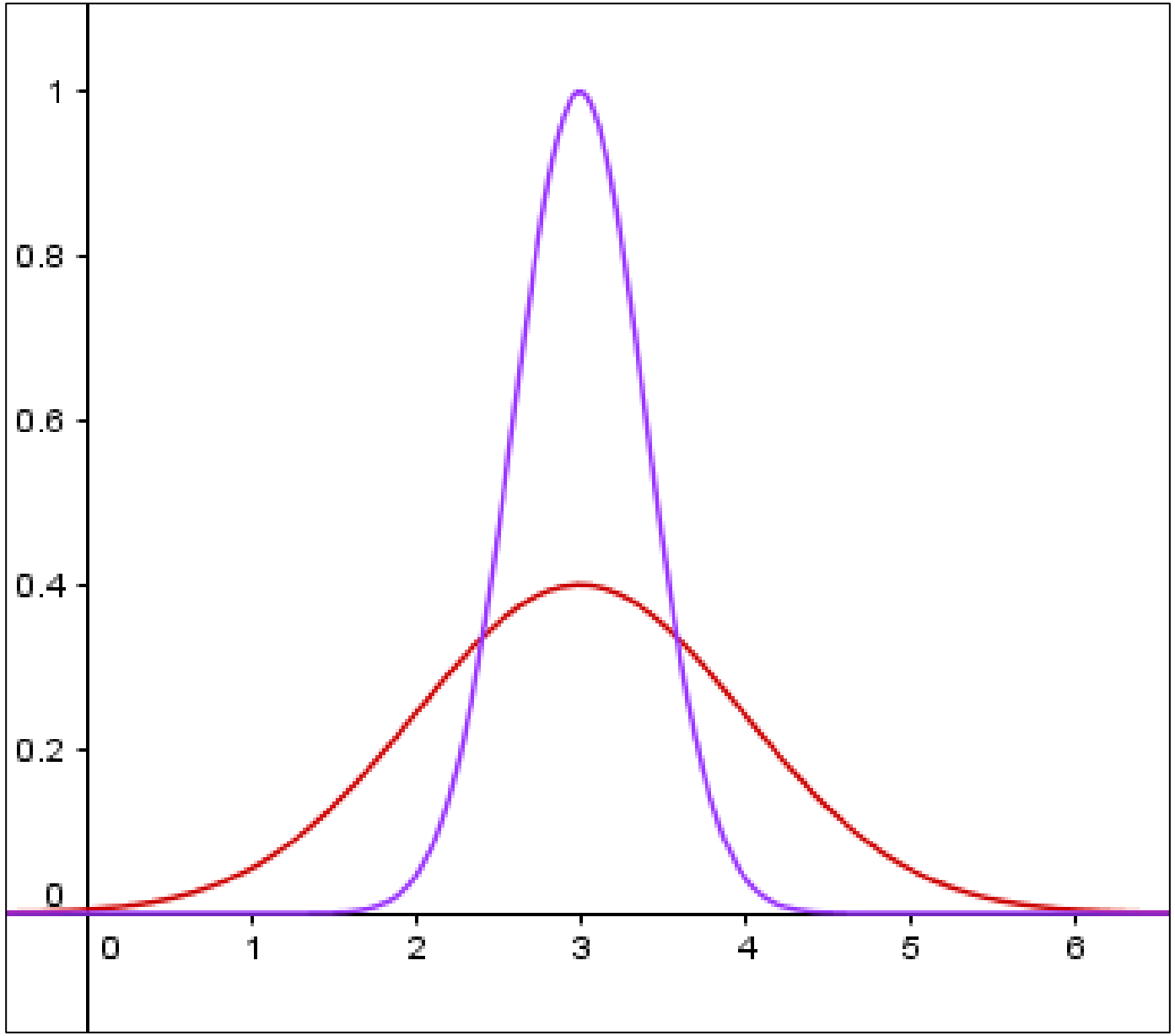
December 5

Aim of this lecture

- How to obtain basic information about your data
- Control of the assumptions
- Association of two variables:
  - Crosstabs (Contingency tables)
  - Correlation

Descriptive Statistics

- Basic measures to summarize the characteristics of your data
- Various types:
  - Central tendencies – mean, median
  - Dispersion – variance, minimum, maximum
- Not all descriptives are suitable for all types of variables
- We use them to describe and explore your data


1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6

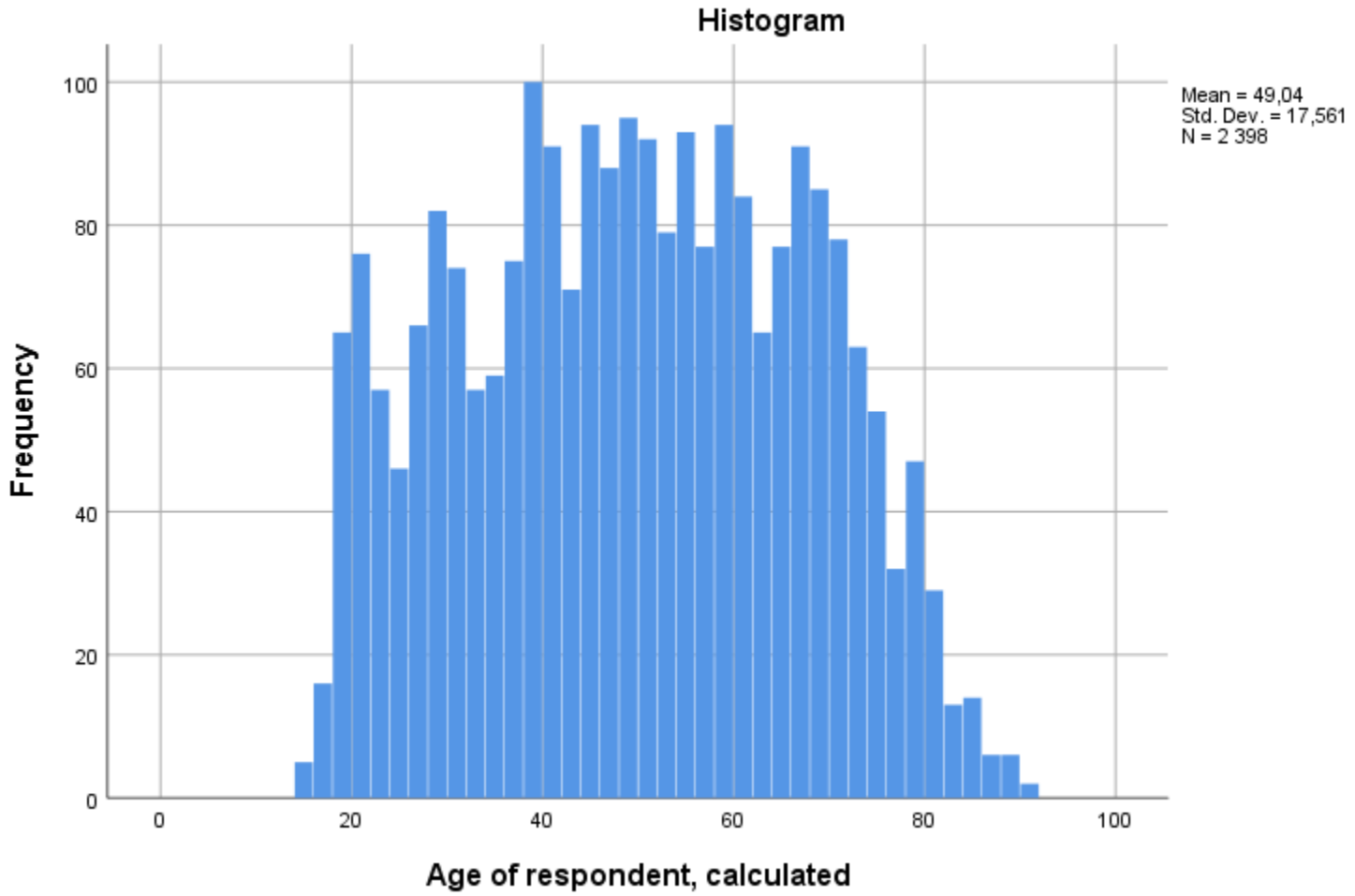
How to Obtain Descriptives in SPSS

- Analyze > Descriptive Statistics > Frequencies
- Move variables of interest to the right
- In ‘Statistics’ choose all measures you require

Statistics

Age of respondent, calculated

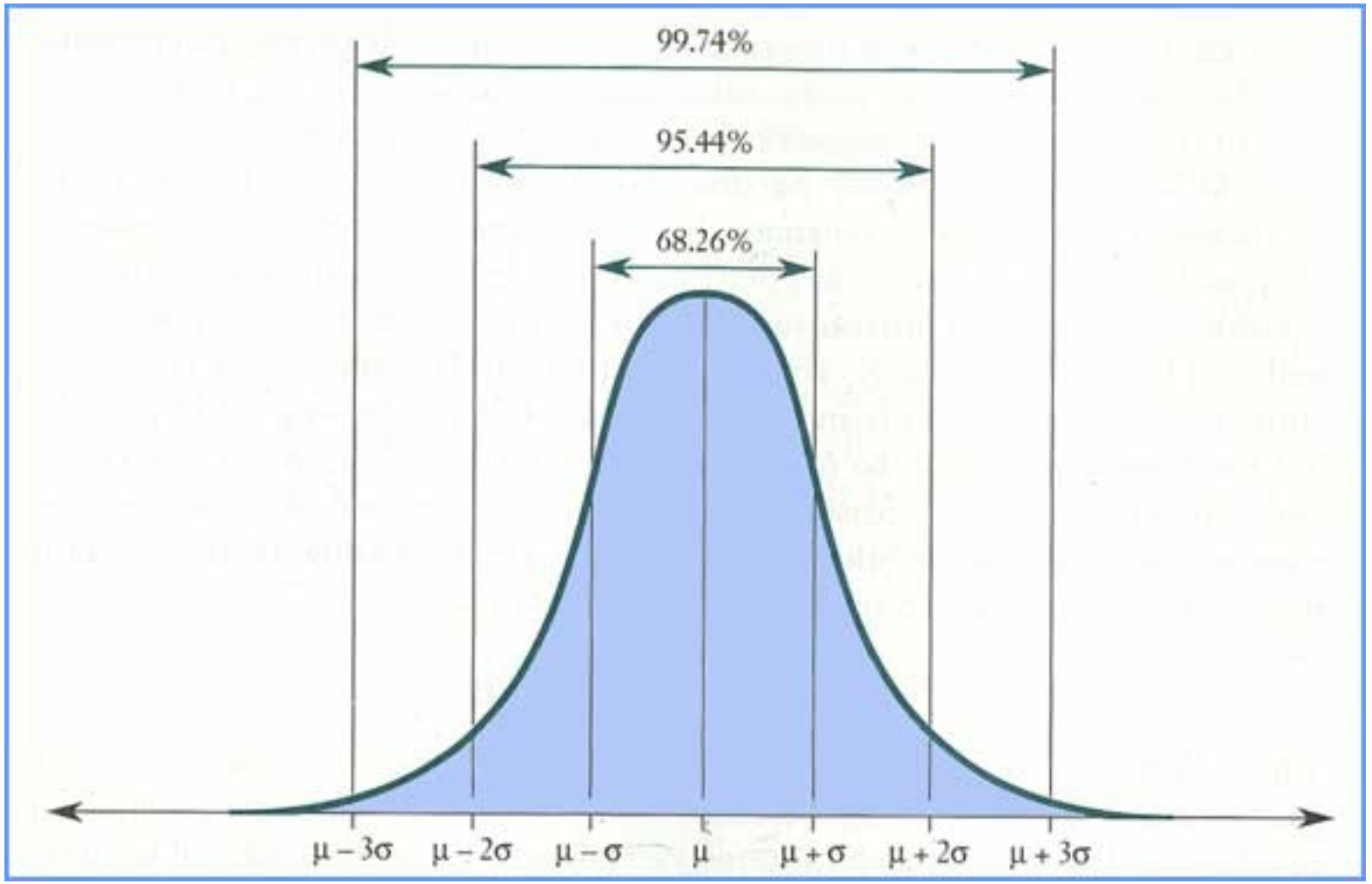
N	Valid	2398
	Missing	0
Mean		49,04
Median		49,00
Mode		50
Std. Deviation		17,561
Minimum		15
Maximum		90
Sum		117591



Assumptions of Data

- Not all data are suitable for all statistical tests
- Parametric and Non-parametric tests
- Parametric tests as a preference v. higher requests on data

Normal Distribution



How to Check the Distribution

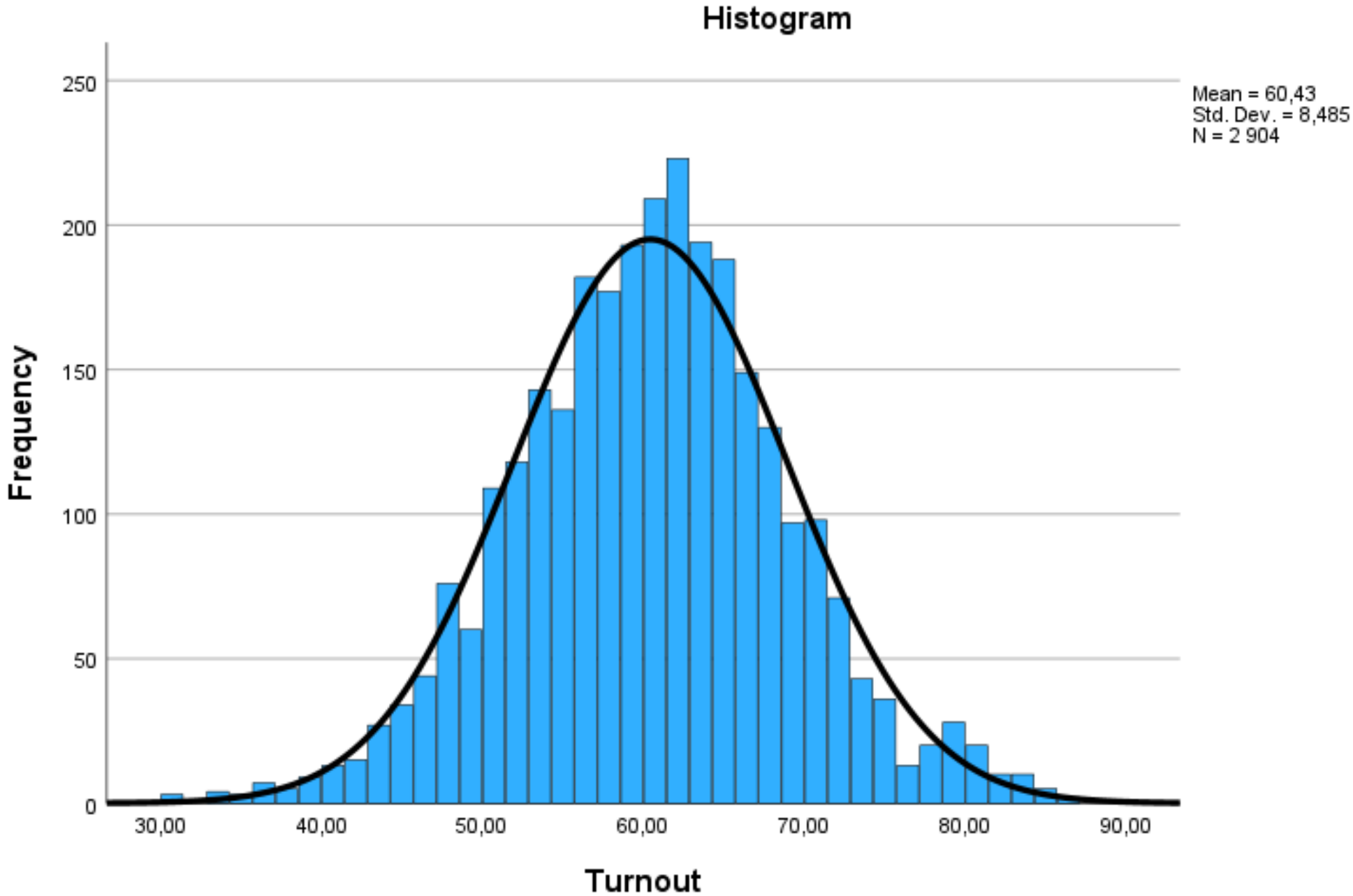
1) Visual control – Histogram

2) Statistical tests:

- Kolmogorov-Smirnov
- Shapiro-Wilk

1) Histogram

- Analyze > Descriptive Statistics > Frequencies
- In ‘Charts’ choose ‘Histogram’
- Select ‘Show normal curve on histogram’ to draw a line corresponding to normal distribution


Histogram
Mean = 60,43
Std. Dev. = 8,485
N = 2 904
Frequency
250
200
150
100
50
0
30,00
40,00
50,00
60,00
70,00
80,00
90,00
Turnout

2) Statistical Tests

- Kolmogorov-Smirnov (Shapiro-Wilk)
  - Both test the null hypothesis that your data are normally distributed

- Results:
  - Significant ($p <= 0.05$) – we reject the null hypothesis
  - Not significant ($p > 0.05$) – we keep the null hypothesis

- With large samples the tests tend to lead to significant results without meaningful reason → use histogram instead

How to *read* the significance in SPSS outputs

SPSS output	Significance
,900	10 %
,750	25 %
,500	50 %
,200	80 %
,100	90 %
,050	**95 %**
,010	**99 %**
,001	**99.9 %**
,000	**> 99.9 %**

= (1 – SPSS output) * 100

Example: (1 – 0.234) * 100 = 0.766 * 100 = 76.6 %

2) Statistical Tests

- Analyze > Descriptive Statistics > Explore
- Place variable of your interest into ‘Dependent List’
- In ‘Plots’ select ‘Normality plots with tests’

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Turnout	,018	2904	,039	,998	2904	,000

a. Lilliefors Significance Correction

Association of Two Variables

- Depends on types of variables

- Crosstabs:
  - Suitable for two categorical variables
  - Low amount of categories in your variables (but at least two per variable)

- Correlation:
  - Two scale variables, scale and ordinal, two ordinal variables
  - Specific case – scale and binary variable

Crosstabs

- Contingency tables
- Describe interaction of two categorical variables
- Age groups of people v. turnout in election (yes/no)
- Allow generalization to population

Crosstabs

- Analyze > Descriptive statistics > Crosstabs
- Select variables for Columns and Rows
- Features:
  - Cells – counts, percentages, residuals
  - Statistics – Chi-square, Cramer's V
- Try not to fill your crosstab with too many features

Counts: Observed

Age * Voted in election Crosstabulation

Count

		Voted in election		
		No	Yes	Total
Age	18 - 35	271	248	519
	36 - 59	390	655	1045
	60 - 90	186	556	742
Total		847	1459	2306

Counts: Observed
Percentages: Column

Age * Voted in election Crosstabulation

			Voted in election		
			No	Yes	Total
Age	18 - 35	Count	271	248	519
		% within Voted in election	32,0%	17,0%	22,5%
	36 - 59	Count	390	655	1045
		% within Voted in election	46,0%	44,9%	45,3%
	60 - 90	Count	186	556	742
		% within Voted in election	22,0%	38,1%	32,2%
Total		Count	847	1459	2306
		% within Voted in election	100,0%	100,0%	100,0%

Counts: Observed
Percentages: Row

Age * Voted in election Crosstabulation

			Voted in election		
			No	Yes	Total
Age	18 - 35	Count	271	248	519
		% within Age	52,2%	47,8%	100,0%
	36 - 59	Count	390	655	1045
		% within Age	37,3%	62,7%	100,0%
	60 - 90	Count	186	556	742
		% within Age	25,1%	74,9%	100,0%
Total		Count	847	1459	2306
		% within Age	36,7%	63,3%	100,0%

Counts: Observed
Percentages: Row

- Younger people do not vote to the same extent than older people
- But can we apply this to the whole population?

Age * Voted in election Crosstabulation

			Voted in election		
			No	Yes	Total
Age	18 - 35	Count	271	248	519
		% within Age	52,2%	47,8%	100,0%
	36 - 59	Count	390	655	1045
		% within Age	37,3%	62,7%	100,0%
	60 - 90	Count	186	556	742
		% within Age	25,1%	74,9%	100,0%
Total		Count	847	1459	2306
		% within Age	36,7%	63,3%	100,0%

Chi-square, Cramer's V

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	97,142[a]	2	,000
Likelihood Ratio	97,604	2	,000
Linear-by-Linear Association	96,677	1	,000
N of Valid Cases	2306		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 190,63.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	,205	,000
	Cramer's V	,205	,000
N of Valid Cases		2306	

- There is a relationship between age and turnout, and it applies to the population
- But is it okay to end the analysis at this point? Can we find out **more**?

Counts: Observed + Expected

Age * Voted in election Crosstabulation

			Voted in election		
			No	Yes	Total
Age	18 - 35	Count	271	248	519
		Expected Count	190,6	328,4	519,0
	36 - 59	Count	390	655	1045
		Expected Count	383,8	661,2	1045,0
	60 - 90	Count	186	556	742
		Expected Count	272,5	469,5	742,0
Total		Count	847	1459	2306
		Expected Count	847,0	1459,0	2306,0

Counts: Observed + Expected
Residuals: Unstandardized

Age * Voted in election Crosstabulation

			Voted in election		
			No	Yes	Total
Age	18 - 35	Count	271	248	519
		Expected Count	190,6	328,4	519,0
		Residual	80,4	-80,4	
	36 - 59	Count	390	655	1045
		Expected Count	383,8	661,2	1045,0
		Residual	6,2	-6,2	
	60 - 90	Count	186	556	742
		Expected Count	272,5	469,5	742,0
		Residual	-86,5	86,5	
Total		Count	847	1459	2306
		Expected Count	847,0	1459,0	2306,0

Counts: Observed + Expected
Residuals: Adjusted standardized

Age * Voted in election Crosstabulation

			Voted in election		
			No	Yes	Total
Age	18 - 35	Count	271	248	519
		Expected Count	190,6	328,4	519,0
		Adjusted Residual	8,3	-8,3	
	36 - 59	Count	390	655	1045
		Expected Count	383,8	661,2	1045,0
		Adjusted Residual	,5	-,5	
	60 - 90	Count	186	556	742
		Expected Count	272,5	469,5	742,0
		Adjusted Residual	-8,0	8,0	
Total		Count	847	1459	2306
		Expected Count	847,0	1459,0	2306,0

Counts: Observed + Expected
Residuals: Adjusted standardized
Chi-square, Cramer's V

Age * Voted in election Crosstabulation

			Voted in election		
			No	Yes	Total
Age	18 - 35	Count	271	248	519
		Expected Count	190,6	328,4	519,0
		Adjusted Residual	8,3	-8,3	
	36 - 59	Count	390	655	1045
		Expected Count	383,8	661,2	1045,0
		Adjusted Residual	,5	-,5	
	60 - 90	Count	186	556	742
		Expected Count	272,5	469,5	742,0
		Adjusted Residual	-8,0	8,0	
Total		Count	847	1459	2306
		Expected Count	847,0	1459,0	2306,0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	97,142[a]	2	,000
Likelihood Ratio	97,604	2	,000
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a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 190,63.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	,205	,000
	Cramer's V	,205	,000
N of Valid Cases		2306	

Why Not Make It Too Complicated?

Age * Voted in election Crosstabulation

			Voted in election		
			No	Yes	Total
Age	18 - 35	Count	271	248	519
		Expected Count	190,6	328,4	519,0
		% within Age	52,2%	47,8%	100,0%
		% within Voted in election	32,0%	17,0%	22,5%
		% of Total	11,8%	10,8%	22,5%
		Residual	80,4	-80,4	
		Adjusted Residual	8,3	-8,3	
	36 - 59	Count	390	655	1045
		Expected Count	383,8	661,2	1045,0
		% within Age	37,3%	62,7%	100,0%
		% within Voted in election	46,0%	44,9%	45,3%
		% of Total	16,9%	28,4%	45,3%
		Residual	6,2	-6,2	
		Adjusted Residual	,5	-,5	
	60 - 90	Count	186	556	742
		Expected Count	272,5	469,5	742,0
		% within Age	25,1%	74,9%	100,0%
		% within Voted in election	22,0%	38,1%	32,2%
		% of Total	8,1%	24,1%	32,2%
		Residual	-86,5	86,5	
		Adjusted Residual	-8,0	8,0	
Total		Count	847	1459	2306
		Expected Count	847,0	1459,0	2306,0
		% within Age	36,7%	63,3%	100,0%
		% within Voted in election	100,0%	100,0%	100,0%
		% of Total	36,7%	63,3%	100,0%

Correlation

- Association between two variables (for other cases than crosstabs)
- Examples: two scale variables, scale and ordinal, two ordinal variables
- Three coefficients:
  - Pearson
  - Spearman
  - Kendall

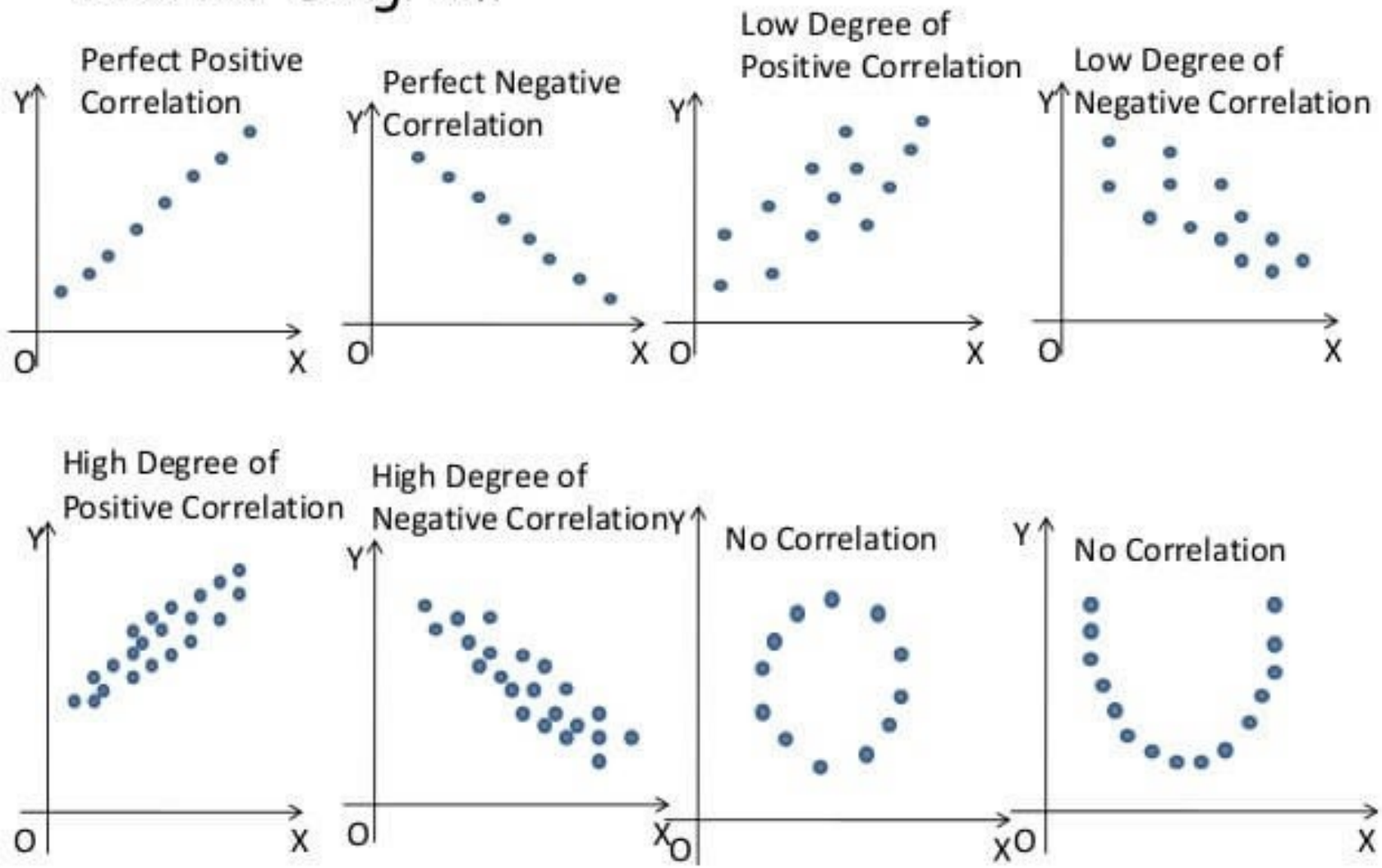
Correlation

- Results vary on a scale between -1 and 1

- Interpretation:
  - Zero means no association between the variables
  - Rising distance from zero shows rising association (regardless the direction – negative or positive)
  - -1: perfect negative association
  - 1: perfect positive association

- Beware of false absence of association
- Always good to visualize data before calculating correlations

Scatter Diagram



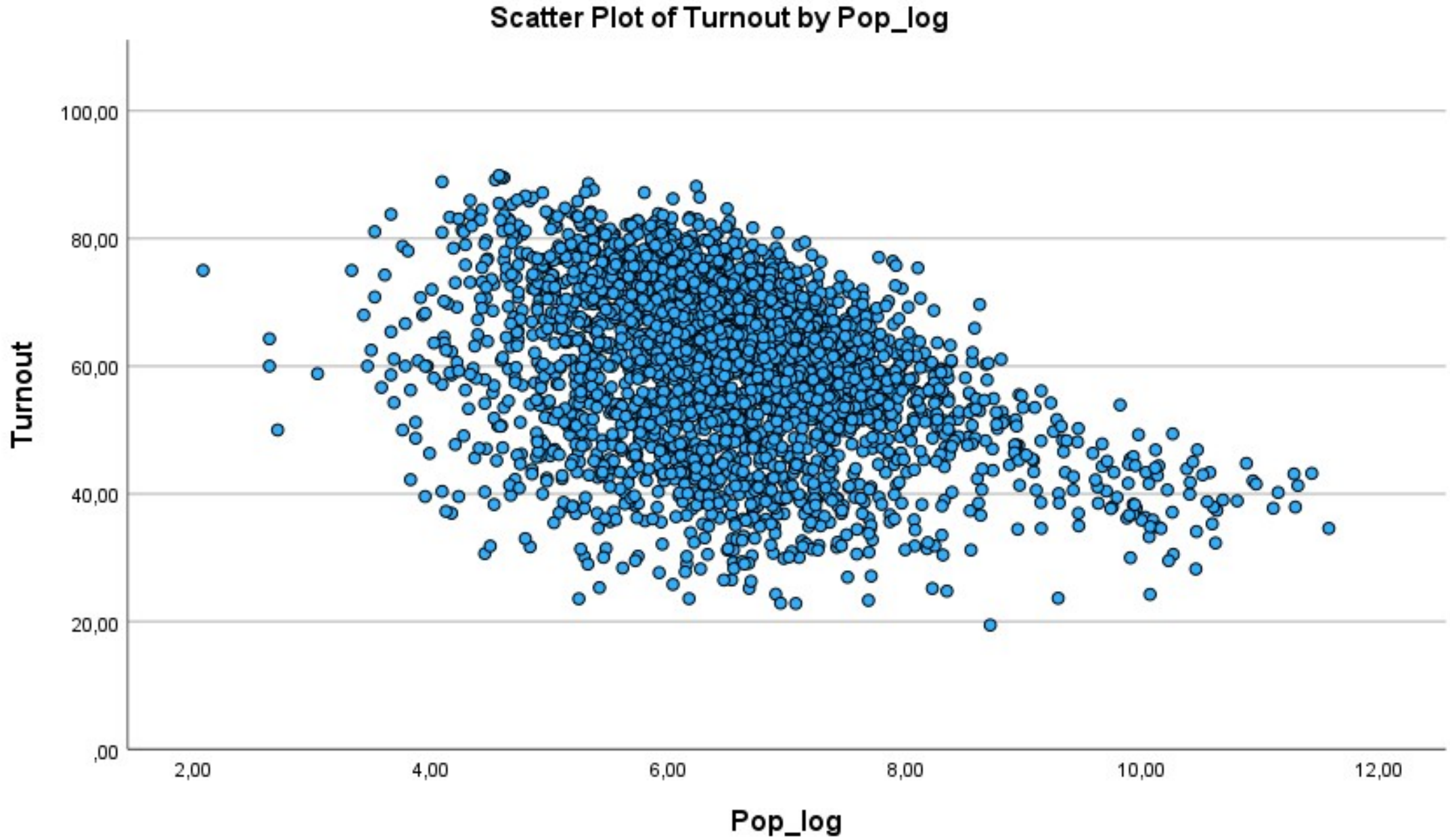
Pearson's Correlation Coefficient

- Parametric operation
- Requirements:
  - Scale data (exemption – scale and binary)
  - If we aim to apply the findings to the population, we need normally distributed data (or a large sample)
- Sensitive to outliers

Pearson’s Correlation Coefficient

- Visualize the data
  - Graphs > Chart Builder
  - Select Scatter/Dot a variables of your interest

- Correlation
  - Analyze > Correlate > Bivariate
  - Select variables and the proper coefficient (PCC is set by default)
  - For significance select ‘Flag significant correlations’


Scatter Plot of Turnout by Pop_log
Turnout
100,00
80,00
60,00
40,00
20,00
,00
2,00
4,00
6,00
8,00
10,00
12,00
Pop_log

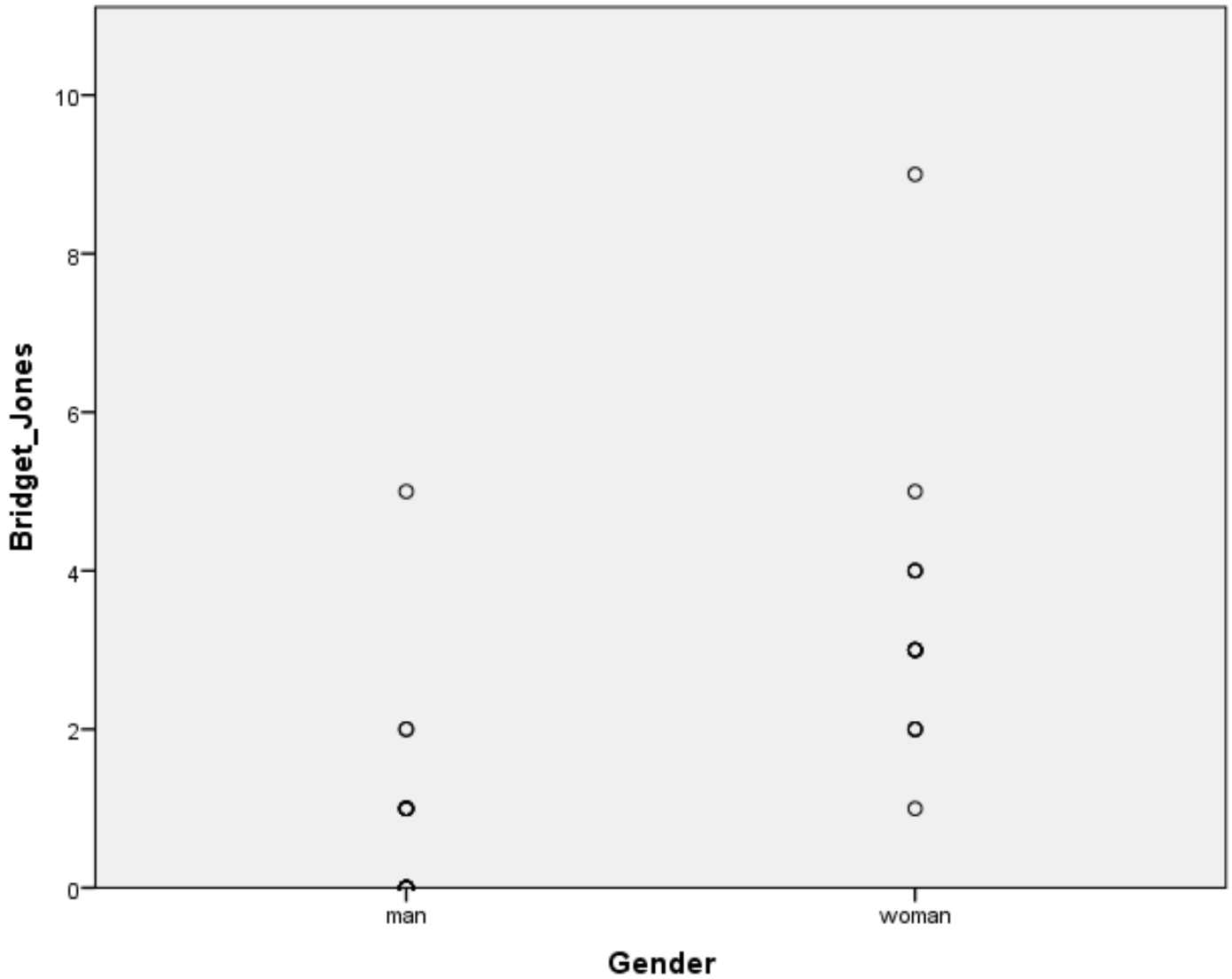
Correlations

		Pop_log	Turnout
Pop_log	Pearson Correlation	1	-,366**
	Sig. (2-tailed)		,000
	N	2926	2919
Turnout	Pearson Correlation	-,366**	1
	Sig. (2-tailed)	,000	
	N	2919	2919

**. Correlation is significant at the 0.01 level (2-tailed).

Pearson's Correlation Coefficient

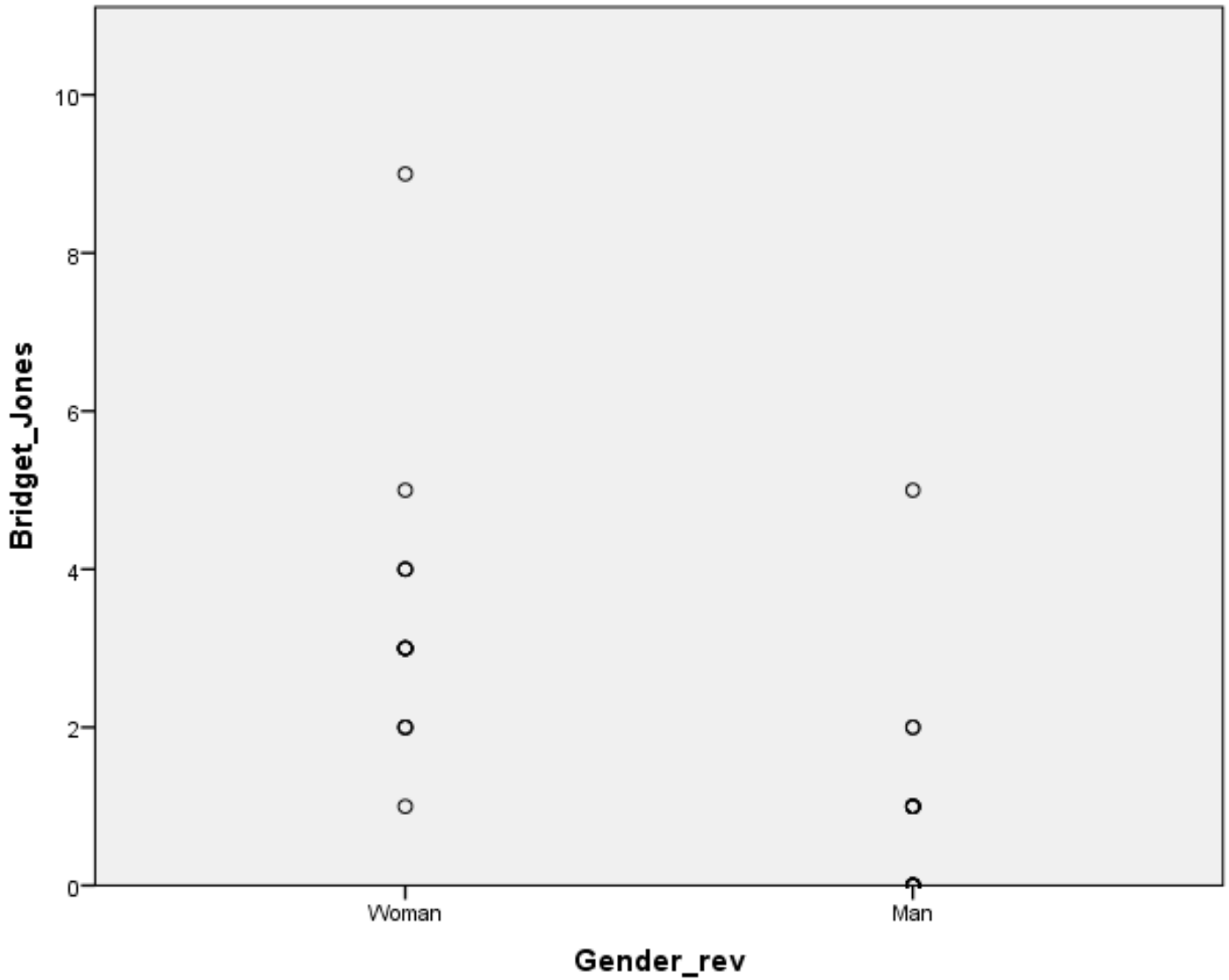
- Scale variable and binary variable
- Works the same as for two scale variables
- Beware of coding of the binary variable (be sure what values the codes represent)



Correlations

		Bridget_Jones	Gender
Bridget_Jones	Pearson Correlation	1	,677**
	Sig. (2-tailed)		,000
	N	37	37
Gender	Pearson Correlation	,677**	1
	Sig. (2-tailed)	,000	
	N	37	37

**. Correlation is significant at the 0.01 level (2-tailed).



Correlations

		Bridget_Jones	Gender_rev
Bridget_Jones	Pearson Correlation	1	-,677**
	Sig. (2-tailed)		,000
	N	37	37
Gender_rev	Pearson Correlation	-,677**	1
	Sig. (2-tailed)	,000	
	N	37	37

**. Correlation is significant at the 0.01 level (2-tailed).

Non-Parametric Correlation

- Spearman’s Rho and Kendall’s Tau
  - Correlation for other cases than two scale variables (or scale and binary)
  - Same interpretation as in Pearson’s CC
  - Preference of Kendall’s Tau if variables contain less categories and for smaller samples

- Analyze > Correlate > Bivariate
  - Select variables and Spearman/Kendall
  - For significance select ‘Flag significant correlations’

Interpretation

- Correlation does not imply causality
  - No control of other variables
  - No independent and dependent variable

- You cannot tell that one variable affects the other even in cases when such relationship seems to be meaningful and logical

- Keep the interpretation of effects of IVs on DV for the regression analysis