Introduction to Quantitative Research

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In the social sciences, **quantitative research** refers to the **systematic empirical investigation** of social phenomena via **statistical** techniques.

The process of **measurement** is central to quantitative research

*🡪* it provides the fundamental connection between empirical observation and statistical expression of *quantitative* relationships.



**Quantitative research** is generally made using scientific methods, which can include:

* The generation of models, theories and hypotheses
* The development of instruments and methods for measurement
* Collection of empirical data
* Experimental control and manipulation of variables
* Modeling and analysis of data
* Evaluation of results

### http://www.greenbook.org/Content/DataStar/tick-box.jpg

### What is Quantitative Research?

The word "quantitative" expresses data that is subject to **measurements** and **numbers**. Quantitative methods of research in sociology employ data that is **objective** and **statistical**. This type of research generates information with trends and correlations.

Quantitative information is similar to scientific-style data; where objects are analyzed in exact descriptions, often utilizing logic and reasoning.

### http://courses.tlt.psu.edu/course/bio12/module03/population%20sample.png

### Significant Differences between Qualitative and Quantitative

* When employing quantitative research methods, the **researcher usually already knows what is expected** from the results. On the other hand, researchers that rely on qualitative techniques cannot expect results similar to their hypothesis.
* Qualitative information is subjective and open to interpretation. **Quantitative information is more objective**; expressed in exact descriptions such as statistics, percentages and numbers.
* Qualitative research methods portray what the social world has in store for people of various backgrounds and living situations. This type of research communicates results through detailed observation and description.
* Conversely; **quantitative research is a reflection of people and situations from a specific point of view**, such as the rate of divorce amongst parents of suicidal teenagers, organisational commitment amongst female and male employees.

*Quantitative research consists of those studies in which the data concerned can be analysed in terms of numbers ... Research can also be qualitative, that is, it can describe events, persons and so forth scientifically without the use of numerical data ...*

*Quantitative research is based more directly on its original plans and its results are more readily analysed and interpreted. Qualitative research is more open and responsive to its subject. Both types of research are valid and useful. They are not mutually exclusive. It is possible for a single investigation to use both methods. (Best and Khan, 1989: 89-90) 🡪 MIXED METHOD*

*Summa summarum:*

*Quantitative research is empirical research where the data* ***are in the form of numbers****.*

*Qualitative research is empirical research where the data* ***are not in the form of numbers****. (Punch, 1998: 4)*



***STRENGTHS of Quantitative research:***

· Precision and transparency - through quantitative and reliable measurement

· Control - through sampling and design

· Ability to produce causality statements, through the use of controlled experiments

· Statistical techniques allow for sophisticated analyses

· Replicable

# *Quantitative research is qualitatative*!!!

Social scientist is not interested in numbers or coefficients in itself (%-distributions, alfa, eta and beta values or correlation coeffficients), but he/she is interested in social phenomena (connections between variables refer/represent connections between social phenomena)

🡪 Social reality is a research subject that a researcher is interested in!



***Key elements of Quantitative research****:*

* ***Observational units*** *(human being (survey), country, organisation, voluntary association…)*
* ***Variables*** *(quality)*
* ***Values*** *(all qualities have numeric symbols)*

*♦ Quantitative research means that all variables (qualities) have been expressed in numerical way.*

Observational matrix:



SPSS = **Statistical** **Package** for the **Social** **Sciences**

**Analyse** 🡪 descriptive statistics: frequencies, crosstabs, compare means, anova, general linear model, correlate, regression, classify (discriminant), data reduction (factor), scale (reliability analysis).

**Transformations** 🡪 recode ja Transform > compute

**Data** 🡪 split file and select cases

**Graphs** 🡪 bar, line, pie, scatter, boxplot

Three Levels of Quantitative Analysis:

•**Descriptive** level of analysis (frequencies, graphs)

• The **association** (or independence/dependence) between variables (variables-oriented study)

• **Explanatory** analysis (elaboration, multivariate models)

1. Analysing a single variable: Tables, distributions and graphs

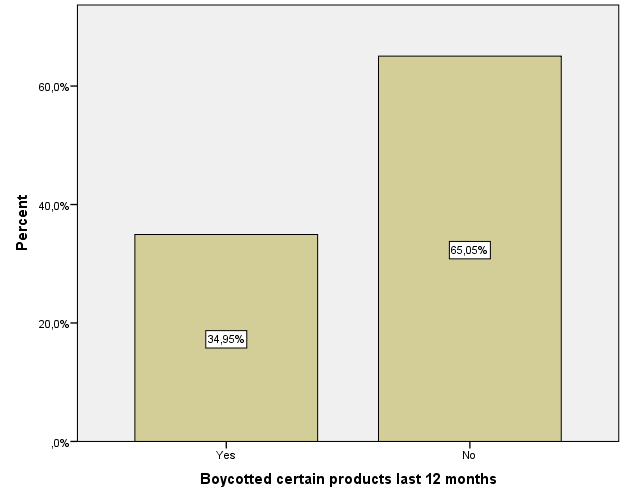
2. Analysing two variables: Cross tabulations, Compare means, One-way ANOVA and linear relationships between variables (correlation)

1. Analysing a single variable: Tables, distributions and graphs

Examples of descriptive analysis:

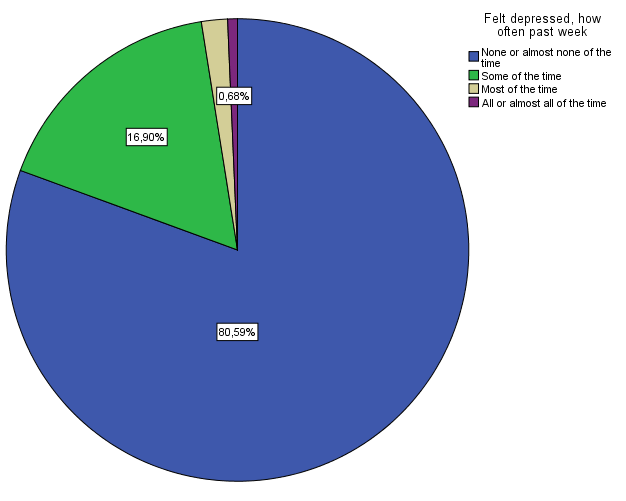
Have Finns boycotted certain products during last 12 months?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Boycotted certain products last 12 months** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Yes | 766 | 34,9 | 34,9 | 34,9 |
| No | 1426 | 64,9 | 65,1 | 100,0 |
| Total | 2192 | 99,8 | 100,0 |  |
| Missing | Don't know | 5 | ,2 |  |  |
| Total | | 2197 | 100,0 |  |  |



Graphs 🡪 bar (B17)

Are Finns depressed?



Finns’ confidence towards social institutions:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Descriptive Statistics** | | | | | |
|  | N | Minimum | Maximum | Mean | Std. Deviation |
| Trust in country's parliament | 2188 | 0 | 10 | 5,91 | 2,090 |
| Trust in the legal system | 2185 | 0 | 10 | 7,04 | 1,983 |
| Trust in the police | 2195 | 0 | 10 | 8,10 | 1,590 |
| Trust in politicians | 2189 | 0 | 10 | 4,83 | 2,032 |
| Trust in political parties | 2176 | 0 | 10 | 4,89 | 2,002 |
| Trust in the European Parliament | 2127 | 0 | 10 | 5,04 | 2,164 |
| Trust in the United Nations | 2124 | 0 | 10 | 6,55 | 1,935 |
| Valid N (listwise) | 2089 |  |  |  |  |

[](http://www.google.fi/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRxqFQoTCI_q5POh_MgCFUR8cgod_r8OXA&url=http://www.jimtv.fi/ohjelmat/poliisit&bvm=bv.106923889,d.bGQ&psig=AFQjCNGdietuzRjWJuifVdE_JA5woQiFFw&ust=1446915350813982)



[](http://www.google.fi/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRxqFQoTCN3Xybqi_MgCFQMscgodskoPsA&url=http://inspirationfeed.com/articles/business/are-you-happy-at-work-rate-your-job-satisfaction-with-5-key-questions/&bvm=bv.106923889,d.bGQ&psig=AFQjCNFZ1ZtYiXgRmQBrqoW1RGJpBcfX-w&ust=1446915449937231)

Distribution of a statement concerning organisational commitment:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Belonging to this organisation has a great deal  of personal meaning for me | Totally agree | Partially agree | Not agree, not disagree or can’t say | Partially  disagree | Totally  Disagree |
|  | 25% | 38% | 22% | 11% | 4% |

ESS Statement, B27: Gay men and lesbians should be free to live their own life as they wish

[](http://www.google.fi/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRxqFQoTCLbg4sHU-8gCFYeNLAod_kUKQA&url=http://opinion.inquirer.net/86190/defining-marriage&psig=AFQjCNFqBLcsEebyfsvZlxJUZu7KIlQ_gQ&ust=1446894563976888)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Gays and lesbians free to live life as they wish** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Agree strongly | 884 | 40,2 | 40,5 | 40,5 |
| Agree | 748 | 34,0 | 34,3 | 74,8 |
| Neither agree nor disagree | 326 | 14,8 | 14,9 | 89,7 |
| Disagree | 148 | 6,7 | 6,8 | 96,5 |
| Disagree strongly | 77 | 3,5 | 3,5 | 100,0 |
| Total | 2183 | 99,4 | 100,0 |  |
| Missing | Refusal | 4 | ,2 |  |  |
| Don't know | 10 | ,5 |  |  |
| Total | 14 | ,6 |  |  |
| Total | | 2197 | 100,0 |  |  |

2. Analysing two variables: Cross tabulations

**First:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Feeling of safety of walking alone in local area after dark** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Very safe | 861 | 39,2 | 39,3 | 39,3 |
| Safe | 1154 | 52,5 | 52,7 | 92,0 |
| Unsafe | 161 | 7,3 | 7,3 | 99,3 |
| Very unsafe | 15 | ,7 | ,7 | 100,0 |
| Total | 2191 | 99,7 | 100,0 |  |
| Missing | Don't know | 6 | ,3 |  |  |
| Total | | 2197 | 100,0 |  |  |

Has that safety/unsafety -feeling something to do with a gender?

[](https://www.google.fi/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRxqFQoTCK-mr77P-8gCFYyFLAodDewKFQ&url=https://www.polk.edu/news/polk-state-students-stay-safe-after-dark-with-these-tips/&psig=AFQjCNHZT4g2c8tgowCE8aKdd89tawFinw&ust=1446893226507364)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Feeling of safety of walking alone in local area after dark \* Gender Crosstabulation** | | | | | |
|  | | | Gender | | Total |
| Male | Female |
| Feeling of safety of walking alone in local area after dark | Very safe | Count | 570 | 291 | 861 |
| Expected Count | 421,7 | 439,3 | 861,0 |
| % within Feeling of safety of walking alone in local area after dark | 66,2% | 33,8% | 100,0% |
| % within Gender | 53,1% | 26,0% | 39,3% |
| Safe | Count | 478 | 676 | 1154 |
| Expected Count | 565,1 | 588,9 | 1154,0 |
| % within Feeling of safety of walking alone in local area after dark | 41,4% | 58,6% | 100,0% |
| % within Gender | 44,5% | 60,5% | 52,7% |
| Unsafe | Count | 24 | 137 | 161 |
| Expected Count | 78,8 | 82,2 | 161,0 |
| % within Feeling of safety of walking alone in local area after dark | 14,9% | 85,1% | 100,0% |
| % within Gender | 2,2% | 12,3% | 7,3% |
| Very unsafe | Count | 1 | 14 | 15 |
| Expected Count | 7,3 | 7,7 | 15,0 |
| % within Feeling of safety of walking alone in local area after dark | 6,7% | 93,3% | 100,0% |
| % within Gender | 0,1% | 1,3% | 0,7% |
| Total | | Count | 1073 | 1118 | 2191 |
| Expected Count | 1073,0 | 1118,0 | 2191,0 |
| % within Feeling of safety of walking alone in local area after dark | 49,0% | 51,0% | 100,0% |
| % within Gender | 100,0% | 100,0% | 100,0% |

|  |  |  |  |
| --- | --- | --- | --- |
| **Chi-Square Tests** | | | |
|  | Value | df | Asymp. Sig. (2-sided) |
| Pearson Chi-Square | 214,123a | 3 | ,000 |
| Likelihood Ratio | 226,326 | 3 | ,000 |
| Linear-by-Linear Association | 212,527 | 1 | ,000 |
| N of Valid Cases | 2191 |  |  |
| a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,35. | | | |

**Statistical tests are used in quantitative analyses to show that is it possible to generalize results in data (differences between groups, connections between variables) to cover the whole population too.**

**Chi-square (independence-test): association between proportions**

**Significance levels:**

p< .05 statistically almost significant (950/1000) 🡪 5 % likelihood that a result is accurate just in sample (95% likelihood to make a statitical generalisation)

p< .01 statistically significant (990/1000) 🡪 1% likelihood that a result is accurate just in sample (99% likelihood to make a statitical generalisation)

p< .001 statistically highly significant (999/1000) 🡪 0.1 % likelihood that a result is accurate just in sample (99.9% likelihood to make a statitical generalisation)

**Analysing two variables: Compare means (One-way Anova = analysis of variances) and linear relationships between variables (correlation)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **How happy are you** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Extremely unhappy | 3 | ,1 | ,1 | ,1 |
| 1 | 2 | ,1 | ,1 | ,2 |
| 2 | 9 | ,4 | ,4 | ,6 |
| 3 | 10 | ,5 | ,5 | 1,1 |
| 4 | 26 | 1,2 | 1,2 | 2,3 |
| 5 | 55 | 2,5 | 2,5 | 4,8 |
| 6 | 107 | 4,9 | 4,9 | 9,7 |
| 7 | 288 | 13,1 | 13,1 | 22,8 |
| 8 | 799 | 36,4 | 36,4 | 59,2 |
| 9 | 688 | 31,3 | 31,4 | 90,6 |
| Extremely happy | 206 | 9,4 | 9,4 | 100,0 |
| Total | 2193 | 99,8 | 100,0 |  |
| Missing | Don't know | 4 | ,2 |  |  |
| Total | | 2197 | 100,0 |  |  |

### OR:



[](http://www.google.fi/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRxqFQoTCNGN65vP-8gCFUaNLAodODYPhg&url=http://www.zenworkplace.com/2012/09/the-benefits-of-happiness/&psig=AFQjCNEWocLoar2_8_V5DO831l112_wAUQ&ust=1446893151535722)

### Present income and happiness:

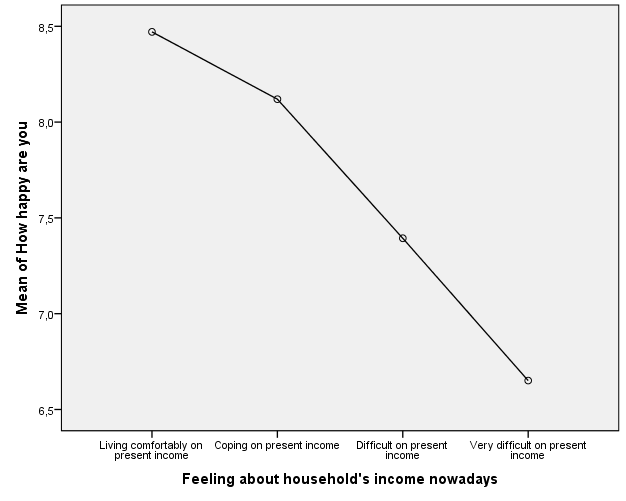
### [http://laofutze.files.wordpress.com/2009/07/life-satisfaction-and-per-capita-gdp-around-the-world-gallup.png](https://www.google.fi/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRxqFQoTCK3onPnP-8gCFQWHLAodyI8B1w&url=https://laofutze.wordpress.com/tag/happiness-and-income/&psig=AFQjCNGTdPP6b4L92G9W1rO6n9WYuixQ0w&ust=1446893292966368)

### One-way Anova:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Descriptives** | | | | | | | | |
| How happy are you | | | | | | | | |
|  | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
| Lower Bound | Upper Bound |
| Living comfortably on present income | 514 | 8,47 | 1,076 | ,047 | 8,38 | 8,56 | 3 | 10 |
| Coping on present income | 1380 | 8,12 | 1,244 | ,033 | 8,05 | 8,19 | 0 | 10 |
| Difficult on present income | 221 | 7,39 | 1,579 | ,106 | 7,18 | 7,60 | 2 | 10 |
| Very difficult on present income | 63 | 6,65 | 2,343 | ,295 | 6,06 | 7,24 | 0 | 10 |
| Total | 2178 | 8,09 | 1,344 | ,029 | 8,03 | 8,14 | 0 | 10 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Test of Homogeneity of Variances** | | | |
| How happy are you | | | |
| Levene Statistic | df1 | df2 | Sig. |
| 30,707 | 3 | 2174 | ,000 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ANOVA** | | | | | |
| How happy are you | | | | | |
|  | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 313,370 | 3 | 104,457 | 62,759 | ,000 |
| Within Groups | 3618,403 | 2174 | 1,664 |  |  |
| Total | 3931,772 | 2177 |  |  |  |



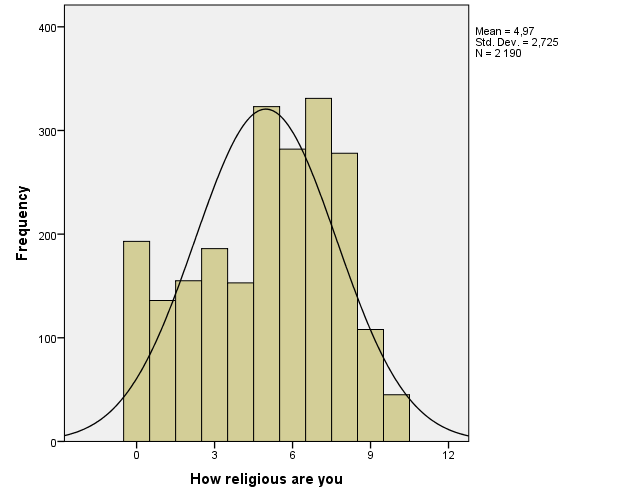
**Correlation:**

Correlation means linear relationship between two variables. Variables should be so-called continual variables (min --------------------- max)

* Is there a positive, negative or zero correlation between religiousness and happiness?

[](http://www.google.fi/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRxqFQoTCNq-1sTQ-8gCFURXLAodfj4AkQ&url=http://www.choosehelp.com/news/society/religion-linked-to-happiness-in-poorer-societies-less-benefit-seen-in-richer-societies&psig=AFQjCNEMrj5xS4k_WT5S62xaWP8J2Jk9jg&ust=1446893495521561)





|  |  |  |  |
| --- | --- | --- | --- |
| **Correlations** | | | |
|  | | How happy are you | How religious are you |
| How happy are you | Pearson Correlation | 1 | ,105\*\* |
| Sig. (2-tailed) |  | ,000 |
| N | 2193 | 2187 |
| How religious are you | Pearson Correlation | ,105\*\* | 1 |
| Sig. (2-tailed) | ,000 |  |
| N | 2187 | 2190 |
| \*\*. Correlation is significant at the 0.01 level (2-tailed). | | | |

Correlation matrix:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Correlations** | | | | | | | | | |
|  | | Most people can be trusted or you can't be too careful | Placement on left right scale | Immigrants make country worse or better place to live | How happy are you | How religious are you | Feel appreciated by people you are close to | Deal with important problems in life | Household's total net income, all sources |
| Most people can be trusted or you can't be too careful | Pearson Correlation | 1 | ,071\*\* | ,257\*\* | ,273\*\* | ,096\*\* | ,292\*\* | ,209\*\* | ,118\*\* |
| Sig. (2-tailed) |  | ,001 | ,000 | ,000 | ,000 | ,000 | ,000 | ,000 |
| N | 2196 | 2096 | 2172 | 2192 | 2190 | 2181 | 2179 | 2061 |
| Placement on left right scale | Pearson Correlation | ,071\*\* | 1 | ,004 | ,118\*\* | ,206\*\* | ,061\*\* | ,091\*\* | ,132\*\* |
| Sig. (2-tailed) | ,001 |  | ,861 | ,000 | ,000 | ,006 | ,000 | ,000 |
| N | 2096 | 2096 | 2076 | 2092 | 2091 | 2084 | 2082 | 1983 |
| Immigrants make country worse or better place to live | Pearson Correlation | ,257\*\* | ,004 | 1 | ,149\*\* | ,036 | ,189\*\* | ,137\*\* | ,092\*\* |
| Sig. (2-tailed) | ,000 | ,861 |  | ,000 | ,091 | ,000 | ,000 | ,000 |
| N | 2172 | 2076 | 2173 | 2170 | 2168 | 2162 | 2163 | 2046 |
| How happy are you | Pearson Correlation | ,273\*\* | ,118\*\* | ,149\*\* | 1 | ,105\*\* | ,463\*\* | ,408\*\* | ,257\*\* |
| Sig. (2-tailed) | ,000 | ,000 | ,000 |  | ,000 | ,000 | ,000 | ,000 |
| N | 2192 | 2092 | 2170 | 2193 | 2187 | 2179 | 2177 | 2059 |
| How religious are you | Pearson Correlation | ,096\*\* | ,206\*\* | ,036 | ,105\*\* | 1 | ,114\*\* | ,053\* | -,045\* |
| Sig. (2-tailed) | ,000 | ,000 | ,091 | ,000 |  | ,000 | ,013 | ,039 |
| N | 2190 | 2091 | 2168 | 2187 | 2190 | 2176 | 2175 | 2058 |
| Feel appreciated by people you are close to | Pearson Correlation | ,292\*\* | ,061\*\* | ,189\*\* | ,463\*\* | ,114\*\* | 1 | ,336\*\* | ,193\*\* |
| Sig. (2-tailed) | ,000 | ,006 | ,000 | ,000 | ,000 |  | ,000 | ,000 |
| N | 2181 | 2084 | 2162 | 2179 | 2176 | 2182 | 2172 | 2050 |
| Deal with important problems in life | Pearson Correlation | ,209\*\* | ,091\*\* | ,137\*\* | ,408\*\* | ,053\* | ,336\*\* | 1 | ,157\*\* |
| Sig. (2-tailed) | ,000 | ,000 | ,000 | ,000 | ,013 | ,000 |  | ,000 |
| N | 2179 | 2082 | 2163 | 2177 | 2175 | 2172 | 2180 | 2053 |
| Household's total net income, all sources | Pearson Correlation | ,118\*\* | ,132\*\* | ,092\*\* | ,257\*\* | -,045\* | ,193\*\* | ,157\*\* | 1 |
| Sig. (2-tailed) | ,000 | ,000 | ,000 | ,000 | ,039 | ,000 | ,000 |  |
| N | 2061 | 1983 | 2046 | 2059 | 2058 | 2050 | 2053 | 2061 |
| \*\*. Correlation is significant at the 0.01 level (2-tailed). | | | | | | | | | |
| \*. Correlation is significant at the 0.05 level (2-tailed). | | | | | | | | | |

Most people can be trusted or you can't be too careful Can’n be too careful 0 ------------- 10 Most people can be trusted

Placement on left right scale Left 0 ------------- 10 Rught

Immigrants make country worse or better place to live Worse placeto live 0 ------------- 10 Better place to live

How happy are you Extremely unhappy 0 ------------- 10 Extremenly happy

How religious are you Not at all religious 0 ------------- 10 Very religious

Feel appreciated by people you are close to Not at all 0 ------------- 10 Completely

Deal with important problems in life Extremely difficult 0 -------------- 10 Extremely easy

Household's total net income/month, all sources Less than €1000 0 -------------- 10 More than €5361

Let’s make some interpretations!