Weighting European Social Survey Data

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1 Do analyses conducted with ESS data need to be weighted?

In principal, analyses should always be conducted using weightes. Most users will want results based on samples using estimates that take into account how likely each respondent was to be part of the sample - which means that the most accurate estimates will be obtained only after weighting the data. This applies to online analyses as well as to analysis conducted with downloaded data.

2 What weights are there to apply?

There are three weighting variables available: DWEIGHT (design weights), PSPWGHT (post-stratification weights), and PWEIGHT (population size weights).

1. Design weights (DWEIGHT):
   In several of the sample designs used by countries participating in the ESS not all individuals in the population aged 15+ have precisely the same chance of selection. Several countries use complex sampling designs where some groups or regions of the population have higher probabilities of selection. The main purpose of the design weights is to correct for the fact that in some countries respondents have different probabilities to be part of the sample due to the sampling design used. Applying the weights allows to correct for this and obtain estimates that are not affected by a possible sample selection bias. The design weights are computed as the inverse of the inclusion probabilities and then scaled such that their sum equals the net sample size. For further information on design wegihts please see also the ESS Documentation Report.

2. Post-stratification weights (PSPWGHT):
   Design weights account for differences in inclusion probabilities and thus correct for bias that is introduced by the sampling design. However, other errors sources remain, including sampling error (related to attempting to measure only a fraction of the population) and non-response error (which may lead to a systematic over- or under-representation of people with certain characteristics). Post-stratification weights are a more sophisticated weighting strategy that uses auxiliary information to reduce the sampling error and potential non-response bias. They have been constructed using information on age-group, gender, education, and region. The post-stratification weights are obtained by adjusting the design weights in such a way that they will replicate the distribution of the cross classification of age-group, gender, and education in the population and the marginal distribution for region in the population. The population distributions for the adjusting variables were obtained from the European Union Labour Force Survey (LFS). For a short description of how the post-stratification weights were computed, see the report Documentation of ESS Post-Stratification Weights.
   The advantage of post-stratification weights over design weights is that:

- They can reduce the sampling error, if it can be expected that there is a linear dependency between the variable of interest and the variables used for post-stratification.

- They can reduce an existing non-response bias if there is a linear dependency between propensity to respond to the variable of interest and the variables used for post-stratification.

3. Population size weights (PWEIGHT):
   Population size weights are used when examining data for two or more countries combined. The population size weights are the same for all persons within a country but differ across countries. These weights correct for the fact that most countries taking part in the ESS have different population sizes but similar sample sizes. Without this weight, any figures combining data from two or more countries might be biased, over-representing smaller countries at the expense of larger ones. The population size weight makes an adjustment to ensure that each country is represented in proportion to its population size. The population size weight is calculated as PWEIGHT=[Population size aged 15 years and above]/[(Net sample size in country)*10 000].

3   When should weights be used?

When computing frequencies, percentages, or other summary statistics, we recommend using *weighted* data. However, different types of analyses require different *combinations* of weights. In general:

- when analysing data for one country alone, only the design weight or the post-stratification weight need to be applied

- when comparing data from two or more countries but without reference to statistics that combine data from more than one country, only the design weight or the post-stratification weight need be applied

- when comparing data of two or more countries and *with* reference to the average (or combined total) of those countries, design or post-stratification weight in combination with population size weights should be applied

- when combining different countries to describe a group of countries or a region, such as „accession countries" or „EU member states", design or post-stratification weights in combination with population size weights should be applied.

Design weights and post-stratification weights can be used independently or in combination with the population size weight, whereas the population size weight should always be used in combination with either the design or post-stratification weights. However a combination of design weights and post-stratification weights is *not* meaningful, i.e. either one is used or the other, **not both**. Design or post-stratification weights can be easily combined with population size weights by creating a new variable that is the result of multiplying two existing weighting variables. Further, please note that when analysing data from *more than one round* , the weights from each round should be applied.

Examples of different types of analyses and the weights recommended for them are given in Table 1.

4   Some considerations when analysing groups of countries

WARNING Users who are interested in combining data for groups of countries (e.g. EU member states or accession countries) should note that this was not the primary aim of the ESS design which instead aimed to facilitate comparisons across individual countries. The population size weights enable the estimation of these „combined totals", but users should note that these estimates may have relatively high margins of error. We would generally advise checking the margins of error associated with such estimates before drawing firm conclusions.

Another point to note is that the *total* column of any table is merely an aggregate of those countries included in that table. It cannot be automatically assumed to be a figure

for *Europe* or *the EU*, as not all EU member states are included in the ESS. Conversely, some countries participating in the ESS would be outside some users definition of *Europe*. Users who wish to look at combined country tables must satisfy themselves that (a) all the countries they require, and (b) only those they require, are present in the tables they run.

Table 1: Weighting Examples in the ESS

		Weights to be used	
	Example - voter turnout (% of respondents voting in the last election)	Design/ Post-Stratification weight	Population size weight
To examine data from a single country whether a single variable or a cross-tabulation	Voter turnout in Germany	X	
	Voter turnout in Germany by age and gender	X	
To compare results for two or more countries separately without using totals or averages	Compare voter turnout in France, Germany and the UK.	X	
To combine countries - whether on a single variable or via a cross- tabulation	Voter turnout in Scandinavia.	X	X
	Voter turnout in the EU.	X	X
	Voter turnout across all countries participating in the ESS.	X	X
	Compare voter turnout between EU member states and accession countries.	X	X
	Voter turnout by age group across all ESS participating countries.	X	X

5 Describing sample sizes

The sample size is contained in the N (Total) row of the **unweighted tables, NOT in the weighted tables**. So, even when quoting weighted rather than unweighted *percentages*, avoid quoting weighted **N**s *(numbers of cases)*, which are not meaningful in themselves.

6 How does weighting affect the data?

Applying weights will change any measures based on the data, such as:

- the distribution of variables (descriptive statistics);

- percentages in cross-tabulations (tabulations);

- average measures such as the mean or mode;

- measures of spread and variance, such as the standard deviation or standard error of a variable, or the *margin of error*;

- tests of statistical significance for differences between e.g. countries or years.

If you analyse data from complex designs, please bear in mind: The confidence intervals computed in the ESS Online Analysis tool (Nesstar) are only correct for data collected by simple random sampling. However, it should be noted that for more complex sample designs the standard errors can differ much from the ones under a simple random sample. A detailed description of the ESS sample designs can be found in the ESS Documentation Report.

7 Do weights need to be applied for more sophisticated analyses?

For multivariate analyses the same weighting rules apply. The data should always be weighted: the decision between using design/post-stratification weights alone or design/post-stratification weights in combination with population size weights depends upon the purpose of the analysis. Analysis that aims to compare countries should use the design or post-stratification weight; analysis that is based on combining data from countries should use the design/post-stratification weights in combination with population size weights.

8 How to weight tables using the ESS Online Analysis tool?

Having first selected the variables you wish to analyse, the *unweighted* table will appear unless one previously selects and applies the weighting variables. Then click on the weight icon. The top left-hand box (weighting variables defined in the dataset) then lists the pre-defined weights, the *Design weight*, the *Post-Stratification weight*, and the *Population size weight*. Highlight the weighting variable you require, and then click on the right-pointing arrow to move it to the right- hand box. You can do this sequentially to select more than one weighting factor for a table. Then press the OK button, and the weighted table will appear. A footnote will indicate that weights have been applied.

9   Conducting analyses with downloaded data

If downloading data for use by another statistical package, it will be necessary to check first how that package handles weights. On the ESS web site, it is possible to combine the weights by specifying more than one weight to be used. However, other packages may allow the use of only one weight at a time. In this case, if combined weights are required, a new weight variable will need to be created by multiplying design or post-stratification weights with the population size weight, that are present in the data file. The code in Example 1 shows how this can be done using SPSS.

```
COMPUTE newweight=dweight*pweight.
EXECUTE.
WEIGHT BY newweight.

/* OR */

COMPUTE newweight=pspwght*pweight.
EXECUTE.
WEIGHT BY newweight.
```

Example 1: Weighting example with SPSS

10   Bibliography

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