Policy Brief

Estimating Differential Mortality from EU-SILC Longitudinal Data – a Feasibility Study

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Summary

Socio-economic **differences in mortality** have been known to exist for a long time. The poor usually die young. The implications of this fact for the fairness of pension reforms, public health and social policy are still **not sufficiently recognized in the public debate**. Despite its importance, several European countries cannot provide official data on mortality by socio-economic status. The research evidence which is available is not easily comparable between countries because of technical data problems.

A feasibility study by Statistics Austria in the FACTAGE project demonstrates that **this gap can be closed** by better use of harmonized longitudinal microdata from EU-SILC (Community Statistics on Income and Living Conditions). By its design, EU-SILC measures socio-economic inequality, and the assessment shows that comparative mortality estimation from EU-SILC longitudinal data is technically possible.

Improvement of the comparative knowledge base on socio-economic excess mortality through EU-SILC does require however that **vital status is measured with good quality** by Member States. Many countries have capacities in linking survey data with national mortality registers, and this may be used to extend the value of EU-SILC with only little additional effort. Additionally, **Eurostat may consider relaxing some restrictions in the User Database**.

The FACTAGE method which is presented in this policy brief may serve as a minimum standard for all countries which cannot provide national figures on the subject and as an important tool for cross-national comparisons.

Background: The Need for Comparative Facts on Fairer Ageing

In an era of demographic ageing, pension reforms which aim at increasing the effective retirement age have become dominant. Mortality differences between socio-economic subgroups are not necessarily reflected in this policy discourse. For all European countries with available data, it is found, that those with **higher education, higher incomes and better occupational positions live longer**, on average, than the poor. There is also evidence that in general, the substantial mortality improvements during the last decades have not come along with a reduction of socio-economic inequalities in mortality.

This puts into question the **fairness of a uniform pension age** when short-living-poor are likely to subsidize pensions of long-living-rich. Besides unintended redistribution effects socio-economic excess mortality may have adverse fiscal consequences, if those living longer than average have also higher pensions. Finally, the sheer physical possibility of longer working lives must be put in question for population groups which are prone to premature death and probably restricted health.

A key issue in the analysis of the social gradient of mortality is its variation between countries. Since European countries differ substantially in terms of pension systems, health systems and labor market policies, a **comparative European perspective could reveal determinants of social inequalities in mortality**. A major deficiency in that respect is that mortality by socio-economic status is not part of the European Statistical System. As of 2017, some European countries still cannot provide any figures on socio-economic differences in mortality, and available figures are not easily comparable between countries because of different data sources, reference periods and socio-economic breakdowns.

Previous attempts to compare differential mortality between European countries are based on literature reviews, micro data collection and ex-post harmonization (Erasmus MC Rotterdam), and macro data collection on mortality rates by educational level (Eurostat, OECD). Although **considerable progress has been made during the last years**, data quality and comparability is far from ideal. Some ‘white spots’ remain for countries which do not publish any statistics on the subject. For other countries estimates are derived from unlinked cross-sectional rather than linked longitudinal data. Finally, it appears that educational level does not sufficiently capture the manifold dimensions of social inequality in contemporary societies.

Data and Method: Assessing Mortality Data in the EU-SILC Longitudinal Component

The European Union Statistics on Income and Living Conditions (EU-SILC) have been created to ensure **coverage and comparability for measuring inequality**. Its fully harmonized longitudinal design is based on EU-regulations and firmly embedded in the European Statistical System. EU-SILC has been conducted annually in all Member States since around 2004 and is currently conducted in several other countries (e.g. Former Yugoslav Republic of Macedonia, Iceland, Norway, Serbia, Switzerland and Turkey). Individuals are usually interviewed in four consecutive calendar years. The **longitudinal component of EU-SILC captures information on vital status** (survived or died since the previous year). Many social stratification variables are available, as are some health variables.

Longitudinal information of the EU-SILC survey (micro data on individuals and households) is provided in **Eurostat's User Database (UDB) for researchers**. With some data manipulation it is possible to obtain a list of all individuals who have ever been interviewed. For each person a vast array of socio-economic characteristics is available and it can be determined if he or she survived or died between successive survey waves.

Compared to the original EU-SILC data which Member States submit annually to Eurostat, the **UDB data comes with limitations**. Most importantly, Germany is not included in the UDB. Moreover, anonymization rules are applied to the original data which negatively affect mortality analyses. Most notably this refers to the top-coding of all respondents aged 80 or over into one age category and grouping of months (of date variables) into quarters.

Statistics Austria conducted a **small web survey among Member States** on the methods used to verify vital status. The enquiry should reveal the potential to link data from national mortality registers to individual survey respondents. On an aggregate level, the observed number of deaths in EU-SILC was **assessed against the expected number of deaths**, given national life tables.

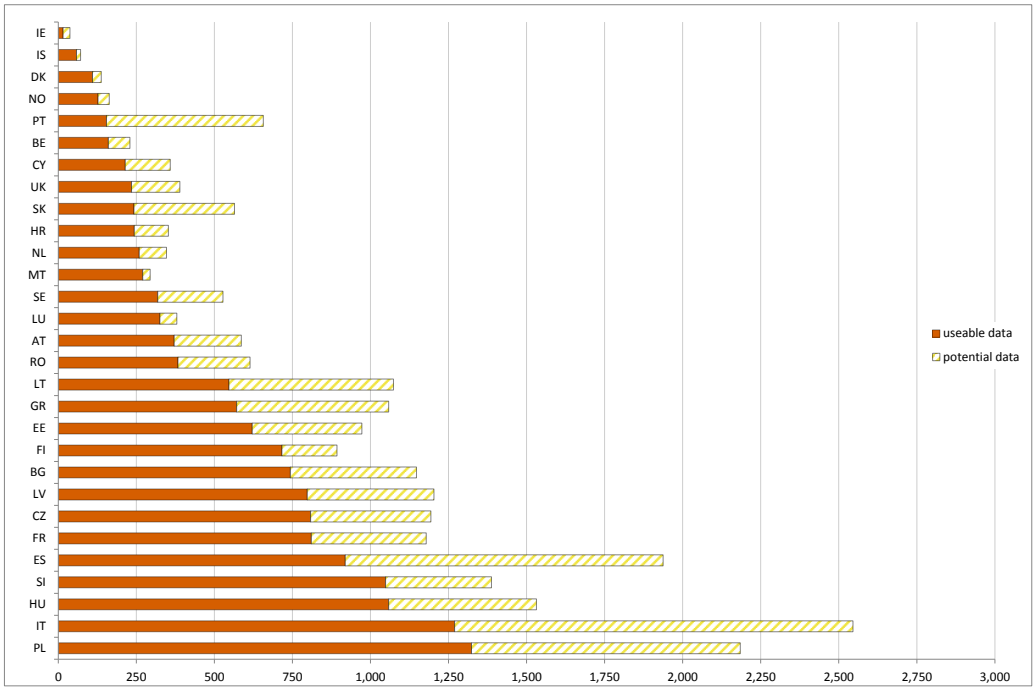
Findings on Feasibility: Little Effort Required to Increase Public Value

In most countries, vital status information is obtained from other household members. A majority of countries would be able to link survey micro data with mortality information from national mortality registers, but at present only a few of them are actually doing the linkage. It would be of great importance to **encourage all countries** to do so.

From the UDB data 2004-2015 a list of in total 1.04 million distinct individuals can be extracted. This list includes sample persons from 29 European countries who were ever to be re-interviewed in EU-SILC. Among them, 24,000 have died between two survey waves. However, not all of these observations can be used directly for mortality analyses. Firstly, respondents aged 80 and over are grouped into one age category in the UDB. Secondly, for a few countries personal IDs are not unique over time, and mortality information is discontinued in three countries. From a technical point of view, these obstacles could easily be removed without much additional cost, and the **value of the data for mortality analyses could be substantially improved**.

At present, 14,700 deaths can be used without limitations for mortality analyses. The largest useable death counts are found for Poland, Italy, Hungary and Spain (Figure 1). As a rule of thumb, around 500 deaths are sufficient for a minimum precision of estimates on mortality differences by socio-economic status. In total **13 countries appear to have sufficiently large numbers of observations**, including some countries for which very little information on the subject is available from other sources.

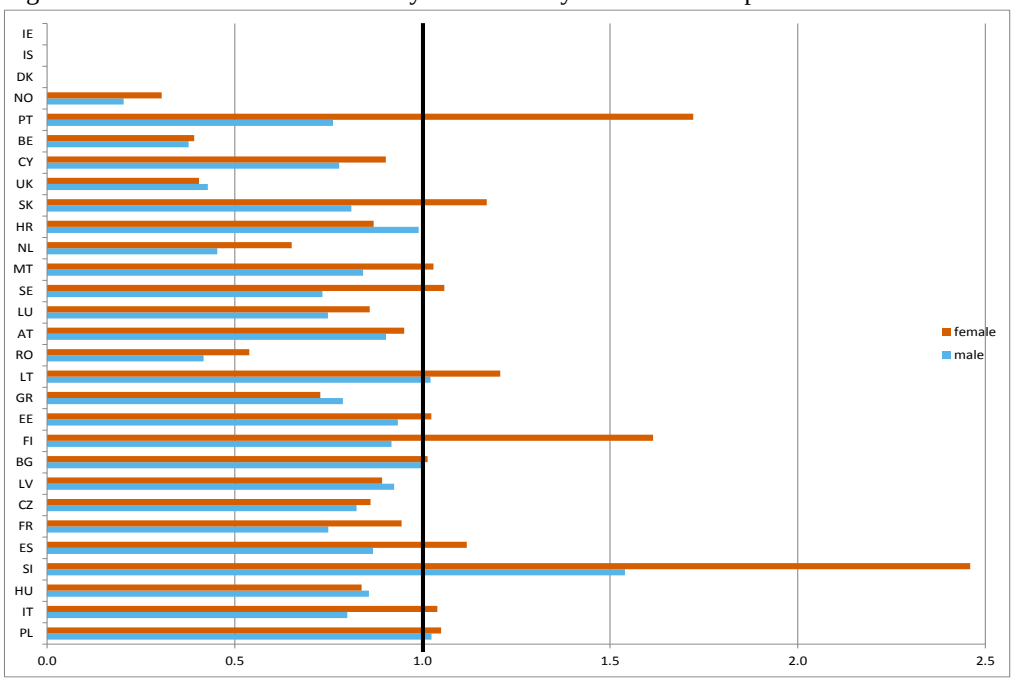
Figure 1: Useable and potential death count per country



Source: Statistics Austria.

Relative mortality ratios (Figure 2) indicate that in most countries, the **EU-SILC sample population is slightly less mortal than the general population**. This is to some degree expected, given health-related selection into the survey. On average, the ratio of observed to expected deaths is 0.80 for males and 0.99 for females. There are, however, some countries with values far below 1.0, indicating that there may be quality problems in mortality information which are not fully understood yet.

Figure 2: Cumulative relative mortality ratio after 3 years of follow-up



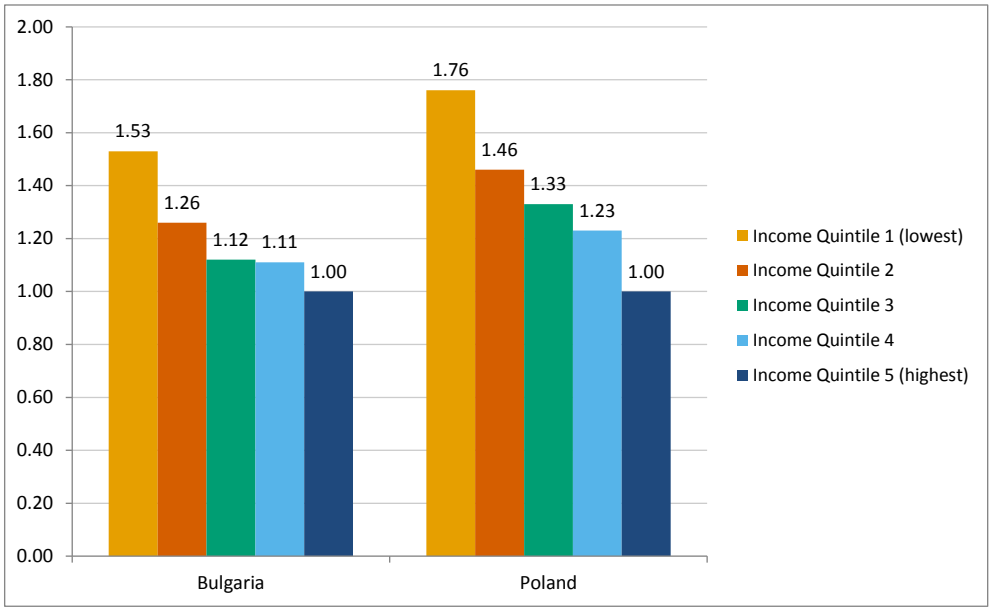
Source: Statistics Austria.

NB: Unweighted data. Figures for Ireland, Iceland and Denmark are not shown because mortality information is discontinued.

Exemplary Results: Income-Related Mortality Confirmed also for Poland and Bulgaria

Statistics Austria estimated mortality hazard ratios by income for Poland and Bulgaria. These countries were chosen because death counts and relative mortality figures indicate good data quality, and the **scientific literature on differential mortality in Bulgaria and Poland is scarce**.

Figure 3: Mortality hazard ratios by income quintile in Bulgaria and Poland



Source: Statistics Austria.
NB: Unweighted data. Estimates refer to respondents aged 35-79 at the time of the survey and are controlled for age and sex. Income means equivalized disposable household income.

In Bulgaria, people in the lowest income quintile have a mortality risk **1.53 times as high** as people in the highest income quintile. The relative mortality disadvantage in the lowest income quintile is even greater in **Poland, where mortality risk is 1.76 times as high** as in the highest quintile.

Conclusions: A Method to Set Fair Ageing on the Policy Agenda

Mortality differences by socio-economic status are pertinent in all modern societies. So far, some European countries could not provide reliable statistics on the subject. The figures which are available are not easily comparable between countries. Statistics Austria has now developed the **FACTAGE method as a new and relatively easy approach** based on longitudinal information from harmonized survey sample data (EU-SILC). We use data from Eurostat's User Database (UDB), which is available to researchers carrying out statistical analyses for scientific purposes.

We developed an algorithm that **prepares UDB data so that it can be used for differential mortality estimation**. EU-SILC has great potential, because it covers all EU member states (although Germany is excluded from the UDB) and contains a large number of relevant and harmonized target variables. As EU-SILC has been conducted annually since 2004, data can be pooled over several survey waves to obtain a sufficiently large number of observations.

There are, however, some quality problems. They refer to mortality information provided by countries as well as to restrictions in the UDB that are unnecessarily restraining the analysis. **Countries and Eurostat could vastly improve data deficiencies without effort of additional data collection**. Certain technical issues such as appropriate weighting and variance estimation for pooled data are yet unsolved. Further research by Statistics Austria will be published in two forthcoming FACTAGE reports.

Read more: J. Klotz and T. Göllner: Estimating Differential Mortality from EU-SILC Longitudinal Data. A Feasibility Study. FACTAGE – WP 4 Deliverable 4.1. Statistics Austria, October 2017.

The FACTAGE method…

- provides a minimum standard when national sources are not available yet;
- complements national figures when these rely only on unlinked cross-sectional data;
- allows for comparative European analyses of mortality differentials in 26 countries;
- creates opportunity for (multivariate) analysis of harmonized social determinants, including the analysis of mortality and morbidity from the same data source;
- uses publicly available data from Eurostat's User Database.

…will benefit if countries will ensure sufficient data quality of vital status information in EU-SILC longitudinal data, most importantly by linking survey data with national mortality registers. Although this may not be possible yet at the time of interview, it will usually be possible before data are transmitted to Eurostat.

…will benefit if Eurostat will drop certain restrictions in the User Database, most importantly the grouping of all survey respondents aged 80 and over into one age category and the grouping of months into quarters. Also, all weighting variables transmitted to Eurostat (cross-sectional and longitudinal) should be made accessible in the User Database.

…is subject of a dedicated training session. Statistics Austria will host a training session on 25-26 April 2018 in Vienna. Theoretical aspects of differential mortality estimation will be combined with hands-on exercises in a computer lab. There is no course fee, but participants will be responsible for their own expenses on travel and accommodation. As places will be limited, potential participants are strongly encouraged to express their potential interest as early as possible. For further information please contact Mr Tobias Göllner: tobias.goellner@statistik.gv.at .