

Validity of the Mortality Follow-Up in SHARE

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Introduction

With the second SHARE-wave a new data source is available for analyzing mortality and its risk factors regarding health as well as on socioeconomic conditions, family and social networks. But before using the data for mortality analyses it is necessary to check the validity of SHARE's mortality follow-up. The question is: Can SHARE describe real mortality in Europe?

Data

The Survey of Health, Ageing, and Retirement in Europe (SHARE) was developed to assess the individual as well as the societal ageing process in Europe (www.share-project.org). It is a multidisciplinary and cross-national survey of older European people aged 50 and above (Börsch-Supan 2005). The first wave was conducted in the years 2004 and 2005 in Sweden, Denmark, Austria, Germany, Netherlands, France, Switzerland, Belgium, Spain, Italy and Greece. Additionally, Israel participated in SHARE's first wave in 2005 and 2006. Altogether 31,115 persons could be interviewed. The second wave with 33,281 interviews was conducted in most countries in the years 2006 and 2007.

The interview consists of several modules which cover the most important fields of the living circumstances of elderly people. Respondents were asked about their physical and mental health, family and social networks and income and assets. The second wave contains a so-called "end-of-life" module. If a person who participated in the first wave of SHARE died between the first and the second waves an "end-of-life" interview was conducted. In this interview, relatives, friends or neighbors were asked about the last year of the decedent. This end-of-life module provides information on the date of death as well as on the cause and place of death.

An important issue to mention is that the institutionalized is missing in the first wave of SHARE since almost all respondents are sampled from private households.

The following analysis is based on the two first waves of SHARE (Releases 2.2.0), where all countries that participated in both waves were included (with the exception of Greece).

Information on the date of death is based on the end-of-life module. As described in the method protocol for 60 % of all deaths that occurred between the two waves an end-of-life interview could be conducted (Jürges 2008). Another 9 % of all deaths could be identified in the coverscreen module for the households in the second wave. Here the respondents were asked if anyone died who was member of the household at time of the first interview. By comparing features like gender and the date of birth it was possible to get information on date of death for those 9 %. For about 31 % of all deaths there is no information on the date of death.

16,461 persons of all persons of the first wave were interviewed a second time. For 546 persons (those 69 % mentioned above) we know the date of death. For 8,612 persons we have no information about their vital status.

As reference for evaluation of the SHARE data the Human Mortality Database (www.mortality.org) is used. The HMD is an internet database that provides information on mortality for almost all European countries (not Greece) as well as of the United States, Canada, Australia, Chile, Japan, New Zealand and Taiwan. The HMD is a joint project of the Department of Demography at the University of California, Berkeley (USA) and at the Max Planck Institute for Demographic Research (MPIDR) in Rostock (Germany). In addition to annual population size and exposure-to-risk population data on annual births and deaths can be retrieved.

Methods

Observed mortality

To get information on mortality measured in SHARE data of the two first waves were merged. The process time begins with the date of the first interview, and if the person died between the first two waves the process times ends with the date of death. For censored cases process time ends with the date of the second interview. If there is no information on survival status the cases are censored at half of the country-specific average time between the first and the second interview. Analysis is done for all countries together.

To get the observed age-specific death rates the person-years at risk to die at every age x and the failures are counted by using the “stptime” command in STATA. By division of those two terms the observed age-specific death rates m_x are calculated (see eq. [1]).

$$m_x = \frac{\text{deaths at age } x}{\text{person} - \text{risk} - \text{years at age } x} \quad [1]$$

Since we know that there are only 69 % of all deaths in the dataset the empirical death rate is corrected by weighting the observed deaths. It is assumed that the relative error is the same in every age, so the age-specific number of deaths is weighted by the value 1/0.69 (see eq. [2]).

$$m_x(\text{corrected}) = \frac{\text{deaths at age } x \cdot \frac{1}{0.69}}{\text{person} - \text{risk} - \text{years at age } x} \quad [2]$$

Expected Mortality

To get the expected age-specific death rate the data of the HMD of the years 2004 and 2005 is used. For every country j the age-specific number of deaths is divided by the age-specific exposure-to-risk population. This leads to a country- and age-specific death rate $M_{x,j}^p$. $M_{x,j}^p$ is then used to calculate the country-specific expected number of deaths $D_{x,j}^e$ by multiplying $M_{x,j}^p$ with the in SHARE observed exposure-to-risk population $E_{x,j}^{SHARE}$ (see eq. [3]).

$$D_{x,j}^e = E_{x,j}^{SHARE} \cdot M_{x,j}^p \quad [3]$$

Then, all expected deaths and the population at risk are added. So the expected death rate M_x^e is based on the same composition like the observed death rate (see eq. [4]).

$$M_x^e = \frac{\sum_{j=1}^{10} D_{x,j}^e}{\sum_{j=1}^{10} E_{x,j}^{SHARE}} \quad [4]$$

Meta-Analysis

In a second step we perform a meta-analysis to explore factors influencing the differences in country-specific life expectancy between SHARE and the HMD. One difference between the HMD and SHARE is the exclusion of the institutionalized population from the latter which results in a selection of comparatively healthy people in SHARE. To partly account for this bias the country-specific analysis in our meta-analysis is restricted to the age span from 50 to 89 thus focusing on ages where institutionalization rates are still low (Gaymu et al. 2006).

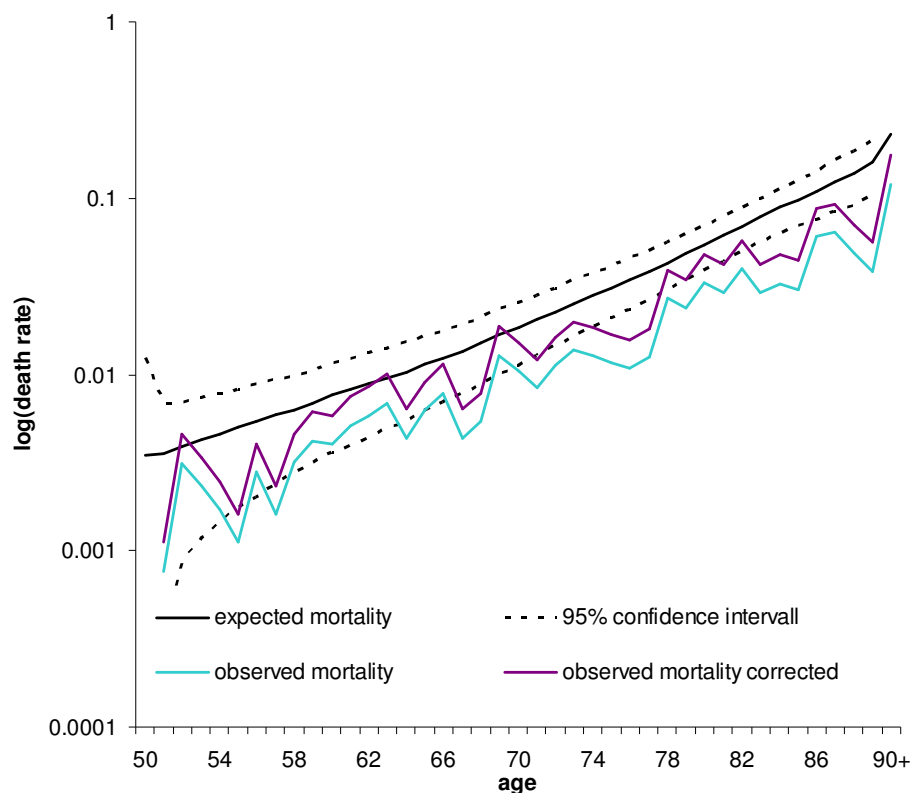
Age-specific hazards for every country are estimated by a discrete time proportional hazards model. Predicted hazards are then used to calculate country-specific partial

life expectancy from age 50 to 89. A meta-regression is carried out to explain differences in life expectancy between SHARE and HMD using structural variables that relate to the sample process of SHARE and structural variables of the country such as the institutionalization rate. Because we only observe 10 countries, the indicators are introduced separately into six univariate models.

Results

Figure 1 displays the trajectories of the observed and expected age-specific death rates as well as the 95 % confidence interval of the expected death rates. If the values of the observed death rates stay within the borders of the confidence interval it can be assumed that mortality measured in SHARE is a random realization of real mortality conditions. First of all, it can be seen that all death rates increase with age. The uncorrected as well as the corrected death rates are characterized by a very discontinuous form.

Figure 1: Observed and expected age-specific mortality rates



Source: SHARE, Wave 1 Release 2.2.0, Wave 2 Release 2.2.0 and HMD

This is due to the fact that the calculation is based on only a few deaths and that we did not use any theoretical distribution for smoothing. The uncorrected death rates lie mostly within the confidence interval up to age 65 (blue line). From age 65 on those rates are located always below the lower bound of the confidence interval. Here we can see that SHARE underestimates systematically real mortality if we do not consider the missing deaths. When correcting for missing deaths in the data the age-specific death rates stay within the confidence interval up to age 75 (violet line). From this age on also the corrected death rates leave the confidence interval and show an underestimation of real mortality.

Table 1: Results of meta-regression analyses assessing the association between differences in partial life expectancy (SHARE – HMD) at age 50 to 89 and the structural indicators for 10 SHARE countries

<i>Meta-Variable</i>	<i>β-Coefficient</i>	<i>stand. β</i>	<i>p-value</i>
% Observed to expected deaths	-0.0564	-0.7124	0.026
% People living in institutions aged 65+	0.3252	0.6254	0.071
Beds in institutions per 10,000 inhabitants	0.0164	0.7673	0.018
% Panel attrition	-0.0409	-0.2852	0.429
% Non-response rate wave 1	-0.1225	-0.7314	0.033
Sample size	0.0002	0.1976	0.601

Source: SHARE, Wave 1 Release 2.2.0, Wave 2 Release 2.2.0, HMD

The results of the meta-regression show that the variable “percentage observed to expected deaths” and the indicators measuring the institutionalization rate have the strongest impact on the difference in life expectancy between SHARE and HMD (see Table 1). An increase of the “percentage observed to expected deaths” by 10 percentage points leads to a decrease in life expectancy difference between SHARE and HMD by about 0.56 years. Regarding the indicator “percentage of people living in institutions aged 65+” an increase by 1 percentage point reduces life expectancy difference by 0.3 years. Due to the strong negative correlation between the

institutionalization rate and the “non-response rate” also the “non-response rate” can explain part of the life expectancy difference. However, the variables “panel attrition” and “sample size” cannot explain the difference. This leads to the conclusion that at present the difference between SHARE and HMD mainly results from an incomplete mortality follow-up as well as from the country-specific institutionalization rate.

Conclusion

Our analysis reveals that the current version of SHARE’s mortality follow-up does underestimate real mortality systematically. This is on the one hand due to the missing deaths in the mortality follow-up, and on the other hand due to the missing institutionalized population in the sample. When we correct for the extent of the missing deaths the observed death rates lie within the 95% confidence interval up to age 75.

To detect other factors influencing differences between observed and expected death rates a meta-regression on country level was carried out. The results confirm that the missing deaths and the institutionalization rate are the driving factors for underestimation of mortality in SHARE’s mortality follow-up.

Literature

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