Persistence in inequalities of frailty at older age: a comparison of 9 EU countries

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Take home message

- Women are more at risk of frailty than men
- Strong inequalities exist among both men and women according to the level of education
- These social inequalities persist over the period 2004-2014

Aim of the study

Reducing inequalities in health and mortality among socioeconomic groups has become a major goal of health policy in many European countries (Marmot et al., 2008). Although remarkable declines in amenable mortality among both groups of low- and high-educated individuals have been achieved, social inequalities in mortality remain large and persistent in Europe, and they seem to increase among men, while remaining quite stable among women (Mackenbach et al., 2017).

One way to reduce this gap is to monitor populations at risk of over-mortality, with a focus on gender issues, in order to implement targeted preventive interventions for tackling health inequalities. As such, frailty has become an important indicator to be measured in clinical settings as well as in the general population (Santos-Eggiman and Sirven, 2016).

Frailty is defined as an increased vulnerability to stressors, resulting from a decrease in physiological reserves of multiple systems. It has been operationalized as a phenotype, determined by the presence of a critical number of impairments in physical strength, physical activity, nutrition, mobility, and energy (Fried et al., 2001). Studies have shown that frailty is associated with a higher use of healthcare resources and predicts health outcomes such as occurrence or aggravation of functional limitations, falls, hospitalizations, and mortality.

Despite the ever-increasing interest in frailty, little attention has been given to the analysis of social inequality in frailty over time. Analysis of change in the prevalence of frailty over time is especially relevant as one of the key aspects of the concept for prevention is that frailty is reversible. Monitoring changes in social inequalities in frailty may be important for designing relevant preventive policies. In addition, although gender issues have always been at the heart of social inequalities analysis, to the

best of our knowledge, no study has yet proposed to measure inequalities in frailty by gender in a dynamic perspective. The aim of this paper is to compare the prevalence of frailty by age groups, gender and socioeconomic groups across Europe.

Methodology

We use data from the waves 1, 2, 4, 5, and 6 of SHARE. We consider respondents aged 50+, who answered questions related to frailty, live in the community and reside in countries that participated to the first 5 standard waves of SHARE (i.e. all but wave 3 which is retrospective), namely Austria, France, Germany, Sweden, Denmark, Switzerland, Belgium, Italy, Spain.

Following Santos-Eggimann et al. (2009) who first proposed an operational measures of Fried's frailty phenotype based on SHARE data, we measure frailty as a clinical syndrome in which three or more of the following criteria are observed: shrinking, self-reported exhaustion, weakness as measured by a grip strength below several thresholds defined by gender and BMI groups, slowness as measured as having difficulties for walking 100 metres or climbing one flight of stairs without resting, and low physical activity. All these measures were collected from each respondent since wave 1 onwards; grip strength is the only non-declarative health measure here.

Education is the indicator of current socioeconomic status that we used for assessing social inequality in frailty and more generally for assessing social health inequalities. We first build a binary variable of education based on the International Standard Classification of Education scale (ISCED-97), considering individuals with a scale equal to 0, 1 or 2 as low educated and others as highly educated. Based on this information, we propose to assess the prevalence of frailty by age groups, gender, education groups and waves in Europe. Inequalities in frailty will be analyzed by computing the difference in frailty prevalence between high and low education groups.

We develop a pseudo-panel approach where clusters of individuals, rather than individuals, are the units of analysis. The clusters are groups defined by sex (female, male), age class (50-64, 65-74, 75+), education levels (low, high), countries (9 European countries), and waves (1, 2 ,4, 5, 6). These 540 clusters are socio-demographic groups for which the prevalence of frailty is computed at every wave, using sampling weights, in order to provide an estimate representative of the population. This method allows comparison over time where age and year effects can be decomposed: the age effect is given by a comparison of frailty prevalence among age classes at each wave, while the year effect is given by the comparison of frailty prevalence among waves for each age class.

Our results depict education-related inequality in frailty prevalence, by gender and age group based on comparison of frailty prevalence (graphs) and time trend (first-difference models with individual fixed effects). In detail, we provide statistics for:

- Education related Inequalities in frailty prevalence, by gender and by age group in average for all the periods (Figure 1)
- Difference-in-difference education related Inequalities in frailty prevalence, by gender and by age group for all the periods (Table 1)

First results

Our first results for the pseudo-panel show inequalities in frailty prevalence according to age and gender in average for all the periods (Figure 1). In average over different time periods, the prevalence of frailty is around 9% among men and of 12% for women. In addition, whatever the period considered, we note a strong increase in the risk of frailty with age: it concerns around 4% of the population aged 50 to 65, 7% of the population aged 65 to 74, and 20% of the population aged 75 and over.

The results displayed in Table 1 (M1-M3) show that women are always more at risk of frailty than men and strong social inequalities exist among both men and women: the risk of frailty is lower among high educated individuals. In addition, these education-related health inequalities seem to increase with age (M2-M3).

Regarding the trends over the period 2004-2015 (Table 1, crossed-terms in M3 and M5), the prevalence of frailty remains quite stable for both women and men. The patterns appear to be similar among education groups, suggesting a persistence of social inequalities in frailty over the period. The time trend is nil (Table 1, variable "Wave" in M1-M5) indicating that the prevalence of frailty remained constant over the pseudo-panel. Decomposition of the trend, i.e. time-fixed effect crossed with cluster fixed-effects (sex, age class, and education level) one after the other, did not reveal any specific trends between men and women, and similar results occur for age classes, and education. In any case, we find no compensation effect – for instance when the increase in one cluster is compensated by a decrease in the other cluster so that the average is nil. The only effect found to be statistically significant ($p<10\%$) is a small increase of 0.5 percentage points in frailty prevalence among low educated women aged 75+.

Conclusion

This analysis of the trends of inequalities in frailty in Europe from a pseudo-panel perspective suggests two main results. First, we account for large and significant social inequalities in the prevalence of frailty between high and low education groups: frailty prevalence for less educated men is on average higher by 4.5 percentage points compared to more educated men, this figure rises to 6.7 percentage points for women. These social inequalities tend to increase with age, reaching 6.6 p.p. for men and 10.9 for women in the 75+ age class. Second, these results are stable over time, meaning that the new generations face a similar risk of frailty as the previous generation. In a nutshell, social inequalities in frailty are strong and persistent.

Despite many effort made to date with the aim to reduce social inequalities in health, these remain large, at least in the case of frailty. Two sets of reasons could be advocated here to explain this result. First, it may be that the mechanisms at play are to be assessed on the long run, so that the period of observation is relatively short here. Second, it may be that two counteracting effects are at play here: medical progress reduces the risk of frailty for any given age, but also increases the pool of survivors, so that we did not observe any change in the prevalence of frailty over time.

Table 1: Difference-in-Difference of frailty prevalence by education over time in 9 European countries

Dep. Var. Prevalence of frailty	OLS			Panel FE	
	M1	M2	M3	M4	M5
Main variables					
Wave (1,2,4,5,6)	0.01	0.01	0.01	0.01	0.01
Education (ISCED)					
Low	ref.	ref.	ref.	-	-
High	-0.05***	-0.05***	-0.05***	-	-
Interaction term					
Wave x Low educ.	ref.	ref.	ref.	ref.	ref.
Wave x Hign educ.	-0.01	-0.01	0.01	-0.01	0.00
Controls					
Sex					
Men		ref.	ref.	-	-
Women		0.03***	0.04***	-	-
Age class					
50-64		ref.	ref.	-	-
65-74		0.03***	0.03***	-	-
75+		0.16***	0.16***	-	-
Country dummies					
(not reported)				-	-
Crossed-terms					
Time invariant					
High educ. x Men			ref.	-	-
High educ. x Women			-0.01	-	-
Time variant					
Men x Wave			ref.		ref.
Women x Wave			0.01		0.01
High educ. x Men x Wave			ref.		ref.
High educ. x Women x Wave			-0.01		-0.01

Intercept	0.13***	0.05***	0.05***	0.10***	0.10***
N	540	540	540	540	540

Legend * p<.1, ** p<.05, *** p<.01. Robust S.E. not displayed for the sake of place.

FIGURE 1. cf. FIG1.gph

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