

## **Frailty, activity participation, and welfare: An analysis using SHARE data**

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### **1. Introduction**

Population ageing has become a pressing issue in the European Union, where the share of older individuals (aged 65 or more) is projected to reach almost 30% of the total population by 2050 (Eurostat 2019). Frailty represents a condition of increased vulnerability among older people, implying a worsening of the risk of adverse health outcomes following losses in one or more domains of the human functioning (Bessa et al., 2018). Thus, a proper understanding of the determinants of frailty can support the identification of policies for healthy ageing, further providing information on the role that institutions can play to this end.

Despite this, the role played by some specific factors in influencing elderly's frailty, both at the micro and at the macro-level, is still to be fully understood. At the micro-level, a key missing piece concerns the role of social networks and activity participation in affecting frailty trajectories. While a great deal of scholarly attention has been devoted to the effect of these aspects on health and survival (Wenger, 1997; Berkman et al., 2000; Jenkin et al., 2018; Morrow-Howell et al., 2003), only few studies have explored the relationship between social aspects and engagement in various kinds of activities and frailty in Europe, such as Etman et al., (2015) and Watts et al. (2017). More recently, Miglio et al. (2023) have attempted to fill this gap, by using SHARE data on 13 European countries to explore how social connectedness and activity participation predict individual frailty trajectories. Their results revealed that both aspects play a significant role in predicting transition to pre-frailty and frailty and risk of death, with activity participation resulting as a much more powerful determinant. However, in their definition of activity participation the authors include widely different types of activities, among which "socially intensive" activities, entailing relevant levels of social interaction, such as doing charity work, participating to sport and other kinds of clubs, and "individual" activities, such as reading and playing number and word games, typically performed in isolation. This leaves open the question of whether there is any difference in the role that these distinct set of activities play in predicting frailty and, if so, which ones matter the most.

Thus, our goal is to complement Miglio et al. (2023), by comparing the effect of participating to "socially intensive" and "individual" activities on frailty. Understanding this aspect can help elucidate on whether it is the social doing and the interpersonal interaction entailed in the more socially intensive activities that can decrease non-frail individuals' likelihood of becoming pre-frail and frail and their risk of death, or whether the entertainment and the intellectual engagement associated with activities such as reading and playing puzzle games are also relevant aspects affecting frailty trajectories.

In addition, we further contribute to the literature by investigating the role of a macro-level characteristic whose impact on frailty has not been thoroughly studied, namely countries' welfare regime. Considering differences in aspects like access to healthcare, generosity and coverage of pension systems, and strength of social safety nets among different welfare regimes, individuals from countries belonging to distinct welfare systems might differ in their frailty trajectories.

### **2. Data and methods**

We rely on data from the 4th (2011) and 5th (2013) waves of the Survey on Health, Aging and Retirement in Europe (SHARE) (Börsch-Supan 2022a 2022b), a longitudinal survey that provides

information on health, socioeconomic status and social life of community-dwelling individuals aged 50 or older in European countries. Out sample includes 8,677 men and 8,616 women aged 60 and older, across 13 European countries.

To assess the impact of different kinds of activities, we rely on some specific questions that SHARE asks survey subjects about the frequency of their engagement with them. In doing so, we distinguish between four “socially intensive” and three “individual” activities. The socially intensive ones include voluntary/charity work, educational or training courses, sport/social/other kinds of clubs, and political/community-related organizations. The individual activities include reading books, magazines, and newspapers, doing word or number games and playing cards or chess. We coded participation to each activity as 1 if the individual engaged with the activity at least once a month in the previous 12 months and 0 otherwise. We then constructed two different scales, one for each group, by counting the number of activities individuals took part to in the previous 12 months, so that the higher the individual’s score in each scale, the greater the variety of activities survey subjects participated to. The Social Activities Scale ranged between 0 and 4, while the range of the Individual Activities Scale was 0-3.

To investigate the role of welfare arrangements on frailty, we employ Eikemo et al.’s (2008) categorization, classifying countries into Social-democratic/Scandinavian (Denmark and Sweden), Bismarckian/continental (Austria, Belgium, France, Germany, the Netherlands, and Switzerland), Mediterranean/southern (Italy and Spain), and eastern/post-communist (Czech Republic, Estonia, Poland, and Slovenia).

Our frailty measure is Romero-Ortuno and Kenny’s (2012) SHARE Frailty Instrument (SHARE-FI), a pre-calculated, population-representative and gender-specific frailty index based on Fried et al.’s (2001) phenotype model. With such index, frailty is assessed based on the presence of five symptoms, that is, unintended weight loss, weakness, slowness, self-reported exhaustion, and low physical activity. Our dependent variable thus classifies individuals into non-frail, pre-frail, and frail. We further included “deceased” as a possible outcome.

Considering the different incidence of frailty among men and women, we stratified our analysis by sex, estimating separately for men and women a multinomial logistic regression model on a pooled sample of all analyzed countries<sup>1</sup> to explore how characteristics assessed in wave 4 influenced frailty in wave 5. We control for social network scale, age, marital status, working status, country-specific wealth quintiles, number of chronic conditions, verbal fluency, and EURO-D scale of depression.

### 3. Results

We provide the results of our multinomial regression models Table 1, in the form of relative risk ratios (RRR).

Results of our models reveal that, for both men and women, engagement with “social” activities protects against the risk of moving from a state of non-frailty to one of pre-frailty and frailty, even if with different intensity. Specifically, among both men and women, participating to social activities significantly decreases the likelihood of becoming frail. However, the magnitude of the effect is different for men and women: while among men each additional score in the social activities scales is associated to an RRR of 0.65, among women the RRR is equal to 0.74, signaling a relatively smaller effect. Rather, participating to individual activities seems to only affect men’s risk of becoming pre-frail, and not women’s. Gender-related differences are also observed when analysing the likelihood of moving from a state of non-frailty to one of frailty. Individual activities appear to only affect the transition to frailty among women, while no effect is observed among men.

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<sup>1</sup> Considering our interest towards investigating the role of welfare regimes, we did not include country-fixed effects in our models, as doing so would have entailed collinearity issues. However, results concerning the role of social and individual activities in affecting frailty are robust to an alternative specification of our models, including country-fixed effects rather than welfare regimes effects.

**Table 1: Estimate of regression parameters from the multinomial logistic regression models (s.e. in brackets)**

	Men			Women		
	Pre-frail	Frail	Deceased	Pre-frail	Frail	Deceased
<b>Social Activities Scale</b>	0.83*** (0.04)	0.65*** (0.05)	0.86 (0.07)	0.83*** (0.03)	0.74* (0.12)	0.54*** (0.05)
<b>Individual Activities Scale</b>	0.91* (0.04)	0.90 (0.09)	0.95 (0.05)	0.94 (0.03)	0.80** (0.07)	0.78 (0.12)
<b>Social Networks Scale</b>	0.85*** (0.04)	0.96 (0.06)	1.05 (0.08)	0.93 (0.03)	0.97 (0.07)	1.05 (0.14)
<b>Age (Cont.)</b>	1.06*** (0.01)	1.11*** (0.02)	1.10*** (0.01)	1.06*** (0.01)	1.09*** (0.01)	1.10*** (0.01)
<b>Wealth Quintile (Ref. 1<sup>st</sup>)</b>						
2 <sup>nd</sup>	1.23 (0.23)	1.07 (0.24)	0.87 (0.21)	0.92 (0.06)	0.75 (0.12)	0.65 (0.23)
3 <sup>rd</sup>	1.13 (0.12)	1.02 (0.14)	0.66** (0.10)	0.86* (0.06)	0.65* (0.13)	0.85 (0.33)
4 <sup>th</sup>	0.95 (0.10)	0.52** (0.13)	0.71 (0.18)	0.80** (0.06)	0.43*** (0.07)	0.94 (0.33)
5 <sup>th</sup>	0.89 (0.11)	0.57*** (0.09)	0.70 (0.21)	0.72*** (0.06)	0.44** (0.13)	0.89 (0.33)
<b>Married/in relationship (Ref. Single)</b>	0.89 (0.10)	1.12 (0.21)	0.64 (0.15)	1.01 (0.06)	1.10 (0.06)	0.67 (0.14)
<b>Currently working (Ref. Not working)</b>	0.75 (0.12)	0.62 (0.16)	0.73 (0.16)	0.90 (0.10)	0.43*** (0.10)	0.84 (0.17)
<b>N. of chronic conditions</b>	1.25*** (0.03)	1.25*** (0.01)	1.09** (0.04)	1.21*** (0.02)	1.41*** (0.09)	0.96 (0.09)
<b>Verbal Fluency score</b>	0.99 (0.01)	0.97 (0.02)	0.96** (0.01)	0.99*** (0.00)	0.95*** (0.01)	0.97 (0.03)
<b>EURO-D scale of depression</b>	1.15*** (0.04)	1.17* (0.07)	1.09 (0.05)	1.16*** (0.03)	1.20*** (0.05)	1.11 (0.08)
<b>Welfare regime (Ref. Scandinavian)</b>						
Continental	1.20 (0.12)	1.03 (0.47)	0.78 (0.22)	1.11 (0.11)	0.95 (0.22)	0.45* (0.17)
Mediterranean	1.86*** (0.27)	1.59 (0.71)	1.26 (0.31)	1.99*** (0.15)	2.63*** (0.65)	0.73 (0.30)
Post-communist	1.77*** (0.20)	1.51 (0.67)	2.14** (0.51)	1.26* (0.13)	1.51 (0.37)	0.78 (0.30)

Source: Authors' elaborations on SHARE data. Notes: 95% C.I. \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ .

Gender-related differences also emerge when it comes to the mortality outcome, as while for non-frail women participating to social activities significantly decreases the probability of death (RRR = 0.54,  $p < 0.001$ ), for men this effect is not observed. In addition, for both men and women, engaging in "individual" kinds of activities does not significantly impact the likelihood of death.

As for the other variables included in the model, our results are in general consistent with previous studies on the determinants of health in later life, highlighting a positive association between number of chronic conditions and frailty (Mangin et al., 2023), as well as a positive association between depression and frailty (Soysal et al., 2017).

In terms of effects of welfare regime of the country where the individual lives on frailty, relevant differences emerge between men and women: a welfare-related effect is observed, among men, for the transition to pre-frailty, so that men in countries with Mediterranean and post-communist welfare regimes are more likely to become pre-frail, relatively to men in Scandinavian countries. In addition, a welfare effect is observed for the risk of death, with men in post-communist countries displaying a 1.14 higher RRR ( $p < 0.01$ ), compared to men in Scandinavian countries. Conversely, significant differences emerge in the frailty trajectories experienced by non-frail women from different welfare regimes, for all outcomes considered. Specifically, non-frail women in Mediterranean welfare states (*i.e.*, Spain and Italy) appear to be significantly more likely to successively become pre-frail (RRR = 1.99,  $p < 0.001$ ) and frail (RRR = 2.63,  $p < 0.05$ ) relative to women in Scandinavian countries. Similarly, women in post-communist welfare regimes, too, appear to be more likely to become pre-frail than their Scandinavian counterparts. In addition, significant differences are observed among non-frail women from continental and Scandinavian welfare regimes, with the former displaying significantly lower relative risk of death than the latter.

#### 4. Conclusions

This study aimed at examining and comparing how participating to “social” and “individual” activities affects frailty at older ages. In addition, we also aimed at understanding differences in the prevalence of frailty among men and women from different welfare regimes. To do so, we employed SHARE data on community-dwelling individuals from 13 European countries, aged 60 and older.

Our findings suggest that both participating to socially intensive activities and “individual” activities are aspects that affect frailty trajectories, with the former, often entailing a great deal of interpersonal interaction, seemingly exerting a stronger effect. Some of these effects, however, were stratified across gender. In particular, among both non-frail men and women, participation to activities such as doing voluntary work and participating to community-related organizations and sport, social, or other kinds of clubs protects against the risk of becoming pre-frail and frail, and for women, against the risk of death, too. The impact of engagement with individual activities, on the other hand, appears to only affect transition to pre-frailty, for men, and to frailty among women.

All in all, these findings are suggestive of a different role of the two groups of activities examined, so that activities requiring a certain degree of networking and interaction appear to affect all the considered outcomes, albeit differently among men and women, while engaging with activities such as doing crossword puzzles, number games, and playing cards, affects differently pre-frailty and frailty for men and women. There are various hypotheses as to what might produce these differences. For instance, the role theory emphasizes the key impact of activities like volunteering and participating to various kinds of clubs, thanks to the active engagement these entail. This active engagement can be especially important for elderly individuals who face the end of their lifelong responsibilities as employees, caregivers, or partners, due to life events like retirement and widowhood (Anderson et al., 2014).

In terms of differences in frailty trajectories among different welfare-regimes, we further found evidence of higher mortality risks among men in countries characterized by post-communist welfare regimes, compared with men from Social-democratic/Scandinavian countries. This is consistent with findings of a stagnation in older people’s (particularly men’s) life expectancy in Eastern European countries (Karanikolos, Adany and McKee, 2017), a pattern that is widely different from that observed in Social-democratic/Scandinavian countries, typically displaying life expectancy levels that exceed the global average (Knudsen et al., 2019).

We also highlighted higher likelihood of developing pre-frailty and frailty among non-frail

women in Mediterranean welfare regimes, compared to women in Scandinavian ones. Possible explanations for this result include the high degree of familism characterizing Mediterranean welfare states (Misra and Moller, 2005), determining a heavy responsibility of the family for their members' wellbeing. This can be particularly detrimental for the health of elderly women, given the gendered expectations seeing women bearing the greatest caregiving responsibilities for family members (Zygouri et al., 2021). As such, women in familistic societies are all the more likely to end up bearing a disproportionate caregiving burden, providing care for grandchildren and spouses. This can increase their stress and fatigue, negatively impacting their health and thus determining an increase in the likelihood of becoming pre-frail and frail, relative to women from countries characterized by Scandinavian welfare regimes. Indeed, in such systems, the state tends to assume an active role in providing comprehensive social support, via policies and public services that ensure the well-being and equality of its citizens, such as healthcare, long-term care, pension and housing programs, all aspects that partially relieve the individual of often burdening care responsibilities and concurrently improve healthcare outcomes among elderly women, thanks to a widespread access to quality medical care and support services.

## Acknowledgements

*This research was funded by the 2020 PRIN-Research Project of National Relevance "Social and health Frailty as determinants of Inequality in Aging (SOFIA)". We acknowledge co-funding from European Union – Next Generation EU, in the context of The National Recovery and Resilience Plan, Investimento Partenariato Esteso PE8 "Conseguenze e sfide dell'invecchiamento", Project Age-It (Ageing Well in an Ageing Society).*

*This paper uses data from SHARE Waves 4 and 5. The SHARE data collection has been funded by the European Commission, DG RTD through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982, DASISH: GA N°283646) and Horizon 2020 (SHARE-DEV3: GA N°676536, SHARE-COHESION: GA N°870628, SERISS: GA N°654221, SSHOC: GA N°823782, SHARE-COVID19: GA N°101015924) and by DG Employment, Social Affairs & Inclusion through VS 2015/0195, VS 2016/0135, VS 2018/0285, VS 2019/0332, and VS 2020/0313. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01\_AG09740-13S2, P01\_AG005842, P01\_AG08291, P30\_AG12815, R21\_AG025169, Y1-AG-4553-01, IAG\_BSR06-11, OGHA\_04-064, HHSN271201300071C, RAG052527A) and from various national funding sources is gratefully acknowledged (see [www.share-project.org](http://www.share-project.org)).*

## References

- Anderson, N.D., Damianakis, T., Kröger, E., Wagner, L.M., Dawson, D.R., Binns, M.A., Bernstein, S., Caspi, E., Cook, S.L., and The BRAVO Team. (2014). The benefits associated with volunteering among seniors: A critical review and recommendations for future research. *Psychological Bulletin*, **140**(6), pp. 1505–1533.
- Baxter, S., Blank, L., Cantrell, A., Goyder, E. (2021). Is working in later life good for your health? A systematic review of health outcomes resulting from extended working lives. *BMC Public Health*, **21**, pp. 1-11.
- Berkman, L.F., Glass, T., Brissette, I., Seeman, T.E. (2000). From social integration to health: Durkheim in the new millennium. *Social Science and Medicine*, **51**(6), pp. 843-857.
- Bessa, B., Ribeiro, O., Coelho, T. (2018). Assessing the social dimension of frailty in old age: A

- systematic review. *Archives of Gerontology and Geriatrics*, **78**, pp. 101–113.
- Börsch-Supan, A. (2022a). Survey of health, ageing and retirement in Europe (SHARE) Wave 4. Release version: 8.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w4.800
- Börsch-Supan, A. (2022b). Survey of health, ageing and retirement in Europe (SHARE) Wave 5. Release version: 8.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w4.800
- Eikemo, T.A., Bambra, C., Joyce, K., Dahl, E. (2008). Welfare state regimes and income-related health inequalities: A comparison of 23 European countries. *The European Journal of Public Health*, **18**(6), pp. 593–599.
- Etman, A., Kamphuis, C.B.M., van der Cammen, T.J.M., Burdorf, A., van Lenthe, F.J. (2015). Do lifestyle, health and social participation mediate educational inequalities in frailty worsening? *The European Journal of Public Health*, **25**(2), pp. 345–350.
- Eurostat (2019). *Ageing Europe - Looking at the Lives of Older People in the EU*. EU, Stat. book.
- Fried, L.P., Tangen, C.M., Walston, J., Newman, A.B., Hirsch, C., Gottdiener, J., Seeman, T., Tracy, R., Kop, W.J., Burke, G., McBurnie, M.A., Cardiovascular Health Study Collaborative Research Group. (2001). Frailty in older adults: Evidence for a phenotype. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, **56**(3), pp. M146–156.
- Jenkin, C.R., Eime, R.M., Westerbeek, H., van Uffelen, J.G.Z. (2018). Sport for adults aged 50+ years: Participation benefits and barriers. *Journal of Aging and Physical Activity*, **26**(3), pp. 363–371.
- Karanikolos, M., Adany, R., McKee, M. (2017). The epidemiological transition in Eastern and Western Europe: A historic natural experiment. *The European Journal of Public Health*, **27**(suppl\_4), pp. 4–8.
- Knudsen, A.K., Allebeck, P., Tollånes, M.C., Skogen, J.C., Iburg, K.M., McGrath, J.J., ... Øverland, S. (2019). Life expectancy and disease burden in the Nordic countries: Results from the Global Burden of Diseases, Injuries, and Risk Factors Study 2017. *The Lancet Public Health*, **4**(12), e658–e669.
- Mangin, D., Lawson, J., Risdon, C., Siu, H.Y.H., Packer, T., Wong, S.T., Howard, M. (2023). Association between frailty, chronic conditions and socioeconomic status in community-dwelling older adults attending primary care: a cross-sectional study using practice-based research network data. *British Medical Journal Open*, **13**(2), e066269.
- Miglio, R., Puglisi, C., Rettaroli, R., Roli, G., Scalone, F. (2023). Frailty in Europe: The role of social networks and activity participation. Manuscript submitted for publication.
- Misra, J., Moller, S. (2005). Familialism and welfare regimes: Poverty, employment, and family policies. *LIS Working Paper Series*, 399.
- Morrow-Howell, N., Hinterlong, J., Rozario, P.A., Tang, F. (2003). Effects of volunteering on the well-being of older adults. *The Journals of Gerontology: Series B*, **58**(3), pp. S137–S145.
- Romero-Ortuno, R., Kenny, R.A. (2012). The frailty index in Europeans: Association with age and mortality. *Age and Ageing*, **41**(5), pp. 684–689.
- Soysal, P., Veronese, N., Thompson, T., Kahl, K.G., Fernandes, B.S., Prina, A.M., ... Stubbs, B. (2017). Relationship between depression and frailty in older adults: A systematic review and meta-analysis. *Ageing Research Reviews*, **36**, pp. 78–87.
- Watts, P., Webb, E., Netuveli, G. (2017). The role of sports clubs in helping older people to stay active and prevent frailty: A longitudinal mediation analysis. *International Journal of Behavioral Nutrition and Physical Activity*, **14**(1), 95.
- Wenger, G.C. (1997). Social networks and the prediction of elderly people at risk. *Aging and Mental Health*, **1**(4), pp. 311–320.
- Zygouri, I., Cowdell, F., Ploumis, A., Gouva, M., Mantzoukas, S. (2021). Gendered experiences of providing informal care for older people: A systematic review and thematic synthesis. *BMC Health Services Research*, **21**, pp. 1–15.