

Changes in Provision of Social Support among the Older Population in Nine European Countries during 2004–2015: A panel data analysis

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Abstract

Background : Providing support to others may be beneficial for older adults. As people age, their health and social relationships change. These changes may relate to change in social support provision as well. We examined the trajectory of social support provision by older people in three European regions throughout eleven years of follow-up. We then examined the extent to which age, gender, and region (represents welfare state regime) influenced the variations in the trajectory.

Methods : Data collected from 8,354 respondents who had completed at least waves 1 and 6 of the Survey of Health, Ageing and Retirement in Europe (SHARE) was analysed. Social support provision was determined from asking a single question regarding whether the respondent provided help personally for people outside their household. Region, sex, and age were the main predictors tested. We used growth model to address the aims of this study.

Results : The northern European region (Sweden and Denmark) had the highest odds ratio of providing social support. The likelihood of social support provision decreases by 10% yearly (OR: 0.901, 95%CI: 0.878,0.925) over 11 years of follow-up. Older respondents were less likely to provide support and their trajectories declined faster than the younger respondents. Gender difference in social support provision was more apparent among younger older people in the southern European region.

Conclusions : European older adults are important source of support, especially for their family. The probability of social support provision by European older adults declines over time. Age, gender and welfare state regime predict this trajectory.

Background

Social relationships play an important role in promoting healthy ageing in various ways [1, 2]. Studies reported that a lack of social network has been linked to poor health behaviours, mental illness, low physical and cognitive functioning, morbidity, and mortality [3, 4]. The social network's effect on health is mediated through several psychosocial pathways; for example, through social engagement, social influence, and social support [5]. Social support is defined as the provision and receiving of resources to and from individuals within a social network [6, 7]. The resources exchanged can be instrumental (e.g. financial assistance, help with daily tasks), informational (e.g. advice or guidance), or emotional (e.g. empathy, reassurance, and trust) [5, 7].

Studies on the association between social support and older adults' health have reported that receiving social support prevents depression [8, 9], improves morale and cognitive ability, and reduces the risk of disability and mortality [10]. However, being dependent on social support may also negatively affect one's self-esteem and lead to depression [11]. Although providing support or care for others has sometimes been associated with physical and mental health problems [12], giving support may also have positive effects, such as increased happiness and belongingness [13]. Levels of freedom of choice in providing support to others and the effectiveness of the support given have been found to be important conditions

for its beneficial effects. Another longitudinal study also showed that providing instrumental or emotional support was associated with longevity [14]. On the other hand, support-givers tend to experience negative feelings when they feel forced to provide support or when they know that their support may not effectively help the support receivers [13].

Most research on social support has focussed on the effect of receiving support and the negative effects of providing support in terms of caregiving [9, 13]. The potential benefits of giving support warrant further investigation [13]. A range of factors, from individual level to societal level, including gender, age, economic status and welfare state policy [15, 5], could influence personal social networks and the exchange of social support. Traditional gendered expectations may lead to more frequent support provision being offered by women than by men, which may influence gender differences in health status [9].

'Welfare state' is a type of governing in which a government distributes and redistributes access to welfare and its associated resources among its citizens, usually through its health care system and social policies such as education, social insurance, and pension programmes [16]. Family relationships and welfare state regimes have central roles in shaping support exchange.

Traditionally, support provision is regarded as a family obligation and is more common in less generous welfare states. The provision of social service by a welfare state releases family members from part of their obligation [17]. Additionally, changes in family living arrangements that see an increasing number of children living at distance from their parents, may also affect patterns of social support [18]. It is likely that routine support exchanges include other households [18, 19], making the provision of social support for other households an interesting field to explore.

As people age, their cognitive function, as well as mental and physical health, declines. At the same time, their social role and relationships also change [10]. Social networks are likely to decrease with age, mostly due to the deaths of partners, siblings, and friends [20]. These changes in social networks relate to concurrent changes in social support.

To our knowledge, studies on the trajectory of social support, especially on the provision of social support, as older adults age are scarce. A ten-year longitudinal study in the USA reported a decline in the provision of and an increase in the receipt of social support [21]. However, different patterns may emerge in other settings due to differences in contextual factors e.g. cultures, socio-economic levels, and welfare policies. We used data from the Survey of Health, Ageing and Retirement in Europe (SHARE) to: (i) describe the trajectory of social support provision by older people in three European regions throughout eleven years of follow-up; (ii) estimate the extent to which age, gender, and region influence the variations in the trajectory of social support provision.

Methods

Data source

The present study used the SHARE longitudinal data (Release 6-1-0). SHARE focuses on health, and socioeconomic and social relationships among a European population aged 50 and over and their partners (irrespective of their age) [22]. A total of 21 European countries (including Israel) have participated in at least one wave of SHARE. The first data collection was conducted in 2004 and, by 2015, six waves of data collection had been collected in nine European countries. Unlike the 3rd wave which is part of the SHARELIFE panel and assesses life history, data from all waves belong to the regular panel. More details on the survey method has been described elsewhere [22].

Study sample

The first wave of SHARE included 29,389 respondents aged ≥ 50 . Among them, a total of 8,636 respondents with a total of 40,123 observations met our three inclusion criteria: 1) aged 50 and over in wave 1; 2) participated in at least waves 1 and 6. Respondents from nine countries (i.e. Austria, Belgium, Denmark, France, Germany, Italy, Spain, Sweden, and Switzerland) met this criteria; 3) have never moved to a nursing home. When respondents resided in a nursing home, they were interviewed using a different set of questionnaires, thus their data may not be comparable to data from community-dwelling respondents.

In the analysis, a total of 8,354 respondent with 39,084 observations had at least two valid values of support provision, the minimum requirement for trajectory analysis. A total of 4,221 observations were excluded from the analysis because of missing data in any one of the variables of interest. Thus, 34,863 observations from those 8,354 respondents were included in the current analysis.

Measures

All measures used in this study were obtained by trained interviewers from face-to-face interviews using computer-assisted personal interviewing (CAPI). In addition, SHARE collected information from self-administered questionnaires and physical tests. More details on the data collection procedures is available elsewhere [22].

Main outcome: Providing social support

We determined the provision of support from the question *“In the time since the last interview, have you personally given any kind of help listed on this card to a family member from outside the household, a friend or neighbour?”*. The types of social support referred to in this question included 1) personal care, i.e. dressing, bathing or showering, eating, getting in or out of bed or using the toilet; 2) practical household help, e.g. with home repairs, gardening, transportation, shopping, household chores; and 3) help with paperwork, such as filling out forms, settling financial or legal matters.

Time measures

Time indicates the number of years that have passed since the baseline interview, taken as the difference between the date of first interview (wave 1) and the date of the subsequent interviews. SHARE is run biannually but the follow up time was not exactly the same for all countries. Thus, in this study follow-up time ranged from 0 for wave 1 to 12 for wave 6.

Time-varying predictors

The values of the following predictors were updated in each follow-up wave.

Marital status. Respondents who were married or had a partner were grouped as “with partner” and those who were never married, divorced, or widowed were grouped as “no partner”.

Household size. The total number of people residing in the respondent’s household.

Number of children. The number of living children (either natural, fostered, adopted and stepchildren) reported by the respondent.

Self-perceived health. Respondents were asked to choose “Excellent”, “Very good”, “Good”, “Fair”, and “Poor” to the question “Would you say your health is...?” Respondents who reported “Excellent”, “Very good” or “Good” were classified in “good” health. While those who reported “Fair” or “Poor” were classified as being in “poor” health.

Time-constant predictors

The following covariates had, or were assumed to have, a constant value across the follow-up periods.

Age at baseline was the respondent’s age in the first wave, calculated based on birth date and interview date. In the main analysis, the baseline age of 50 years was rescaled to zero.

Gender had two categories: women and men.

Education level was defined as the highest level of education reported by the respondents throughout the study. We recorded education level according to the 1997 International Standard Classification of Education (ISCED-97), with seven levels ranging from 0 (early childhood education) to 6 (doctoral or equivalent level). In this study, the ISCED levels were recategorized into “low” (ISCED 0, 1 and 2), “middle” (ISCED 3 - Upper secondary education and 4-Post-secondary non-tertiary education), and “high” (ISCED 5 and 6).

Region. The nine SHARE countries included in this study were grouped into three regions that represented their geographical location and welfare state regimes. The type and the level of generosity of those welfare state regimes vary across Europe. In this study, we followed Esping-Andersen’s classification of welfare states [23]. Countries in the northern region, i.e. Sweden and Denmark, represent a ‘social democratic’ welfare state regime. It is known as a generous welfare state and characterised by high taxes, high income redistribution, high women’s participation in the labour-force, high standard of living, and

high trust in the public system. The central region includes 'conservative' (i.e. Austria, Belgium, France, Germany) and 'liberal' welfare regimes (i.e. Switzerland). A 'conservative' welfare state is characterised by low female participation in the labour-force, moderate redistribution of income, higher unemployment, and dependency on social contribution. A 'liberal' welfare regime has a low level of total state spending, low expenditure on social services and high inequality. Italy and Spain were grouped in the southern region [24], which has a 'fragmented' welfare system characterised by diverse income protection, limited or partial coverage of health services, and reliance on the family and charitable sectors.

Statistical Analyses

We used descriptive analysis to report respondents' sociodemographic characteristics as well as the distribution of self-perceived levels of health and provision of support. We addressed the aims of the study using a growth model with a multilevel approach. To test the fit of a multilevel growth model for our data, we first specified the unconditional models. The unconditional mean model (Model 1) was specified without any predictors to confirm whether there are 'within-individual variations' (changes over time) and 'between-individual variations' (changes across time) in the odds of providing support [25].

Next, the unconditional means growth model (Model 2) was specified by adding the time variable. This model was used to describe the average pattern of change in the odds of social support provision across the follow-up period, as well as to check the presence of the between-individual variance regarding the trajectory of the outcome. In the conditional models, we added time-constant (Model 3) and time-varying predictors (Model 4). We also tested within and cross-level interactions. In the final model (Model 5), we kept interaction terms that changed the time estimate.

The final model used in this study is presented in equation 1.0 with growth parameters as specified in equation 1.1 -1.8. For a more detailed model formulation see section A in the additional file.

$$\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \alpha_{0i} + \alpha_{1i} \text{Time}_{ij} + \alpha_{2i} \text{Without partner}_{ij} + \alpha_{3i} \text{Household size}_{ij} + \alpha_{4i} \text{N.living children}_{ij} + \alpha_{5i} \text{Poor health}_{ij} + \alpha_{6i} \text{Time}_{ij} \times \text{Without partner}_{ij} + \alpha_{7i} \text{Time}_{ij} \times \text{Poor health}_{ij} \quad (1.0)$$

$$\alpha_{0i} = \beta_{00} + \beta_{01} \text{Age at baseline}_v + \beta_{02} \text{Man}_v + \beta_{03} \text{Middle edu.level}_v + \beta_{04} \text{High edu.level}_v + \beta_{05} \text{Central region}_v + \beta_{06} \text{Northern region}_v + \beta_{07} \text{Age at baseline}_v \times \text{Man}_v + \beta_{08} \text{Middle edu.level}_v \times \text{Central region}_v + \beta_{09} \text{High edu.level}_v \times \text{Central region}_v + \beta_{010} \text{Middle edu.level}_v \times \text{Northern region}_v + \beta_{011} \text{High edu.level}_v \times \text{Northern region}_v + \beta_{012} \text{Man}_v \times \text{Central region}_v + \beta_{013} \text{Man}_v \times \text{Northern region}_v + u_{0i} \quad (1.1)$$

$$\alpha_{1i} = \beta_{10} + \beta_{13} \text{Middle edu.level}_v + \beta_{14} \text{High education level}_v + \beta_{15} \text{Central region}_v + \beta_{16} \text{Northern region}_v + \beta_{17} \text{Age at baseline}_v \times \text{Man}_v + \beta_{18} \text{Age at baseline}_v \times \text{Woman}_v + u_{1j} \quad (1.2)$$

$$\alpha_{2i} = \beta_{20} + \beta_{22} \text{Man}_v + \beta_{25} \text{Central region}_v + \beta_{26} \text{Northern region}_v \quad (1.3)$$

$$\alpha_{3i} = \beta_{30} \quad (1.4)$$

$$\alpha_{4i} = \beta_{40} + \beta_{45} \text{Central region}_v + \beta_{46} \text{Northern region}_v \quad (1.5)$$

$$\alpha_{5i} = \beta_{50} \quad (1.6)$$

$$\alpha_{6i} = \beta_{60} + \beta_{65} \text{Central region}_v + \beta_{66} \text{Northern region}_v \quad (1.7)$$

$$\alpha_{7i} = \beta_{70} \quad (1.8)$$

Since Model 5 was specified with several interaction terms, the interpretation of those effects was not straightforward. The odds ratios do not readily communicate the nature of interaction terms. Estimates of interaction terms need to be interpreted by considering the independent effect of each predictor in the interaction term. Thus, we calculated the predicted probability of support provision from model 5 based on the ‘marginal effects at representative’ values (MERs) method, using the *marginplots* command in Stata. In predicting the probability of social support provision by sex and age at baseline, we only used three baseline-ages to represent different periods in people’s lives, i.e. pre-retirement (age 50), retirement transition (age 60) and post-retirement (age 70).

As a sensitivity analysis, we specified Model 5 as a three-level multilevel analysis with variable *region* in the third level. However, this model only worked without a random slope due to the limited sample size. In general, this three-level model led to the same conclusion as Model 5 used in the present study. We used Stata MP (Version 15.1) for all analyses.

Results

Respondents characteristics

Table 1 presents the descriptive statistics of outcome and covariate variables. Gender, education and region are time-constant predictors, thus their different values by wave were due to the different sample size in each wave. In wave 1, ages ranged from 50-95 years old with a mean of 62.5 years. There were

more female respondents in the sample (56.3%) and the most common highest education attainment was low level (48.0%). Respondents from central Europe (Austria, Belgium, France, Germany, and Switzerland) comprised half of the sample, while the other two regions shared similar proportions. Across waves, the mean of the household size decreased while the number of living children was quite constant. A higher proportion of respondents reported being married or had partner. Most respondents (77.0%) perceived their health as 'good' in wave one and, as time progressed, more respondents reported 'poor' health (37.4% in wave 6).

Table 1. Characteristics of the respondents across different waves

	Wave 1 (n = 8,326)	Wave 2 (n = 7,537)	Wave 4 (n = 5,195)	Wave 5 (n = 5,571)	Wave 6 (n = 8,234)
Follow-up time in year, Mean(SD)	0 (0)	2.3 (0.6)	6.7 (0.5)	8.7 (0.5)	10.6 (0.5)
Age, Mean(SD)	62.5 (8.2)	64.7 (8.2)	69.5 (8.4)	71.3 (8.3)	72.98 (8.2)
Gender, n(%)					
Women	4691 (56.3)	4252 (56.4)	2999 (57.7)	3208 (57.6)	4651 (56.5)
Men	3635 (43.7)	3285 (43.6)	2196 (42.3)	2363 (42.4)	3583 (43.5)
Highest education level, n(%)					
Low	3997 (48.0)	3584 (47.6)	2416 (46.5)	2588 (46.5)	3955 (48.0)
Middle	2509 (30.1)	2284 (30.3)	1594 (30.7)	1721 (30.9)	2471 (30.0)
High	1820 (21.9)	1669 (22.1)	1185 (22.8)	1262 (22.7)	1808 (22.0)
Region, n(%)					
Southern Europe	2203 (26.5)	1945 (25.8)	1279 (24.6)	1391 (25.0)	2182 (26.5)
Central Europe	4126 (49.6)	3808 (50.5)	2694 (51.9)	2798 (50.2)	4081 (49.6)
Northern Europe	1997 (24.0)	1784 (23.7)	1222 (23.5)	1382 (24.8)	1971 (23.9)
Marital status, n(%)					
With partner	6339 (76.1)	5632 (74.7)	3247 (62.5)	3316 (59.5)	5538 (67.3)
No partner	1987 (23.9)	1905 (25.3)	1948 (37.5)	2255 (40.5)	2696 (32.7)
Self-perceived health, n(%)					
Poor	1916 (23.0)	2220 (29.5)	1793 (34.5)	1959 (35.2)	3079 (37.4)
Good	6410 (77.0)	5317 (70.6)	3402 (65.5)	3612 (64.8)	5155 (62.6)

	Wave 1 (n = 8,326)	Wave 2 (n = 7,537)	Wave 4 (n = 5,195)	Wave 5 (n = 5,571)	Wave 6 (n = 8,234)
Household size, Mean(SD)	2.25 (1.0)	2.25 (1.0)	1.92 (0.8)	1.88 (0.8)	1.92 (0.8)
Number of children, Mean(SD)	2.24 (1.4)	2.25 (1.4)	2.2 (1.4)	2.19 (1.4)	2.22 (1.4)
Provided social support, n(%)	3185 (38.3)	2874 (38.1)	1584 (30.5)	1635 (29.4)	2250 (27.3)

As for the main outcome of this study, at baseline, 38.3% respondents reported that they provided support for persons outside their household. This number declined constantly to 27.3% in wave 6. The most common type of support reported was practical household help, followed by paperwork-related help and personal care. Provision of personal care and paperwork-related help was mostly reported by respondents in the southern region, while providing practical household help was more common in the northern region. In all regions the main recipients of support were respondents' parents, children, current or ex-partners (see section B in the additional file).

Model fit for social support provision trajectory

Table 2 presents the estimates obtained from three multilevel growth models. The intercept in the unconditional mean model (Model 1) showed that the overall odds of providing support (across time and individuals) was 0.389 and ranged from 0.373 to 0.405 ($p = 0.000$). Furthermore, the variance of intercept indicated a variation between individuals as to the likelihood of social support provision by older European adults over time. Thus, was the fit of multilevel growth model established for our data.

Table 2

Result of unconditional mean model (Model 1), unconditional growth model (Model 2) and final model (Model 5)

	Model 1 (°n=34,863)		Model 2 (n = 34,863)		Model 5 ^b (n = 34,863)	
	Odds Ratio (95% Confidence Interval)		Odds Ratio (95% Confidence Interval)		Odds Ratio (95% Confidence Interval)	
Fixed effects						
Part i: For intercept						
Intercept	0.389***	(0.373,0.405)	0.526***	(0.495,0.560)	0.821	(0.615,1.096)
Gender						
Women					1	
Men					0.619***	(0.502,0.765)
Baseline age					0.939***	(0.930,0.947)
Gender x Baseline age						
Women x baseline age					1	
Men x baseline age					1.019**	(1.008,1.031)
Education						
Low					1	
Middle					1.812***	(1.409,2.331)
High					1.575**	(1.125,2.204)
Region						
South					1	

^a The estimates for interaction that include a reference category were not shown as it equal to the main effect of the other variable. For example, estimates for interaction between south x middle education level and south x high education level are equal to estimates for middle education level (1.8, 95%CI:1.4–2.3) and high education level (1.6, 95%CI:1.1,2.2), respectively.

^b Model 3 and Model 4 are available in Table A1 in the additional file

* p value < 0.05, ** p value < 0.01, ***p < 0.001

^c n = number of records

	Model 1 (°n=34,863)	Model 2 (n = 34,863)	Model 5 ^b (n = 34,863)
Central			1.643*** (1.251,2.157)
North			2.252*** (1.631,3.109)
Marital status			
With partner			1
Without partner			0.611** (0.438,0.851)
Number of children			0.890*** (0.836,0.947)
Self-perceived health			
Poor			1
Good			1.107 (0.979,1.251)
Household size			0.912*** (0.867,0.958)
Gender x Marital status ^a			
Women x with partner			1
Men x without partner			0.733*** (0.612,0.878)
Region x Gender ^a			
South x women			1
Central x men			1.413** (1.148,1.741)

^a The estimates for interaction that include a reference category were not shown as it equal to the main effect of the other variable. For example, estimates for interaction between south x middle education level and south x high education level are equal to estimates for middle education level (1.8, 95%CI:1.4–2.3) and high education level (1.6, 95%CI:1.1,2.2), respectively.

^b Model 3 and Model 4 are available in Table A1 in the additional file

* p value < 0.05, ** p value < 0.01, ***p < 0.001

^c n = number of records

	Model 1 (°n=34,863)	Model 2 (n = 34,863)	Model 5 ^b (n = 34,863)
North x men			1.682*** (1.331,2.125)
Region x Education ^a			
South x low			1
Central x middle			0.607*** (0.466,0.790)
Central x high			0.803 (0.568,1.137)
North x middle			0.661** (0.491,0.888)
North x high			0.744 (0.514,1.077)
Region x Marital status ^a			
South x with partner			1
Central x without partner			1.629** (1.129,2.350)
North x without partner			2.530*** (1.680,3.811)
Region x Number of children ^a			
South x number of children			1

^a The estimates for interaction that include a reference category were not shown as it equal to the main effect of the other variable. For example, estimates for interaction between south x middle education level and south x high education level are equal to estimates for middle education level (1.8, 95%CI:1.4–2.3) and high education level (1.6, 95%CI:1.1,2.2), respectively.

^b Model 3 and Model 4 are available in Table A1 in the additional file

* p value < 0.05, ** p value < 0.01, ***p < 0.001

^c n = number of records

	Model 1 (°n=34,863)	Model 2 (n = 34,863)	Model 5 ^b (n = 34,863)
Central x number of children			1.098* (1.021,1.181)
North x number of children			1.146** (1.054,1.245)
Part ii: For time slope			
Time		0.926*** (0.917,0.934)	0.901*** (0.878,0.925)
Gender x Age x Time ^a			
Women x age x time			0.998*** (0.997,0.999)
Men x age x time			0.997*** (0.996,0.998)
Region x Time ^a			
South x time			1
Central x time			1.029* (1.005,1.054)
North x time			1.020 (0.993,1.048)
Education x Time ^a			
Low x time			1
Middle x time			1.013 (0.994,1.031)
High x time			1.022* (1.002,1.043)

^a The estimates for interaction that include a reference category were not shown as it equal to the main effect of the other variable. For example, estimates for interaction between south x middle education level and south x high education level are equal to estimates for middle education level (1.8, 95%CI:1.4–2.3) and high education level (1.6, 95%CI:1.1,2.2), respectively.

^b Model 3 and Model 4 are available in Table A1 in the additional file

* p value < 0.05, ** p value < 0.01, ***p < 0.001

^c n = number of records

	Model 1 (°n=34,863)	Model 2 (n = 34,863)	Model 5 ^b (n = 34,863)
Self-perceived health x Time ^a			
Poor x time			1
Good x time			1.032*** (1.014,1.050)
Marital status x Time ^a			
With partner x time			1
Without partner x time			1.063** (1.019,1.109)
Marital status x Region x Time ^a			
With partner x south x time			1
Without partner x central x time			0.965 (0.920,1.012)
Without partner x north x time			0.918** (0.871,0.968)
Random effect			
Intercept	1.723*** (1.591,1.855)	2.866*** (2.487, 3.245)	2.262*** (1.934, 2.590)
Time slope		0.023*** (0.018, 0.027)	0.021*** (0.017, 0.026)

^a The estimates for interaction that include a reference category were not shown as it equal to the main effect of the other variable. For example, estimates for interaction between south x middle education level and south x high education level are equal to estimates for middle education level (1.8, 95%CI:1.4–2.3) and high education level (1.6, 95%CI:1.1,2.2), respectively.

^b Model 3 and Model 4 are available in Table A1 in the additional file

* p value < 0.05, ** p value < 0.01, ***p < 0.001

^c n = number of records

	Model 1 (°n=34,863)	Model 2 (n = 34,863)	Model 5 ^b (n = 34,863)
Covariance		-0.117 (-0.152,-0.082)	-0.132 (-0.165,-0.099)
Intraclass correlation	0.344	0.466	0.407
^a The estimates for interaction that include a reference category were not shown as it equal to the main effect of the other variable. For example, estimates for interaction between south x middle education level and south x high education level are equal to estimates for middle education level (1.8, 95%CI:1.4–2.3) and high education level (1.6, 95%CI:1.1,2.2), respectively.			
^b Model 3 and Model 4 are available in Table A1 in the additional file			
* p value < 0.05, ** p value < 0.01, ***p < 0.001			
^c n = number of records			

The intraclass correlation (ICC) indicated that around 34% of the total variance in the odds of support provision was due to the between-individual variation. In the unconditional growth model (Model 2), time was added as fixed effect and random slope effect, i.e. the effect of time could vary by individual. This model showed that the odds of providing support declined by approximately 7% on an annual basis (OR: 0.926, 95% CI: 0.917–0.934). The time and intercept variance indicated a variability in the initial and trajectory of support provision. We proceeded further by including predictor variables in our model to explain these variations.

Compared to Model 2, variances for intercept and slope in Model 5 were slightly lower. This means that the addition of predictors in this model could explain only a small part of variance observed in the unconditional growth model. The negative covariance indicated that people with high initial likelihood of support provision had a steeper decline in their trajectory. Furthermore, the ICC also reduced from 0.466 (Model 2) to 0.407 (Model 5).

Predictors of social support provision at baseline

The first part of Model 5's estimates in Table 2 showed factors associated with social support provision at baseline. We used an interaction plot to visualise the effect of covariates interaction while holding other covariates at their reference value (section C in the additional file). The odds of support provision was highest in the northern region. Compared to women, men had 40% lower odds of support provision (Table 2). However, in the northern region no clear gender difference was observed (Fig. C1 in the additional file). The gender difference was also more apparent among younger baseline ages (Fig. C2 in the additional file).

Those without a partner had 39% lower odds of the outcome (Table 2). The effect of marital status was slightly different by gender. In the central region, both men and women had the same odds of support provision regardless of their marital status. But in the northern region people without a partner had higher odds of providing support than those with a partner (Fig. C3 in the additional file).

The effects of household size in all regions were the same, i.e. a unit increase in the number of household members was associated with an approximately 9% decrease in the odds of support provision (Table 2). In all regions, people with middle or high education level were more likely to provide support for people outside their household. Our results also showed that self-reported 'good' health only increased the likelihood of providing support by approximately 10% (OR: 1.107, 95% CI: 0.979-1.251).

The trajectory of social support provision

The second part of the final model's results showed that the odds of social support provision decrease by around 10% yearly (OR: 0.901, 95%CI:0.878,0.925). The predictors of this trajectory were tested through its interaction with the time variable (Part II of Table 2). In order to further examine the trajectories of social support, we focused on three predictors which have been reported to have key roles in explaining support provision, i.e. gender, age at baseline and region [16, 26].

Figure 1 presents the trajectories of predicted probability of support provision for other households. At baseline, the overall probability was 0.40 (95%CI 0.39;0.40). In the course of ten years the probability declined steadily to 0.28 (95%CI 0.27;0.29) (Fig.1(A)). The trajectories for each region by gender and three baseline ages are shown in Fig. 1(b)-1(d). Generally, people in the northern region had a higher probability of providing support than their counterparts in the central and southern regions. One common characteristic across regions was that younger baseline ages had a higher probability of providing support. In each region, women aged 50 had the highest probability of the outcome at the baseline, with a probability of 0.64 in the north, 0.54 in the central, and 0.39 in the south region.

In the northern region, among people aged 50 years at baseline, women had a higher probability than men of providing support, but the opposite was apparent among those with baseline ages of 60 and 70 years old (Fig.1(b)). Baseline age affected the trajectory of the outcome's probability, with older age associated with steeper decline. For the older age (70 years old at baseline), the probability of men providing support declined faster than it did for women. We observed a similar pattern in the central region (Fig.1(c)).

Among people in the southern region, women had a higher probability of support provision compared to men, regardless of their baseline age. Gender difference was more apparent among southern Europeans aged 50 and 60 at baseline. The older the age at baseline, the smaller the difference between men and women (Fig.1(d)). However, the probability of social support provision in southern Europe did not vary by gender and age at baseline as much as in the other regions.

Discussion

The present study examines the level and trajectory of social support provision by older adults for other households while taking into account personal health and sociodemographic factors. We found different baseline levels and trajectories of social support provision across regions. Furthermore, the effect of gender, number of living children, education level and marital status on social support provision were moderated by region. As expected, we found a decreasing trend of social support provision across time across all age groups. Factors that were associated with the trajectory of social support provision included gender, age at baseline, education level, marital status, self-rated health and region. Additionally, we observed large inter-individual variations of social support provision.

There are complex interactions of individual, societal and structural level factors that influence the provision of social support [5]. Poor health is the most apparent personal factor of decline in the provision of social support among older adults. As their physical and cognitive functions deteriorate with age [10], older people become more dependent and are therefore more likely to receive support rather than provide it.

Prior analysis of SHARE data showed that in Greece, Spain, and Italy, a considerable increase in dependency (measured as limitation in activities of daily living -ADL) was observed between ages 50 and 70 years. Similar increases occurred at older age among people older than 70 years in Sweden and Switzerland [27]. This could partly explain the lower probability of support provision in southern European reported in this study. Our findings also demonstrated that poor self-perceived health was associated with a faster decline in the probability of social support provision over time. In addition, we found decline to be faster among older adults compared to their younger counterparts. This may relate to the higher levels of poor self-perceived health as reported by the older adults.

Effect of social network on social support

The majority of social support exchange happens within personal social networks [5], thus understanding a personal social network and its determinants may give an insight into social support as well. A personal social network is influenced by personal characteristic e.g. age, gender, education and economic status. It is also shaped by the higher structural level factors such as culture, social change and politics [5].

An individual's social networks throughout his or her life course are dynamic. Attempts to explain how personal social networks change over time has for instance been presented in the socioemotional selectivity theory [28] and social convoy theory [29]. Socioemotional selectivity theory postulates that social network change is motivated by a perspective on how much remaining time is left to live. Thus, as people age and perceive their time to be getting shorter, they focus on relationships that satisfy emotional regulation goals (e.g. family and close confidants). While according to convoy theory, people maintain social relationships that could escort them through their life course, like a convoy. In the centre of this convoy is the stable relationship, such as that with family [29]. While at the periphery of the convoy there

are less-stable relationships (e.g. acquaintances). These peripheral networks are more likely to decrease due to circumstances such as those resulting from life events (e.g. job entry, marriage, parenthood, and loss of a spouse) [26].

Our prediction models showed that in all regions, for the three age cohorts tested, as people age their probability of providing support decreases. Moreover, the rate of this decline was faster among the older cohorts. Besides the effects of personal health, this pattern may relate to the smaller social network size people tend to have as they age. The decline in social network size and the change in its composition could mean a smaller pool of potential support recipients. Interestingly, we found that children, parents, and spouses remained as the main beneficiaries of support throughout the eleven years follow-up of this study. These results indicated that family networks were quite stable across time thereby supporting the socioemotional selectivity and social convoy theories.

Gender also has a substantial influence on social networks, possibly as the effects of distinct life experiences in men and women [15]. The traditional gender roles of women as homemakers and men as breadwinners affects social network characteristics. Women tend to have more contact with friends and family [30]. Furthermore, due to the gendered division of labour within the household, women may gain an increased network when they enter parenthood than men do. Meanwhile, men appeared to benefit more from an occupational network than women [31]. The present study showed that gender difference in the probability of support provision was more apparent in southern Europe. These findings may be explained by a lower female participation in the labour force in this region [32].

Previous studies have reported that, compared to men, women tend to be the main care provider for the family. This pattern holds even among older adults in advanced age [33, 34], similar to findings in the southern European region. However, our findings also showed that men had a higher probability of support provision than women among those with baseline age over 60 years in the northern region and 70 years in the central region. Similarly, a study among the older population in the UK reported that after age 70, men had a higher prevalence of social provision than women [35].

Furthermore, in assessing gender difference in support provision, we should consider the type of support provided and the relationship between support providers and beneficiaries. Compared to men, women provide more intensive personal care. In this study, we analysed all types of social supports (i.e. practical household help, personal care, paperwork-related help) together. This procedure possibly masked the gender difference in support provision. The most common type of support in all regions was practical household help (Table B1 in the additional file). However, the highest prevalence of personal care in the southern region may contribute to the gender difference in support provision we observed in this region.

We can also view the present findings through a supply and demand perspective, in that low support provision was due to there being less demand for support. Many adults in their mid-life (40-59 years old) may experience demand to support their children and parents simultaneously (they are referred to as the pivot generation) [34, 35]. Thus, it was not surprising that we found the highest probability of support provision between the ages of 50-60 years old in all regions. Then, when their children have become

independent and their parents have passed away, or are receiving formal care, the support demand will decrease and so does the provision of support.

The effect of a welfare state regime and family ties on social support provision

The effect of a welfare state on intergenerational support is mainly related to its policies that could support individuals to be independent and not require support from family, e.g. the availability of formal care for older people may release their children from the obligation to provide personal care. Thus, the provision of social support was expected to be higher in southern Europe where social services are limited. However, we found that social support provision was most prevalent in countries that have generous welfare policies (Sweden and Denmark) and least prevalent in countries in southern Europe. Nonetheless, in all regions the main recipients of support were respondents' parents, children, and current or ex-partners (Table B2 in the additional file).

The present study did not represent the provision of personal care within a family. But, a side-analysis on personal care provision for household members in SHARE, not reported here, revealed that the prevalence of this type of support was at its highest in southern Europe and its lowest in northern Europe. These results indicate the importance of family characteristics, especially household composition, in explaining the trend of support provision.

Family is one of the central institutions in society that determine the interaction between welfare state policies and individual social practices [36]. Moreover, the degree of shared responsibility between the state, the market and the family in ensuring citizens' welfare is one of the characteristics that differentiate one welfare regime from another [23]. The present study shows that the majority of families in the northern region were characterised by the highest average number of living children and grandchildren but the lowest average household size and proportion of co-residence. These patterns are in contrast with the southern European region that had the largest average household size and highest proportion of respondents who co-resided with their parents or children.

Moreover, the results of multilevel analysis showed that household size (in all regions) and number of living children in southern and central regions had a negative association with support provision. While in the northern region, the effect of the number of living children had the opposite effect. These findings indicate that the lower prevalence of support provision observed in central and southern regions could be due to their main support-beneficiaries who were likely to live with them in the same household. These findings are in line with Fokkema's family typology [37]. This typology suggests that, while the most common family type in Europe is *familialism* (characterised by support for family obligation norm in which parents and children have frequent contact and live in close proximity), this type was more common in southern European countries. On the other hand, *supportive at distance* type (characterised by

refusal of family obligation norms, parents and children living apart from each other but still with frequent contact) was more prevalent in northern Europe.

One interesting aspect when discussing the interaction between a welfare state and the family in the provision of support is whether generous social services substitute or complement family solidarity [17]. The substitution, or *crowd-out*, thesis refers to negative interaction between social service provision and family solidarity [38, 39]. Our results, however, are in line with previous research that supports a complementary thesis [40, 17]. For the majority of older adults in this study, family solidarity was still strong even though they did not live in the same household. Availability of social services in generous welfare regimes tends to lead to shared responsibility between family and state [39]. This arrangement results in a specialisation of the type of intergenerational support exchanged [40, 41]. Using SHARE data, Schmid et. al. reported that in countries with more generous social services, adult children, regardless of their gender, were more likely to provide sporadic support than intensive support [42].

The rates of decline in probability of support provision also differ by region, with the northern European countries showing a steeper decline. The welfare state policies may contribute to this regional difference. Across European countries, active pivot generations were more prevalent in northern countries [43]. The generous welfare state in the northern region may support adult children being independent earlier. The system also provides formal care for frail parents thus releasing pivot generations from their obligation to provide support earlier than in other regions.

The multilevel analysis showed a quite large inter-individual variation in the level and trajectory of support provision. This inter-individual variation remains in the sensitivity analysis that used 'region' as the third level in the multilevel analysis. These results indicate that while culture and welfare state policies may influence personal relationships, social support exchange is a personal experience that is highly affected by personal factors and circumstances.

Strengths and limitations

The main strength of the present study is the use of five waves of panel data from SHARE. Panel study records all changes at individual level throughout follow-up time, therefore the shift in the results may reflect the real change in the phenomena studied. In our case, the trajectory of support provision observed may reflect the real decrease in social support provision as people age, not because of the difference in sample characteristics.

In addition, all countries participated in SHARE using a standardised questionnaire, allowing for a valid comparison across countries. However, we also acknowledge that all variables in this study are self-reported, thus true values may be under- or over-estimated.

Social support provision in this study was measured using a single-item measure. Therefore, our results need to be interpreted with caution as they may not capture all dimensions of social support provision

measured using more comprehensive instruments.

The value of self-perceived health, which has been widely used, has also been scrutinised for its sensitivity to bias. People with different cultures and languages may have different perspectives in rating their health. For example, compared to Danes and Swedes, Germans need to be much healthier to rate their health as very good [44]. However, we argue that the use of self-perceived health in the present study did not reduce the validity of our results as our study does not aim to compare health status across European regions. Additionally, even though we found that the prevalence of good health varied across regions, its effect was not moderated by region.

Another limitation of this study was related to attrition that could lead to selection bias. Thus, limiting the generalisability of the present results. To avoid the effect of selection bias due to death, this study only includes respondents who participated in at least waves one and six. Around 3.27% of those respondents had missing data in the variables studied and were excluded from analysis. We found that respondents who were included in the analysis and those who were excluded due to missing data shared a similar sociodemographic characteristic (ion F in the additional file).

Conclusion

Around a third of European older adults were actively providing support. The trajectory of social support provision indicates a decline of provision over time. Age, gender, education level, household size and welfare state regime all predict the trajectories of social support provision by European older adults. Older adults across the continent are vital resources of interpersonal support, especially for their families, as well as outside their households. This study also shows that generous welfare states complement family support rather than provide a substitute for it.

Abbreviations

CAPI: Computer-Assisted Personal Interviewing

CI: Confidence interval

ICC: Intraclass Correlation

ISCED: International Standard Classification of Education

MER: Marginal Effects at Representative

OR: Odds Ratio

SHARE: Survey of Health, Ageing and Retirement in Europe

Declarations

Authors' contributions

Study conception and design, SKL, NN, ME, GM, XdL; Methodology, SKL, NN, XdL; Statistical analysis, SKL, NN, XdL; Result interpretation, SKL, NN, ME, XdL, GM; Writing - original draft preparation, SKL; Writing - review and editing, SKL, NN, ME, XdL, GM; Funding acquisition: GM, NN; Supervision: NN, ME, XdL, GM. All authors approved the final text.

Ethics approval and consent to participate

The SHARE project is under continuous ethic reviews. The University of Mannheim's internal review board (IRB) reviewed and approved SHARE for wave 1 to 4. From wave 4 onwards, the ethics reviews were done by Ethics Council of the Max Planck Society. Ethics approvals were obtained from ethics committees or institutional review boards in SHARE-participating countries. These reviews confirmed that SHARE met the legal norms and international ethical standards. SHARE data is available for scientific community. Based on the legal requirement and SHARE ethical commitments, SHARE data may only be used for scientific research. The secondary data analysis of SHARE data, such as done in this study, underwent no further ethical approval. The more detail of the ethics approvals is available from SHARE project's website (http://www.share-project.org/fileadmin/pdf_documentation/SHARE_ethics_approvals.pdf).

Consent for publication

Not applicable

Competing interest

The authors declare that they have no conflict of interest.

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Availability of data and material

SHARE data is distributed by SHARE-ERIC (Survey of Health, Ageing and Retirement in Europe – European Research Infrastructure Consortium). It is freely available for scientific community for scientific research upon registration. The data usage is subject to European Union and national data protection laws as well as the SHARE *Conditions of Use*. See <http://www.share-project.org/data-access.html> for further information on data access.

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Additional file information

Additional file-Social Support Trajectories in EU-SKL.pdf

Additional information in this file includes:

1. Growth model formulation
2. Data collection period, type of social support and recipients of social support
3. Interaction Plots
4. Predicted probability plots
5. Characteristics of sample and non-sample

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Figures

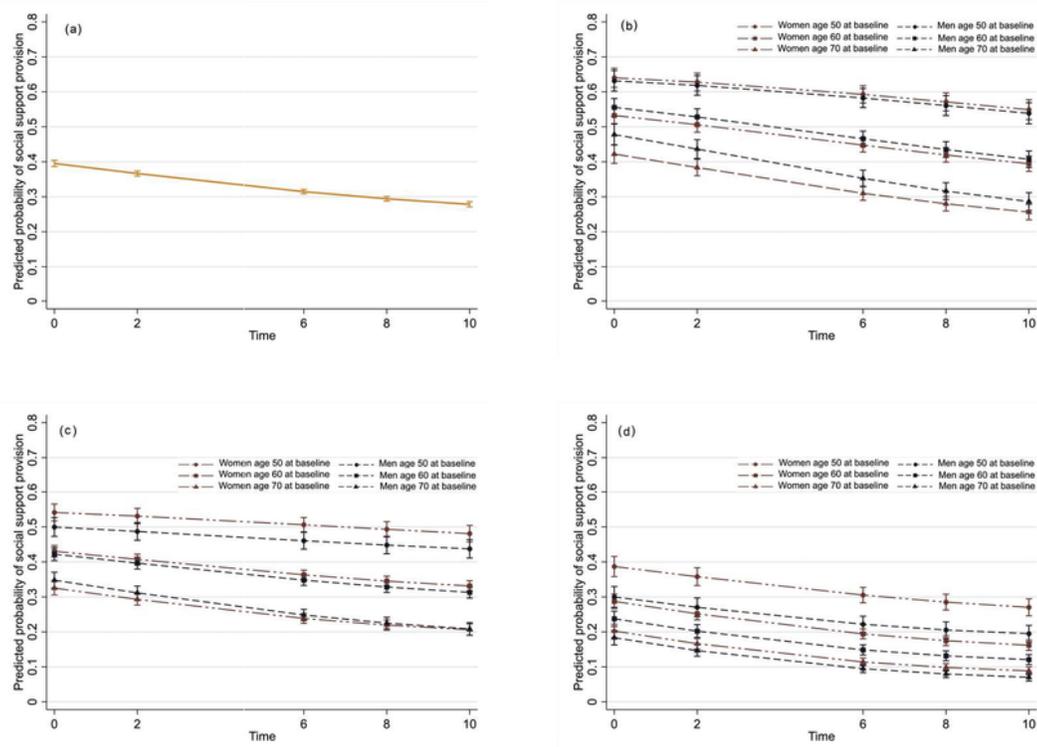


Figure 1

(a) The overall predicted probability of social support provision, holding all predictors at their observed value. The predicted probability of the outcome by gender at baseline age 50,60, and 70 years in Northern Europe (b), central Europe (c) and Southern Europe (d) region, when the rest of predictors were held at their observed value

Supplementary Files

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- [AdditionalfileSocialSupportTrajectoriesinEUSKL191218.pdf](#)