ORIGINAL INVESTIGATION

Network type, transition patterns and well-being among older Europeans

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Abstract

Using SHARE data, this study was based on an earlier analysis that derived social network types among adults aged 65 and over in Europe. The current effort investigated the transitions that occurred across these network types after 4 years ($N = 13{,}767$). Four general network transition patterns were identified according to network type (close-family networks and other networks) and whether a network transition occurred. The associations between network type, network transitions and well-being (depression and life satisfaction) were examined. We regressed depressive symptoms and a life satisfaction measure on the network transition patterns, controlling for socio-demographic background, health and country. The results revealed that a majority of older Europeans experienced a range of network transition, while close-family-based networks tended to prevail over time. Moreover, respondents who remained in or transitioned to close-family networks had fewer depressive symptoms and better life satisfaction than those in other network types. The study, thus, underscores the varied effects of network types and network changes on emotional well-being in late life. It also demonstrates that beneficial changes can be made in one's social network in old age, especially with regard to greater family closeness.

Keywords Social networks · Transition patterns · Longitudinal changes · Family relations · Well-being · SHARE

Introduction

Social relationships are essential components of well-being, especially in old age when the need for social support increases. Good social relations are related to less depression (Schwarzbach et al. 2014), better physical health (Luo et al. 2012), lower mortality (Holt-Lunstad et al. 2010), better well-being (Huxhold et al. 2014) and, in general, the ability to age successfully (Howie et al. 2014). However, social relations vary over the life course, and people tend to find themselves embedded in a range of differing "social network types" in terms of their structure, interaction and quality, particularly in late life (Litwin 2001; Fiori et al. 2007).

Social networks are the collection of social relations that one maintains and from which one receives supports of various kinds (Antonucci 2001). Social network type is a composite characterization of the nature and the extent of one's social relations. Wenger (1991) first identified five different network constellations among older people in Wales, based on proximity, type of network members and the level of interaction. Subsequent studies have developed additional network typologies (Litwin 2001; Park et al. 2015; Szabo et al. 2016).

There is evidence that social network types are differentially related to positive and negative outcomes in old age. For example, people embedded in diverse social network types tend to exhibit better well-being, less loneliness, greater physical health and higher life satisfaction. (Litwin and Shiovitz-Ezra 2011; Stephens et al. 2011; Park et al. 2014). On the other hand, older adults embedded in restricted types of social networks were more likely to have poor self-rated health, higher levels of depressive symptoms and lower levels of emotional support (Fiori et al. 2006; Park et al. 2015).

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The literature on social network types has mostly focused on social relationships and their characteristics at one point in time. However, social networks are dynamic and subject to change as people age (Krause 1999; Shaw et al. 2007; Schwartz and Litwin 2017). Circumstances such as retirement, ailing health, relocation and spousal loss can lead to alterations in the composition and the function of older adults' closest ties (Aartsen et al. 2004; Glaser et al. 2006; Bloem et al. 2008; Northcott et al. 2017). Despite the prevalence of such late-life changes in one's social network, however, relatively little research has been done on the changes that occur in network types, or on their effects.

Two prominent social theories on aging explain why network changes occur. The convoy model conceptualizes the social network as a collection of close others who variously accompany one across the life course, changing over time along with changing circumstances (Kahn and Antonucci 1980). Such convoys tend to become more family oriented when people age (Antonucci et al. 2014). The socio-emotional selectivity theory (SST) contends that people prefer to focus on emotionally meaningful ties in late life and to spend their time with a smaller number of emotionally close others, most often family members (Carstensen et al. 2003; Carstensen 2006). Empirical research supports the claims of both theories, showing that social networks do indeed become more family oriented as people age (Van Tilburg 1998; Shaw et al. 2007; Schwartz and Litwin 2018) and more focused on emotionally meaningful ties (English and Carstensen 2014).

However, network changes do not always occur. A Korean study of aging showed that approximately half the respondents remained in the same social network type over time. In addition, the most prevalent network transition over a two-year period was to a family type, followed by a move to a restricted type. These types were also the most relatively stable networks in that study—almost 60% of respondents from the family and from the restricted networks remained in the same network types in the follow-up (Kim et al. 2016). In another research that investigated transitions among intergenerational relationship types across four waves of measurement in California, more than 80% of the relationships remained stable after the second time point (Hogerbrugge and Silverstein 2014).

Based upon this review thus far, we can identify four broad network patterns among older adults based upon network type and whether a network transition occurred. We divide the respective network types into two main categories: those that are close-family based (i.e., spouse and/or children) and those that are based mainly on other types of relationships (e.g., relatives, friends, others). We also distinguish between networks that remain stable over time and those that change. The property space illustrated in Table 1 shows the resultant four network patterns.

Studying social network types using SHARE data

The Survey of Health, Ageing and Retirement in Europe (SHARE) examines the social networks of older people in a direct manner. Respondents are asked to name the people who are meaningful to them and then to provide additional information on each of the named individuals. The Longitudinal Aging Study Amsterdam (LASA) has employed such a name-based approach starting from 1994 (van Tilburg 1994). SHARE is the first major cross-national study of older Europeans to employ this direct approach to network derivation. The SHARE questionnaire included a name generator, that is, an inventory that directly asks respondents to list the persons most important to them, in its fourth and sixth waves (2011, 2015). The panel nature of the data, moreover, allows one to examine network changes over time.

A first examination of network types, based upon k-means clustering of SHARE data from the fourth wave, derived six network types. These were identified as: "Spouse and children," "Children," "Spouse," "Other family," "Friend" and "Other". A seventh type, termed "No network," was added in that analysis to reflect those who did not name a single confidant (Litwin and Stoeckel 2014). The study also found a positive association between having family-based networks and well-being. In contrast, being embedded in "other" networks (i.e., those composed mainly of neighbors, colleagues or formal helpers) was related to reporting worse well-being.

The present study

The current inquiry considers the extent to which older Europeans transition into and out of different network groupings. Toward this end, we follow-up the aforementioned network types that were derived from the Wave 4 SHARE data. We use the same network type framework at each time point to monitor the transitions across the respective network types, or the stability within them.

Guided by the convoy model and by SST, it may be assumed that older people will tend to transition more into close-family networks in late life than into other network types. It might also be expected that this particular network change is associated with better well-being at follow-up. Based upon these assumptions, and in accordance with Table 1, the current study examines two hypotheses:

1. Among older Europeans who experience network type transitions, more will move into close-family network types (pattern C) compared to moving to other network types (pattern D).
2. Older Europeans who transition into close-family networks in late life (pattern C) and those who remain in such networks (pattern A) will report having better emo-

Table 1 Social network patterns in late life

Change pattern	Network type	
	Close-family networks (spouse and/or children)	Other networks (relatives, friends, others)
No change (Stable)	Remains in close-family network type (A)	Remains in other network type (B)
Change	Transitions to close-family network type (C)	Transitions to other network type (D)

tional well-being than those who transition out of close-family networks into other network types (pattern D) or remain in such other network types (pattern B).

Design and methods

The data for the current study stem from the Survey of Health, Aging and Retirement in Europe (SHARE), a survey of adults aged 50 and older and their spouses of any age. Participants aged 65 and older were selected for this study in order to focus on the old-age population. The current analyses considered data from Waves 4 (baseline) and 6 (follow-up) of the survey, collected in 2011 and 2015, respectively. These waves were chosen because they included a social network questionnaire. Fourteen European countries participated in both of these waves, and, therefore, they constitute the study population in the present analysis (Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Italy, Poland, Portugal, Slovenia, Spain, Sweden and Switzerland). For this study, we related exclusively to the sample of 13,767 respondents who participated in both waves and were 65 years or older at baseline. All the participants of the current analytical sample responded to the social network questionnaire at both time points. Also, as we focused only on the transitions between existing network members, we excluded participants without a network in either wave.

The baseline background characteristics of the sample are given in Table 2. The average age was almost 73. The sample had a larger proportion of women, more than half had secondary or high education, and approximately two-thirds of respondents were living with a partner. Participants rated their health on average as 2.7 (range: 0–5) and they reported having almost two physical limitations (mean = 1.9; range: 0–10).

Measures

Social networks were assessed using a social network name generator, in which participants could note up to six confidants with whom they "most often discussed important things" in the last year, and one additional person who was

Table 2 Europeans aged 65 and older: Univariate baseline description of the sample background characteristics

Characteristic	N	%	Mean	SD	Range
Gender					
Men	5738	41.7			
Women	8029	58.3			
Education					
Elementary	6444	47.7			
Secondary/high	7076	52.3			
Marital status					
No Live-in partner	4566	33.5			
Live-in partner	9043	66.5			
Country					
Austria	1296	9.4			
Germany	455	3.3			
Sweden	778	5.6			
Spain	1100	8.1			
Italy	980	7.1			
France	1159	8.4			
Denmark	597	4.3			
Switzerland	1046	7.6			
Belgium	1242	9.1			
Czech Republic	1360	9.9			
Poland	485	3.5			
Portugal	491	3.6			
Slovenia	731	5.3			
Estonia	2037	14.8			
Age			72.9	6.0	65–98
Self-rated health			2.7	1.0	1–5
Mobility difficulties			1.9	2.3	0–10

"important for any reason." Subsequently they were asked to solicit additional information on these named confidants. Eight indicators from the questionnaire served as inputs to construct the network typology. Five of the variables characterized the compositional character of the network. They indicated the proportion of the networks (0–100%) comprised of the following relationship groupings: (1) spouse or partner, (2) children, (3) other family (e.g., siblings, grandchildren, etc.), (4) friends and (5) others (e.g., neighbors, colleagues, formal helpers). The remaining three variables took interaction into account: (6) proximity [proportion of

confidants (0–100%) living in range of up to 5 km], (7) daily contact frequency [proportion of confidants (0–100%) contacted at least weekly] and (8) emotional closeness (proportion of confidants (0–100%) who are very or extremely close].

Network type In order to identify the same network types that were reported in an earlier study (Litwin and Stoeckel 2014), we applied the same data reduction technique that was employed in that inquiry, namely *K*-means cluster analysis. The procedure, which included the eight criteria that were previously used, was applied for the baseline and follow-up data jointly. That is, the data from both waves were pooled, such that each respondent appeared twice, once for each wave.

The cluster analysis produced the same networks that were identified in the earlier study's findings. One minor exception was that the "other" type that emerged in the current analysis differed slightly from the corresponding network type in the earlier study. In the previous effort, the largest relationship type category within this grouping was "other," i.e., neighbors, colleagues or formal helpers. In the current analysis their relative proportion in this particular network cluster dropped somewhat, but their presence here was still greater in comparison to their proportion in all the remaining network groupings. Consequently, we retained the label "other" to describe this network type.

The six resultant network types that emerged were: (1) "Spouse and children," (2) "Children," (3) "Spouse," (4) "Other family," (5) "Friend" and (6) "Other". The first three of the network types represent the close-family networks. They were the closest, emotionally, of all the network types. The remaining three network groupings represent other network types that are mainly non-close-family in nature. That is, they were composed primarily of extended family, friends or others. These network types were also less close, emotionally, on average. The results of the procedure can be found in Supplementary file 1.

Depressive symptoms were measured by the Euro-D scale, a questionnaire developed for older adults in European countries (Prince et al. 1999). The questionnaire in SHARE consists of 12 items inquiring about different symptoms of depression, such as loss of interest and fatigue. The respondent is asked to indicate whether the symptom was present in the last month (yes\no). The overall scale of the questionnaire is calculated as the number of symptoms, ranging from 0 to 12. The questionnaire was validated and shown to have good internal consistency (Castro-Costa et al. 2008). In the present study, the internal consistency was acceptable: the Kuder–Richardson coefficient = 0.7 for the whole sample.

Life Satisfaction was measured by a single question— "How satisfied are you with your life in general?". Respondents were asked to rank their self-assessments between 0—"Very dissatisfied" and 10—"Very satisfied." Single item measurements of life satisfaction are commonly used in social surveys, as they translate well across cultures and have good validity and reliability (George 2010).

Background variables consisted of socio-demographic and health measurements that can be associated with well-being. Age was measured as a continuous variable. Gender was divided into men (1) and women (2). Education was measured as a dichotomous variable, divided into elementary education and secondary\high education. In terms of marital status, respondents were classified as having a partner if they were married or in a registered partnership. Health was measured as self-rated health, as reported on a 5-point Likert scale; a higher score indicates better health. Mobility difficulties were measured as the difficulties respondents reported having with various functions, such as climbing one flight of stairs without resting. This continuous measure ranges from 0 to 10 limitations. Country of residence was considered by a series of dichotomous variables (0, 1), one such indicator for each country.

Data analysis

Following the network type derivation, described above, we examined the extent of the transitions between the respective network types from baseline to follow-up. The inquiry then considered the bivariate associations between the four main network patterns that are detailed in Table 1 and the socio-demographic, health, country and well-being variables (depressive symptoms and life satisfaction). Most of the differences among the patterns were examined using an ANOVA test. Significant results were further probed using Scheffe post hoc tests to determine which patterns differed significantly from each other. In the final stage of the analysis, we executed OLS regression models to predict the two well-being outcomes. Depressive symptoms and life satisfaction were regressed separately on the main network transition patterns while controlling for the socio-demographic background variables, health and country. The multivariate procedure employed effect coding for the country variable, using the appropriate command for this in STATA.

Results

Table 3 shows the relative distributions of the respective network types at baseline and follow-up, as well as the extent of the transitions in each case from baseline to follow-up. It can be seen that the relative distributions of three of the network types increased after the four years—"Spouse and children," "Children" and "Other family." In contrast, three network types decreased in frequency over the same period—"Spouse," "Friends" and "Other."

Table 3 Network types transitions from baseline to follow-up

Network types at baseline	Network types at follow-up						
	Spouse and children	Children	Spouse	Other family	Friend	Other	Total
	Frequencies (%)[a]						
Spouse and children	1517 (52.4)	482 (16.7)	286 (9.9)	281 (9.7)	193 (6.7)	134 (4.6)	2893 (21.0)
Children	463 (16.4)	1367 (48.3)	223 (7.9)	350 (12.4)	297 (10.5)	130 (4.6)	2830 (20.6)
Spouse	644 (25.7)	415 (16.6)	877 (35.0)	275 (11.0)	192 (7.7)	102 (4.1)	2505 (18.2)
Other family	314 (14.5)	383 (17.7)	170 (7.9)	867 (40.1)	277 (12.8)	150 (6.9)	2161 (15.7)
Friend	260 (12.4)	406 (19.4)	172 (8.2)	336 (16.0)	782 (37.3)	142 (6.8)	2098 (15.2)
Other	215 (16.8)	267 (20.9)	124 (9.7)	150 (19.5)	236 (18.4)	188 (14.7)	1280 (9.3)
Total	3413 (24.8)	3320 (24.1)	1852 (13.5)	2359 (17.1)	1977 (14.4)	846 (6.1)	13,767 (100.0)

[a]The percentages shown (in italics) are the relative frequency of each cell within its row. In the total cells, the percentages (in italics) are the relative frequency of the total sample

Overall, only 40% of the respondents remained in the very same network type over the two waves. Among the majority of respondents who transitioned to a different network type, however, some were more apt to change than others. Thus, the "Other" network type was the most dynamic network—with only about 15% of respondents in this network at baseline remaining in the same network type at follow-up. In comparison, almost half the respondents in the network types—"Spouse and children" and "Children" at baseline remained in the same social network type at follow-up. We note also that almost a fifth of the respondents (18.3%) transitioned from one of the close-family type networks ("Spouse and children," "Children" and "Spouse") to another close-family type network. In addition, a tenth of the respondents (9.6%) transitioned from one of the other network types ("Other family," "Friends" and "Other") to another network within this same grouping.

In the subsequent analyses, the network types were thus viewed in terms of four main patterns, as follows:

(A) *Remains in close-family network type,* characterized by network type stability or transitions within the three close-family network types ("Spouse and children," "Children" and "Spouse").

(B) *Remains in other network type,* characterized by network type stability or transitions among the three less-close types ("Other family," "Friends" and "Other").

(C) *Transitions to close-family network type,* respondents embedded in "Other family," "Friends" or "Other" networks at baseline, and in one of the three close-family networks at follow-up.

(D) *Transitions to other network type,* respondents embedded in "Spouse and children," "Children" or "Spouse" networks at baseline, and in one of the three less-close networks at follow-up.

Table 4 shows the distributions of the respective patterns. The largest group of respondents (45%) belonged to pattern A (Remains in close-family network type). Almost a quarter of the participants remained in the less-close pattern (B) across both waves. Close to a third transitioned between the two network type groupings, with some 16% changing from a less-close "other" network type to a close-family network (pattern C) and some 14% experiencing change in the opposite direction, moving from a close-family network to a less-close "other" network type (pattern D).

The results of a series of bivariate analyses (F-tests) between the network patterns and the socio-demographic and health variables are also presented in Table 4. There was a significant effect of gender, education, living with partner and self-rated health. Post hoc comparisons using the Scheffe test indicated that each of the two stable patterns was significantly different from all the other patterns. Specifically, respondents in pattern A, those who remained in "close-family" type networks, were *less* likely to be female, educated or in good health, and they tended to live with a partner. Respondents in pattern B, those who remained in "other" network types were *more* likely to be women, educated and in good health, and the least likely to live with a partner. In comparison, the two transition patterns (C and D) were not significantly different from each other on these same variables, with their scores ranging between those of the two stability patterns.

Table 5 shows the country differences in relation to the network patterns. As may be seen, respondents from Poland and Spain were the most represented, relatively, among those who were embedded in close-family type networks at both time points, and respondents from France and Belgium were the least represented. Correspondingly, respondents from these same countries showed the opposite pattern in relation to stability within other network types, i.e., not close-family-based networks. Thus, those from Belgium and France showed the most relative stability in these other network

Table 4 Socio-demographic, health and well-being by the four types of transition patterns: analysis of variance

Characteristics	Network transition type				F
	Remains in close-family network type	Remains in other network type	Transitions to close-family network type	Transitions to other network type	
N (%)	6274 (45.6)	3228 (23.4)	2311 (16.8)	1954 (14.1)	
Baseline characteristics					
% Women	51.72[a]	68.71[b]	59.90[c]	60.49[c]	88.97***
% Secondary/high education	46.62[a]	59.90[b]	55.34[c]	54.55[c]	55.90***
% Live-in partner	76.98[a]	45.43[b]	65.19[c]	69.08[c]	340.54***
Age	73.08	72.75	72.90	72.73	3.01
Self-rated health	2.61[a]	2.73[b]	2.68[c]	2.67[c]	10.13***
Mobility limitations	1.99	1.87	1.85	1.84	3.72
Follow-up					
Depressive symptoms	2.65[a]	2.80[b]	2.67[a]	2.84[b]	5.28***
Life satisfaction	7.70	7.61	7.69	7.55	4.44*

***$p < 0.001$; **$p < 0.01$; *$p < 0.0$

Means with differing Superscript (e.g., a, b, c) within rows are significantly different at the $p < 0.05$ based on Scheffe post hoc paired comparisons

Table 5 Network type transition pattern by country: crosstabulations

	Remains in close-family network type (%)	Remains in other network type (%)	Transitions to close-family network type (%)	Transitions to other network type (%)	Total (%)
Austria	46.5	24.7	10.9	17.9	100
Germany	42.4	26.4	13.8	17.4	100
Sweden	37.4	28.7	13.4	20.5	100
Spain	64.0	12.2	12.8	11.1	100
Italy	55.5	14.6	19.1	10.8	100
France	31.8	33.1	18.5	16.6	100
Denmark	39.4	28.5	16.9	15.3	100
Switzerland	33.8	30.2	22.1	13.9	100
Belgium	32.0	35.4	16.9	15.7	100
Czech Republic	52.7	14.9	18.0	14.4	100
Poland	67.6	12.2	8.9	11.3	100
Portugal	51.1	16.3	11.6	21.0	100
Slovenia	56.1	14.4	14.2	15.3	100
Estonia	41.5	25.5	15.5	17.5	100

$X^2 = 860.85$; $p < 0.001$

types across the two time points, and those from Poland and Spain, the least.

Turning to the transition patterns, one can discern that respondents from Switzerland and, to a lesser degree, Italy, were the most relatively represented among those who changed from one of the "other" network types to a close-family type network. Respondents from Poland and Austria made this same change the least often, relatively speaking. As for the transition from a close-family type network to an "other" network, respondents from Portugal and Sweden made this change most often, comparatively, and those from Spain and Portugal, least often.

Returning to Table 4, it may be seen that the associations between the network patterns and the well-being variables at follow-up were significant. A Scheffe post hoc analysis clarified that respondents in pattern A had fewer depressive symptoms than those in patterns B and D, but not fewer than those in pattern C who transitioned to a close-family network type. As for the life satisfaction outcome measure, the post hoc analysis did not reveal any differences between specific patterns.

Multiple regression models (OLS) predicted the two well-being measures (depressive symptoms and life satisfaction) in relation to the four network patterns (Table 5). The model predicting depression controlled for baseline depressive symptoms as well and showed that baseline depression, older age, being female, living with a partner and having mobility difficulties were all associated with depressive symptoms, whereas higher education and better self-rated health were negatively associated.

The country variable also showed some significant differences (not reported in table). The unadjusted regression coefficients revealed that compared to the overall mean for all countries, respondents from Poland ($b = 0.578$), Portugal ($b = 0.407$), Italy ($b = 0.290$) and France ($b = 0.165$) reported more depressive symptoms, all else considered. Respondents from six countries indicated fewer depressive symptoms than the overall average: the Czech Republic ($b = -0.263$) Denmark ($b = -0.255$), Sweden ($b = -0.252$), Slovenia ($b = -0.218$), Switzerland ($b = -0.205$) and Austria ($b = -0.114$).

More importantly for the present analysis, the procedure also showed that with pattern A as the reference category, patterns B and D were positively associated with depressive symptoms. Pattern C, in comparison, was not significantly different from the effect of the reference pattern (A).

The second regression model predicted life satisfaction at follow-up. Here too the model controlled for the baseline score of the well-being outcome. Higher life satisfaction at follow-up was associated with higher life satisfaction at baseline, higher education, living with a partner and better self-rated heath. Mobility difficulties were negatively associated with life satisfaction (Table 6).

As for the country variable (again not reported in the table), respondents from the following countries reported greater life satisfaction than the mean for all countries: Denmark ($b = 0.584$), Sweden ($b = 0.504$), Switzerland ($b = 0.448$) and Austria ($b = 0.386$). Respondents from six countries indicated lower life satisfaction than the overall average: Estonia ($b = -0.658$), Slovenia ($b = -0.329$), Portugal ($b = -0.309$), Poland ($b = -0.304$), France ($b = -0.270$) and the Czech Republic ($b = -0.117$), after taking the other variables into account. These differences show that it was, indeed, necessary to control for the country variable in the present analysis.

As for the network patterns, the results were similar to those found in relation to depression, but in reverse. That is, with pattern A as the reference category, patterns B and D were negatively associated with life satisfaction. Pattern C, once again, was not significantly different from the effect of the reference pattern (A).

Discussion

This study investigated transitions in social network type after four years among adults aged 65 and over in Europe and the association between network type, network transitions and well-being. The results showed that, for the most part, older Europeans did experience network transitions. Some 60% of respondents were embedded in different network types at follow-up compared to the network types

Table 6 OLS models predicting depression and life satisfaction among Europeans aged 65 and older using the transition patterns, controlling background characteristics

	Depression—follow-up	Life Satisfaction—follow-up
Baseline characteristics	Beta	Beta
Baseline-dependant variable	0.343***	0.299***
Age	0.068***	0.005
Women	0.101***	0.017*
Secondary/high education	−0.033***	0.018*
Live-in partner	0.041***	0.031**
Self-rated health	−0.125***	0.128***
Mobility difficulties	0.099***	−0.085***
Remains in other network type[a]	0.024**	−0.019*
Transitions to close-family network type[a]	0.001	0.003
Transitions to other network type[a]	0.031***	−0.035***
Observations	13,120	13,241
R^2	0.302	0.237

All models controlled for country

[a]Reference: "Remains in close-family network type"

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

they had at baseline. However, almost half of those who experienced a network change moved to a similar type of network. Thus, a fair proportion of those in close-family type networks ("Spouse and children," "Children" and "Spouse") transitioned to another close-family type network, while several of those in one of the other network types ("Other family," "Friends" and "Other") moved to yet another network type within this same grouping. Only about a third of the sample experienced a major network transition, that is, a move to a quite different network type in terms of its composition and degree of emotional closeness.

Based upon the convoy model and socio-emotional selectivity theory, our first hypothesis posited that there would be relatively more transitions to close-family type networks than to other network types. This hypothesis was supported by the data. That is, overall, a bit more than a third of the study sample changed to one of the close-family type networks compared to only a quarter who changed to one of the other network types. In addition, if we temporarily disregard those who changed their network type within the same larger network grouping, we discover that a slightly larger proportion made a major network transition to the close-family networks: about 17% from other networks to close-family networks and about 14% from close-family networks to other networks.

The data show, therefore, that close-family-based networks do still prevail over time among older Europeans. Nevertheless, we observed the presence of a significant minority who transitioned out of close-family networks. Consequently, it might be expected that these particular older adults are potentially at risk, insofar as they may have less support resources accessible, particularly less emotional closeness. This population will require the attention of policymakers and service providers in the near future. A counterbalancing positive observation, on the other hand, is that an equal proportion of older Europeans transitioned into close-family type networks, with all the concomitant benefits of such emotionally close interpersonal surroundings in late life.

Our second hypothesis posited that those in close-family type networks would have better emotional well-being than those in the other network types. Thus, we expected that this would be the case for those who remained within the respective larger network type groupings and those who transitioned into them. This hypothesis was supported in full. The data showed that those who were in such non-close-family "other" network types as well as those who transitioned to them had more depressive symptoms and less-reported life satisfaction than respondents in the close-family type networks at both baseline and follow-up. Equally important is the finding that those who transitioned to a close-family network type (from one of the other network types) did not have significantly greater depression or lesser life satisfaction than those in the stable close-family network type reference category. This suggests that the transition to a close-family-based interpersonal environment, even in the short term, brings possible emotional benefits. Having an emotionally close supportive network accessible does seem to make a difference. This last point also illustrates that beneficial changes can be made in one's social network in old age.

Despite the potential contribution of this study to the research literature, there are nonetheless a few limitations that should be mentioned. First, the change period that was examined covered only 4 years. This was necessitated by the fact that the social network inventory in the SHARE survey was implemented only twice, with only a four-year hiatus between the two administrations. It could be that network changes over a longer period would provide even deeper insights. That said, we point out, nevertheless, that the observed transitions were significant in several ways, notwithstanding the relatively short observation period.

A second possible limitation is that we did not take into account the reasons that respondents had for making a transition from one network type to another. Such information could better clarify, for example, the implications of "push" factors versus "pull" factors in relation to the social network transitions. The SHARE data do provide a basic assessment of why specific individuals mentioned at baseline were not mentioned again at follow-up, but this information is not available for everyone and still requires further work. The current analysis made the best possible use of the available data, in our opinion, given the many strengths and the few shortcomings of the information.

A third and final possible limitation concerns the method that was employed in this analysis for the classification of the respective network types. As noted, we used a k-means clustering procedure, a widely applied methodology in gerontological research; see for example (Cheng et al. 2009; Thøgersen-Ntoumani et al. 2011; Burholt and Dobbs 2014; Northcott et al. 2017; Guisado-Clavero et al. 2018; Lyons et al. 2019). However, as a recent review of over 200 articles underscores, several procedures for data-driven population segmentation analysis currently exist (Yan et al. 2018). These include, in addition to K-means cluster analysis, latent class/profile/transition/growth analysis and hierarchical analysis. The authors of that review conclude that each method has its advantages, disadvantages and practical considerations. In yet another comparison of data classification procedures, moreover, other authors contend that "all classification methods should be applied with great caution" (Twisk and Hoekstra 2012, p. 1078). We agree with this assessment and recommend, therefore, that the findings from the present study be viewed with the requisite degree of reservation. We also support the statement by Yan et al. (2018, p. 1) that data

classification requires "the interplay of data analytics and subject matter expertise."

In sum, this research considered the different social network types that prevail among older Europeans and the key transitions that occur across these network types over time. It also clarified the effect of network types and network changes on emotional well-being in late life. As a longitudinal analysis, the study adds to the still somewhat limited body of the literature on the effects of social network types over time. It also highlights the need to continue to investigate the role of close-family networks as one of the main sources of social relations in old age, and the impact that such network types has on the well-being of older people.

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