Social Network Characteristics, Disability and Survival among Middle-Aged and Older Adults

Liili Abuladze

Abstract

Social support may affect survival for everyone, or it may buffer the effects of chronic strain. This paper explores whether, how, and which social network characteristics are associated with longer overall survival as well as longer survival when experiencing disability-related stress. The data used is from the SHARE Estonia survey for the population aged 50+ (2010–2020), cross-checked with the timing of death from the population register. The effects of six network characteristics were analysed: network size, frequency of contact with family members, number of children in the network, reporting a partner and friends as network members, and overall emotional closeness with the network. Network characteristics, disability, employment, legal marital status, and practical support were constructed as time-varying variables. Men and women were analysed separately using Cox's hazard models. The analytical sample includes 2,754 people (1,157 men and 1,597 women) without everyday activity limitations at the onset, of whom 14.5% (19.9% of men and 10.5% of women) died during the observation period. The results show that irrespective of whether they experience stress, larger networks protect women from dying earlier. Frequency of contact with family members was the only significant factor buffering the experience of everyday activity limitations, albeit with high uncertainty and only among men.

Keywords: social networks, emotional support, everyday activity limitations, main and buffering effects, survival.

Introduction

Interacting with others can be an important part of peoples' lives. Through exchanging information and support, social relations can impact various spheres of life, such as health and well-being. These associations influence the physical health and behaviour of individuals directly, or can influence the perception of a stressful situation through providing meaning, esteem support, and self-efficacy (Cohen & Wills, 1985). One of the most persistent health-related stress experiences in contemporary ageing societies relates to disablement. In addition to personal capabilities and institutional settings, the social environment that shapes interdependencies between individuals can affect survival either by alleviating or enhancing the development and progression of chronic conditions, such as old age disablement (Hagestad & Dykstra, 2016; Verbrugge & Jette, 1994). These interdependencies are often gender-specific (Hagestad & Dykstra, 2016; Tambaum et al., 2019; Thompson & Whearty, 2004).

Given the relative stagnation of healthy life years (National Institute for Health and Development, 2025) coupled with the general aims towards deinstitutionalisation in Europe, while community participation has been low in certain parts of Europe (e.g. Morawski et al., 2022), it becomes increasingly important to understand the mechanisms between interpersonal emotional support exchanges, disability and survival. This paper studies the effects of communicating with close people exchanging emotional support on the survival of middle-aged and older people in general, and whether it could prolong the lives of people who over time develop or experience persistent difficulties functioning in their everyday lives.

This paper focuses on Estonia – a country with one of the largest gender gaps in terms of life expectancy (8.5 years in 2023), as well as some of the largest proportions of older people (65+) living alone (36.3% in 2021) and reporting at least some everyday activity limitations in Europe (59.2% in

2023) (Eurostat, 2025; Statistics Estonia 2025). This context makes it an interesting case study for understanding how social relations at the individual level may influence health outcomes in later life. Middle-aged and older people in Eastern Europe tend to have more family-oriented values and smaller networks that tend to be family based, especially among people with severe disabilities (Abuladze & Sakkeus, 2013; Stoeckel & Litwin, 2013). Caregiving has been the responsibility of close family members according to the Family Law Act since 1994, in practice overwhelmingly falling on the shoulders of (older) women (Tulva et al., 2013). Reliance on such networks may possibly counterbalance the effects of societal shocks and underdeveloped care services characteristic to Eastern European lived experiences. Conversely, being overburdened and burnt out with care tasks, there might be less room for emotional support exchange in Estonia. This is the first study analysing associations between social network characteristics and survival for this country.

Background

Types of social relations and sources of support

Interacting with other people defines our roles in society, the community and even within our family, and can bring meaning to our lives (Berkman et al., 2000). It can influence self-perception, potentially determining how we view our life and health. Relationships between people are rarely linear, and therefore a dynamic circle of causes and consequences may emerge between social relations and health. Hence, relationships constitute the social element of health.

Close personal relations refer to strong ties, consisting usually of family members or good friends who remain in one's network when reciprocity of relations becomes less possible and "with whom important matters are discussed" (Marsden, 1987; Wenger, 1997). Different types of support are exchanged with these close people, such as esteem support, which responds to stress triggers with appraisal, as well as emotional support by valuing and accepting people for who they are. In addition, informational support can help define, understand and cope with problems through advice or cognitive guidance (Cohen & Wills, 1985).

Networks differ and change by age, with partners and children making up the core network in old age (Wenger, 1997). A partner is considered one of the main sources of support, especially for men, even though they are also accompanied by the most relational strain (Antonucci et al., 2014; Due et al., 1999). Children are another main source of support, although they are more often recipients of support (Albertini et al., 2007; Kawachi & Berkman, 2001). Usually, the network size and interaction decrease with age (Due et al., 1999; Wrzus et al., 2013). Family members tend to be the most stable elements of a network across the life course (Antonucci et al., 2014; Wrzus et al., 2013), and mobilise for support when a need arises.

Due to difficulties in reciprocating support with worsening health, which is more common among older people, networks can dwindle (Abuladze & Sakkeus, 2013; Suanet & Huxhold, 2020; Tough et al., 2017). Turnover of peripheral ties, as well as friends, is more likely than family ties, depending on various life events (Wrzus et al., 2013). Weaker or middle-circle ties may be more relevant for various health-related outcomes than the closest network members due to how they increase self-esteem, providing important information affecting health behaviour or access to health services, for example (Kauppi et al., 2018; Webster et al., 2022). A double mechanism may operate within networks of people with disabilities – ties mobilise with the onset of mild or moderate disability due to social obligation, but weaken as the severity increases and interaction becomes more complex (Abuladze & Sakkeus, 2013; Cornwell, 2009; Holt-Lunstad et al., 2015). This relates to the increased need for support and the ability to reciprocate among closer ties. Some authors find that no life transition (e.g. retirement, changes in family status or in living arrangements) is associated with network change, the proportion of kin, or the confidence that the network would be supportive in times of need (Weiss et al., 2022). The latter is explained by stable relationships with established priorities, and these ties adjust according to important life transitions.

Friendships are not prescribed or obligatory relations, but function based on choice and mutual

preferences (Thoits, 1995), and can encourage additional self-efficacy and self-reflection outside of family dynamics (Antonucci et al., 2010). Having fewer friends in networks with age may reflect a preference for regulating one's own emotional life in later life as people consciously shape their interactions to fulfil emotional instead of explorative goals (Carstensen, 2021). Therefore, networks in old age can be selectively restricted to enable more meaningful interactions, and are not a sign of disengagement. However, from a socio-historical perspective, the role of friends in old age networks may become more important among more recent generations (Broese van Groenau, 2013). Therefore, restricting communication with friends and non-kin in old age might not happen similarly for everyone. As social interaction norms and patterns transform among more recent cohorts, rather than the expected disengagement, they remain socially more active than previous cohorts, at least during the post-retirement stage (Suanet & Huxhold, 2020).

Support may be detrimental when it reinforces dependence (Kawachi & Berkman, 2001). Women often have more network members than men (Abuladze & Sakkeus, 2013; Umberson et al., 2022), but these may be too demanding or burdensome, as women are typically obliged to be more responsive to the stress of others (Due et al., 1999; Kawachi & Berkman, 2001; Thoits, 1995). Such demands mainly relate to different forms of care task or to taking the stress of others on their shoulders – in short, these are often contacts that take more than they give (Due et al., 1999; Kawachi & Berkman, 2001; Thoits, 1995). Older men usually have their partner as their main source of support; therefore, not being married or widowhood affects men negatively, whereas it is the opposite for women (Antonucci et al., 2014; Drefahl, 2012; Due et al., 1999; Kawachi & Berkman, 2001; Koskinen et al., 2007).

Associations with health and survival

The main and buffering effects of such support have been proposed to explore the relationship between social support and health outcomes (Cohen & Wills, 1985; Vila, 2021). In terms of the main effects, networks have a direct effect on health by affecting the immune system and/or through health behaviour, irrespective of whether a person experiences stress or not. The buffering model assumes that support buffers the experience of stress, either partly or completely. Stress is defined either as a major life event, chronic strain (e.g. disability) or daily hassles, bringing about the need to adjust after or while experiencing stress. Stress can be understood as a social mechanism; that is, its origins and reactions depend on social stratification and structural inequalities, which shape how one's life goals and social roles can be enacted (Aneshensel, 1992; Thoits, 1995). The stressor causes an emotional reaction, which may affect daily functioning by increasing inflammation, for example (Rentscher et al., 2023; Thoits, 1995; Umberson et al., 2022; Vila, 2021). Complementarily, the disablement model considers social relations as part of the social environment, which could affect the health of those with chronic conditions (Verbrugge & Jette, 1994), and thus potentially influence the likelihood of people with disabilities experiencing an earlier death. The buffering effect may function by shaping the perception of the availability of support, and by extension the ability to cope thanks to this perception, reducing the reaction to stress (Rentscher et al., 2023; Vila, 2021). Discussing stress-related experiences, impressions, interpretations and potential solutions with others may help decrease the perceived magnitude of (repeated or prolonged) stress, find further aids or facilitate healthier behaviour (Cohen & Wills, 1985; Lennartsson et al., 2022; Vila, 2021).

Generally, it has been found that having larger networks and more frequent interactions protects against an earlier death while not having anyone to discuss important matters with is related to a higher risk of mortality. These associations can be independent of health status and behaviour, suggesting that social ties have a general benefit for everyone (Berkman & Syme, 1979; Bowling & Grundy 2009; Ellwardt et al., 2015; Freak-Poli et al., 2024; Giles et al., 2005; Holt-Lunstad et al., 2010; Jørgensen et al., 2018; Lennartsson et al., 2022; Penninx et al., 1997; Steptoe et al., 2013; Sugisawa et al., 1994; Umberson et al., 2022). The benefits of support for survival operate on a continuum rather than at specific levels (Laugesen et al., 2018; Shor et al., 2013). Moreover, even low levels of support may be sufficient to prevent harm to survival among both men and women. The magnitude of the effect may be greater for those who suffer from existing (health) concerns (Shor et al., 2013). Some studies do not find any association between social network characteristics

and mortality, even before adjusting for any control variables (Schutter et al., 2022).

Both structural as well as functional aspects of the network are deemed to be relevant for survival (Fiori et al., 2007; Holt-Lunstad et al., 2015; Seeman & Berkman, 1988). While network size reflects the structural characteristic, functional characteristics usually refer to the (perceived) exchange and comparison of different types of support (instrumental, emotional, etc.), social engagement and social influence (Fiori et al., 2007; Seeman & Berkman, 1988; Vila, 2021). The overall level of emotional closeness with network is a qualitative aspect of the perceived intimacy of these ties that provides information on the experience or perception of support (Fiori et al., 2007), and are often also regarded as a functional characteristic (Freak-Poli et al., 2024; Vila, 2021). Structural and functional characteristics can be complementary, and should therefore be included together when studying health outcomes (Fiori et al., 2007). It is recommended that scholars differentiate these characteristics whenever possible in order to identify each aspect's unique association with health (Seeman & Berkman, 1988). While structural characteristics indicate the general opportunities for social interaction, the functional aspects of networks reflect the necessary stress buffering qualities of social support, such as the notion of being cared for, being esteemed, trust and feeling like we belong to a social circle (Rentscher et al., 2023; Vila, 2021). In the case of Estonia, functional network characteristics may make an important difference for survival as the long-standing needs of people with disabilities were not acknowledged as a basic part of life, and instead, people had special needs that were often met with paternalistic, marginalising and stigmatising attitudes (Hanga, 2018). At the same time, people with disabilities were left to fetch for themselves, resulting in the care burden of family members and dependence on others being disproportionately high, without supporting individual needs and autonomy.

The partner is considered one of the main social companions in old age, and marriage or living with a partner has often been shown to protect against an earlier death, while never having been married and/or living alone is associated with the highest mortality risk specifically among men (Drefahl, 2012; Koskinen et al., 2007; Laugesen et al., 2018). The positive role of partnership conceptualised as emotional support, especially among men, emerges in some studies (Berkman & Syme, 1979; Shor et al., 2013), but not in others (Antonucci et al., 2010; Penninx et al., 1997; Sugisawa et al., 1994). Neither the main nor buffering effects in survival emerge for partner relationship quality (Antonucci et al., 2010), possibly due to the adverse effects of (not) having a partner dissipating with age (Due et al., 1999; Penninx et al., 1997; Zhao et al., 2022). While men tend to be more socially isolated than women across the life course, being more dependent on their partner in their social integration, the association between gender and social isolation reverses in old age, partly due to the increased caregiving burden among women (Abuladze & Sakkeus, 2013; Umberson et al., 2022). Therefore, these changing circumstances might also affect women's survival.

However, there are examples where greater social participation by men (e.g., in civic engagement, hobbies, or various organised activities) benefits men's health more than women's (Agahi & Parker, 2008; Landtstedt et al., 2016; Lee & Yeung, 2019). In addition, women do not have poorer coping strategies, nor are they more vulnerable to stress. However, the social distribution of sources of stress, the types of stressful events, reactions to them, as well as support structures, differ by gender (Aneshensel, 1992; Tambaum et al., 2019; Thoits, 1995; Thompson & Whearty, 2004).

Children as sources of emotional support have been shown to be unrelated to survival (Giles et al., 2005), although there might be a distinction in terms of survival by having less as opposed to more children as confidants (Litwin & Shiowitz-Ezra, 2006). Contact frequency with children or other family network members has not been shown to enhance survival in the Danish context (Rasulo et al., 2005). Both main and buffering effects emerged when relations with children were studied from the relationship quality perspective for the US (Antonucci et al., 2010). However, too much support from children reinforced dependence, and lower child relationship quality exacerbated stress situations, indicating the nuanced role of negative aspects of interaction. Since children are often support recipients themselves, accounting for the receipt and provision of practical or personal support adjusts for varying support transactions and directions. Observing only the network structure would mask these support exchange details. Furthermore, the receipt of

tangible support may be less relevant for survival than perceived emotional support, giving help instead of receiving, or social integration – feeling like we belong to a social circle (Holt-Lunstad et al., 2010; Poulin et al., 2013; Shor et al., 2013; Vila, 2021).

The association between having friends and survival is less researched, although the role of non-kin networks may increase with time as family structures transform (Broese van Groenau et al., 2013). Having more (or more contact with) friends as a characteristic of a diverse network can benefit health and survival (Berkman & Syme, 1979; Ellwardt et al., 2015; Giles et al., 2005; Litwin & Shiowitz-Ezra, 2006; Rentscher et al., 2023), especially among women (Rasulo et al., 2005). As relationships with friends usually form based on mutual choice, their positive effect on survival might reflect the importance of agency in forming social ties in old age (Carstensen, 2021). No effect, or even negative effects from emotional support with friends have also been found, indicating a potential mismatch between support needs and provision with a specific type of support resource (Antonucci et al., 2010; Jørgensen et al., 2018; Shor et al., 2013).

The effect sizes of associations between network characteristics and survival is often smaller (Schutter et al., 2022; Shor & Roelfs, 2015) than suggested by earlier studies (e.g., by Holt-Lunstad et al., 2010). This comes primarily from comparing outcomes before adjusting for the other relevant factors, which exert a stronger effect on mortality than network characteristics (Kauppi et al., 2018; Rasulo et al., 2005; Shor et al., 2013; Shor & Roelfs, 2015). A similar methodological issue arises when effects based on network scales are compared with pure network measures – the latter give much lower effects in relation to mortality than the former (Shor & Roelfs, 2015).

Finally, identifying causality in the associations between social networks and survival remains problematic because it is often difficult to account for the order of various events – whether deleterious health caused a person to reduce social interaction, or their social relationships have had a negative effect on their health and survival (Tough et al., 2017). One recent literature overview of survival and living arrangements estimates the causality of the association to be at a low certainty level (Zhao et al., 2022), indicating that the objective or structural characteristic (living alone in this case) itself is not behind the deterioration of health. It is likely there have been more unpublished analyses that found no effects between network characteristics and survival (Shor & Roelfs, 2015).

The current research

The aim of this paper is to understand whether, how, and which social network characteristics of Estonian middle-aged and older persons support longer overall survival both in general and in disability-related stress situations. To date, there have been no studies exploring these relationships in this country. First, we expect structural network characteristics (e.g., network size and contact frequency with network members) in Estonia to be generally associated with survival among the middle-aged and older population, but only functional network characteristics (e.g., reporting the existence of a partner, friends or children in the network) to protect middle-aged and older adults with disabilities from dying earlier. This reasoning follows the assumption that health and mortality developments and the sparse population density in Estonia have restricted social interaction opportunities in mid- and old age in general, while the functional characteristics and greater support from network members may exert neurobiologically or epigenetically relevant stress buffering effects (Rentscher et al., 2023; Vila, 2021). Similarly, emotional closeness with the network is expected to have a protective association with survival for people with disabilities, especially in the Estonian context where the barriers for societal participation for people with disabilities were high during the observation period (Hanga, 2018).

Second, gender differences in the associations between network characteristics and survival are explored as these have been generally understudied in this line of research (Schutter et al., 2022). To that end, we test models for the main and buffering effects separately for men and women. In general, women are expected to have larger and more diverse networks than men in Estonia, as they have been carrying the responsibility of caretaking and maintaining social interactions. Therefore, more associations are expected to be found among women between network characteristics and

survival, either main or buffering, negative or positive. Among men, including those with everyday activity limitations, reporting a confidant partner is expected to protect them from an earlier death.

Data and methods

We use the SHARE Estonia survey data collected from Waves 4 to 8 (2010 to 2020), including the sample from the first COVID-19 survey wave. The probability sample was representative of age and sex, drawn from all people aged 50+ who resided in Estonia at the beginning of 2010 according to the national population register. The information on the time of death of the participants has been cross-checked with data from the Estonian population register prior to each wave, allowing us to observe the correct survival time over a ten-year period.

We observed people at least 50 years of age at the baseline without an upper age limit, interviewed from 2010–2011 until their death or last interview. The analytical sample, including only those without everyday activity limitations at the baseline, is 2,754 people (1,157 men and 1,597 women) of whom 14.5% (19.9% of men and 10.5% of women) died during the observation period.[1] Men contributed with 14,436.3 person-years, and women with 22,539.9 person-years (total person-years 36,976.2). In some models the number of people may be lower than the number of all deceased respondents because of missing values on any of the control variables.

Variables

The dependent variable is the time until death or the last interview (in ages). Death is a clearly defined outcome, and therefore is testable as a (temporal) consequence using the models for the main and buffering effects. Time-constant independent variables include birth cohort (in ten-year groups for people born between 1900 and 1967), origin (native born or foreign born), education level (up to and including basic, (post) secondary non-tertiary, tertiary), number of children ever had, and smoking behaviour (current/former or never smoked). Education grouping is based on ISCED 1997 levels where levels 0–2 were categorised as basic, 3–4 as (post-)secondary non-tertiary, and levels 5–6 as tertiary education. These cover the most common demographic and health behaviour factors behind survival differences. Smoking is included as a time-constant variable because there are very few changes in smoking behaviour over waves in these age groups, while accounting for the experience of smoking adjusts for crucial health behaviour. Smoking is included as a confounder because it affects both survival and social networks. As a stress-coping mechanism, shared smoking behaviour can help foster social ties (Cohen & Lemay, 2007). However, it is more prevalent among socially isolated individuals and may also increase isolation over time (Cohen & Lemay, 2007; Matsuyama & Tabuchi, 2024; Philip et al., 2022). This may occur when forming social ties is hindered by the stigma associated with the behaviour (i.e., smoking) or when the stress situation becomes overwhelming.

The main disability status variable indicates whether the respondent has everyday activity limitations (at severe or moderate levels) or has experienced no limitations during the last six months. This is based on the self-reported and internationally validated Global Activity Limitation Index (GALI), which encompasses general barriers in the social environment in addition to an estimation of one's health (Jagger et al., 2010; Verbrugge & Jette, 1994). This corresponds to the definition of chronic stress as an objective condition (in this case referring to disability-related stress), causing strain and demanding adjustments to both behaviour and social roles (Cohen & Wills, 1985). This was included as a time-varying variable to identify the dynamics between changes in relations and disability accurately (Bowling & Grundy, 1998). Legal marital status (married/partnered, never married, widowed, separated/divorced), employment status (not employed, retired, employed), receiving practical or personal support, and providing practical or personal

1 As a previous analytical step, the same analysis was conducted for all, including those with everyday activity limitations at the onset, including 6,726 people (2,736 men and 3,990 women), of whom 24% (30.7% of men and 19.4% of women) died during the observed ten years. The results for this analysis are not presented as final conclusions are based on the limited sample analysis, to better disentangle the direction of the effects between networks, disability and survival.

support were also coded as time-varying. Dichotomous variables of the receipt and provision of practical or personal support from anyone inside or outside the household were included to adjust for different directions of tangible support exchange. Receiving support, as opposed to providing support, indicates different directions of support exchange – the position of the ego in either case is conceptually different. Controlling for practical and personal support exchange allows for a more reliable conclusion regarding the effects of emotional support.

Information on social networks was collected in Waves 4, 6 and 8 of SHARE using a name-generator method. Respondents were asked to name up to seven people with whom important matters have been discussed during the last year, irrespective of the mode of communication, eliciting the closest ties of the ego (Marsden, 1987; Stoeckel & Litwin, 2013). Total network size and contact frequency with family members indicate the structural characteristics of one's network; that is, the existence of the network and the intensity of the communication. Network size is the count of the total number of close people reported by each survey respondent. The grouped option distinguished those with 0, 1, 2 and 3 or more network members. Contact frequency with family members was categorised as follows: daily, several times a week, once a week, every two to four weeks, never/rare (the 'rare' category includes all those who interact less often than once a month).

Network composition indicators were based on the type of relationship (i.e. role relationship) the respondent named for each network member – they could choose from a list of 27 relationship types that covered broadly different relationships, nuclear and extended family members, including in-laws, stepfamily members, neighbours, colleagues, partners, friends, priests, formal service providers, etc. Reporting friends, a partner, and the number of children in the network indicates the functional aspect, as they reflect the types of relationships and the variation in different perceived support sources. The overall level of emotional closeness with network members reflects a qualitative aspect of perceived intimacy for these ties. This is a dichotomised variable based on a four-category question (ranging from "not very close" to "extremely close") where the respondent indicated their emotional closeness level with each network member, which was then averaged based on all network members.

Analytical strategy

Time-varying variables were constructed using episode splitting according to information retrieved at the time of each interview (survey wave) using the Stata software. The number of episodes was created for each individual according to the number of waves in which they participated, indicating the status for each time-varying variable and whether an event happened or not in the relevant interval. The time-varying variables indicate the status for each year between the waves, based on the assumption that the information remained the same as in the previous wave.

Descriptive analysis and Chi-square tests characterise the distributions of those who died or stayed alive during the observation period.[2] Hazard regression models (i.e., event history or survival models) were used to estimate the effects of network characteristics on survival. The survival analysis of time-to-event data enables the disentanglement of events and their effects on a time axis. More specifically, we employed the Cox regression model, a semi-parametric hazards model suitable for studying the time-to-event data of heterogeneous populations. It does not assume a specific distribution of the underlying process (Cox, 1972)[3]. As mentioned above, time-varying variables were constructed using episode splitting according to information retrieved from each wave based on their status at the time of each interview. The statistical software Stata (version 15.1) was employed with the 'stset' and 'stsplit' commands. The number of episodes was created

2 Because survival method analyses the number of observations, not the number of cases, then the small number of cases in some cells as presented in descriptive tables is counterbalanced by an expanded number of observations after episode-splitting procedure in Stata.

3 The Gompertz model was also experimented with, as it uses a parametric mortality distribution suitable for studying the phenomenon in contemporary societies for those above the age of 40 until about the age of 85 (Le Bras, 2008). After experimenting with Gompertz model, it was decided to present results from the Cox models due to the latter models' more flexible parametrisation.

for each individual according to the number of waves in which they participated, as described above. The starting time for being at risk was set at age 50 for the subjects in order to account for the fact that people were at different ages at the time of their interview.

All models were run separately for men and women because of the differing mortality schedules by sex. To test the proportionality assumption, the Schoenfeld test using the Cox model was run beforehand. For single variables, there was some indication of the proportionality violation, especially when using the time-varying variable of an actual partnership status instead of the time-varying variable of an official marital status. Therefore, models with marital status were preferred and presented. However, it is common to find some violations in most studies – in such cases, results can be interpreted as a weighted average of the true hazard ratios over the entire observation period (Stensrud & Hernán, 2020). Interactions between the disability status and the network variables are estimated for buffering effects – these were run after accounting for the main effects in the same models, including people with and without everyday activity limitations. Every model also controlled for network size, except for the model for the effects of size itself. This helps to interpret the network characteristics as true functional rather than structural indicators following Cohen and Wills (1985).

Results

Significantly more men (19.9%) than women (10.5%) died during the ten-year observation period. Clear differences in survival also emerged by everyday activity limitations – people with or developing everyday activity limitations had a shorter survival duration compared with those without any activity limitations (Tables 2 and 3). The differences in the distribution of deaths were seen by most variables among women, and less so among men (Tables 1–3). Among men, there were significant differences in the distribution of deaths by smoking and education – significantly more men stayed alive during the observation period if they had never smoked, and if they had at least (post) secondary education levels. A significantly higher proportion of women with at least (post) secondary education levels, but also native born stayed alive during the observation period (Table 1). Regarding other variables, significantly more men stayed alive during the observation period if they did not have or had a reduction in everyday activity limitations, and also in the case of being employed, receiving practical support, but not providing practical support (Table 2). Significant differences in the distribution of deaths among women were found in the case of all time-varying variables (Table 3). Statistically significantly more women were alive if they reported at least two network members, at least two children in the network, a friend as well as a partner in the network, communicated with their family members at least several times a week, and were very or extremely close with their network. Significantly more women stayed alive if they did not report or had a reduction in everyday activity limitations, when separated or partnered, employed, receiving practical support, but not providing support.

As expected, more men (10%) than women (4.7%) either did not have anyone to discuss important matters with or lost network members over the observation period, and correspondingly, women had larger networks on average or increased them. A larger share of men also did not report any children in their network (58.7%) compared with women (33.4%). Women more often did not have a partner in their network, but a larger share of them reported having (more) friends. They also reported slightly lower contact frequency with family members in their network, and slightly higher emotional closeness with their network members.

Table 1. Distribution of all time-constant variables in the analytical sample by death status

Gender	Variable	Value	Alive				Deceased				χ^2	Person-Years	Total N
			N	% (row)/ Mean	SE	CI	N	% (row)/ Mean	SE	CI			
MEN													
	Age at first interview			61.5	0.262	[61.02 - 62.04]		67.8	0.581	[66.68 - 68.96]			1157
	Origin	Native born	728	78.5			173	75.2			0.278	11028.1	1157
		Foreign born	199	21.4			57	24.8				3401.6	
	Number of children			2.2	0.042	[2.15 - 2.32]		2	0.088	[1.78 - 2.13]			1150
	Smoker	Current/ former smoker	281	30.3			92	40			0.005	4217.6	1157
		Never smoked	646	69.7			138	60				10215.6	
	Education level	Basic or below	228	24.6			87	37.8			<0,001	4605.6	1157
		(Post) secondary non-tertiary	445	48			94	40.9				6696.3	
		Tertiary	254	27.4			49	21.3				3127.8	
WOMEN													
	Age at first interview			62.3	0.222	[61.87 - 62.74]		73.6	0.775	[72.04 - 75.08]			1597
	Origin	Native born	1,172	82			122	72.6			0.003	16898.7	1597
		Foreign born	257	18			46	27.4				5640.6	
	Number of children			2	0.031	[1.98 - 2.10]		1.8	0.095	[1.61 - 1.99]			1597
	Smoker	Current/ former smoker	227	15.9			20	12			0.185	2754.2	1595
		Never smoked	1,201	84.1			147	88				19774.8	
	Education level	Basic or below	257	18			64	38.1			<0,001	6369.0	1597
		(Post) secondary non-tertiary	751	52.6			68	40.5				11146.7	
		Tertiary	421	29.5			36	21.4				5023.1	

Source: SHARE Estonia Waves 4–8, 2010–2020

Table 2. Distribution of all time-varying variables in the analytical sample by death status, men

Variable	Value	Alive		Deceased		χ^2	Person-years
		N	% (col)	N	% (col)		
Size of network	0	82	9.7	24	11.3	0.899	1105.5
	1	308	36.4	74	34.7		5198.1
	2	217	25.7	56	26.3		3530.0
	3+	238	28.2	59	27.7		4280.2
Number of children in network	0	498	58.9	123	57.7	0.989	8224.4
	1	217	25.7	57	26.8		3497.8
	2	107	12.7	27	12.7		1953.1
	3+	23	2.7	6	2.8		438.6
Report partner in network	no	232	27.5	62	29.1	0.63	3754.6
	yes	613	72.5	151	70.9		10359.3
Report friends in network	no	720	85.2	186	87.3	0.431	11941.3
	yes	125	14.8	27	12.7		2172.5
Contact frequency with family	Never/ Rare	121	14.32	41	19.3	0.325	1869.3
	Every 2–4 weeks	20	2.37	7	3.3		366.2
	Once a week	57	6.75	16	7.5		1185.8
	Several times a week	263	31.12	64	30		4447.6
	Daily	384	45.44	85	39.9		6244.9
Emotional closeness with network	Not very/ Somewhat	151	18.2	38	18.8	0.844	2405.9
	Very/ Extremely	678	81.8	164	81.2		11295.5
Everyday activity limitations	Not limited	564	61.7	116	53.5	0.026	5653.5
	With limitations	350	38.3	101	46.5		8717.5
Marital status	Widowed	67	7.3	22	10	0.417	1049.7
	Separated	108	11.8	20	9		1498.9
	Partnered	684	74.6	166	75.1		10763.0
	Never married	58	6.3	13	5.9		1083.7
Employment status	Not employed	47	5.2	7	3.2	<0.001	917.9
	Retired	450	49.3	156	71.9		7940.5
	Employed	415	45.5	54	24.9		5491.0
Received practical support	Not received	77	8.4	31	14	0.01	2596.0
	Received	840	91.6	190	86		11803.3
Provided practical support	Not provided	840	91.6	189	85.5	0.006	10818.2
	Provided	77	8.4	32	14.5		3581.1

Source: SHARE Estonia Waves 4–8, 2010–2020

Table 3. Distribution of all time-varying variables in the analytical sample by death status, women

Variable	Value	Alive		Deceased		χ^2	Person-years
		N	% (col)	N	% (col)		
Size of network	0	53	4	16	10.7	<0.001	920.9
	1	280	21.1	44	29.5		5194.3
	2	395	29.7	46	30.9		6146.6
	3+	601	45.2	43	28.9		9855.6
Number of children in network	0	433	32.6	60	40.3	0.011	8015.9
	1	524	39.4	66	44.3		8246.9
	2	313	23.6	19	12.8		4854.9
	3+	59	4.4	4	2.7		999.6
Report partner in network	no	745	56.1	108	72.5	<0.001	12642.4
	yes	584	43.9	41	27.5		9474.9
Report friends in network	no	927	69.8	120	80.5	0.006	15793.3
	yes	402	30.3	29	19.5		6324.0
Contact frequency with family	Never/ Rare	141	10.6	28	18.8	0.017	2654.1
	Every 2–4 weeks	42	3.2	8	5.4		806.6
	Once a week	139	10.5	15	10.1		2094.1
	Several times a week	591	44.5	61	40.9		9368.7
	Daily	416	31.3	37	24.8		7172.3
Emotional closeness with network	Not very/ Somewhat	137	10.4	30	21	<0.001	3180.4
	Very/ Extremely	1,185	89.6	113	79		18585.4
Everyday activity limitations	Not limited	823	57.8	67	43.5	0.001	8245.8
	With limitations	602	42.3	87	56.5		14219.3
Marital status	Widowed	363	25.5	78	50	<0.001	6654.8
	Separated	236	16.6	15	9.6		3381.5
	Partnered	709	49.7	49	31.4		10873.9
	Never married	118	8.3	14	9		1581.0
Employment status	Not employed	64	4.5	5	3.3	<0.001	1161.1
	Retired	765	53.7	122	80.8		13985.3
	Employed	596	41.8	24	15.9		7261.6
Received practical support	Not received	97	6.8	22	14.1	0.001	3790.8
	Received	1,329	93.2	134	85.9		18708.1
Provided practical support	Not provided	1,294	90.7	132	84.6	0.015	15591.4
	Provided	132	9.3	24	15.4		6907.5

Source: SHARE Estonia Waves 4–8, 2010–2020

For men, no main effects between network characteristics and survival were observed, even before including any of the control variables; that is, no independent associations (Table 4 in the Appendix; Figure 1). Only buffering effects with one network characteristic emerged (Table 6 in the Appendix; Figure 2). Men with everyday activity limitations who were in contact with family members about once a week had a significantly higher hazard of dying than men with daily contact (HR 7.18, 95% CI 1.36 – 37.95; Table 6 in the Appendix; Figure 2). This independent association with survival already existed of a similar magnitude before including any of the control variables. However, this outcome might be primarily explained by the fact that there are few cases in this category, as the wide confidence intervals indicate.

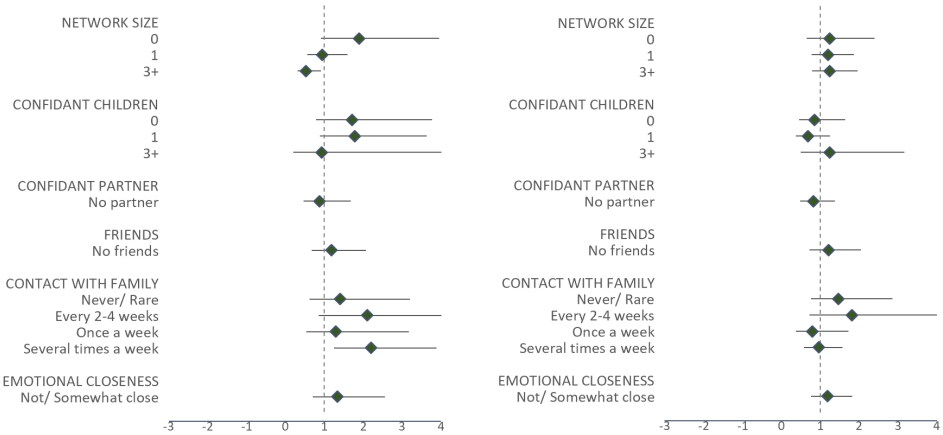
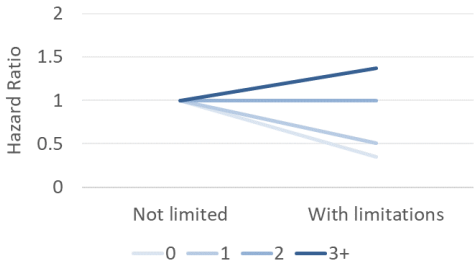


Figure 1. Hazard ratios and confidence intervals from fully adjusted Cox hazard models for estimating the main effects of network characteristics with survival for men (right panel) and for women (left panel).

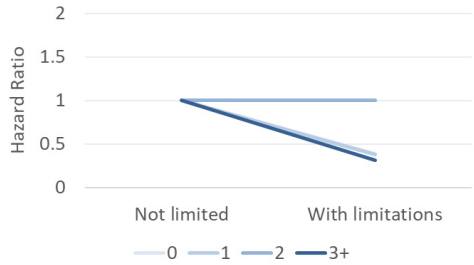
Reference categories: network size and children: 2; confidant partner and friends: yes; contact frequency: daily; emotional closeness: very/extremely close

Source: SHARE Estonia Waves 4–8, 2010–2020.

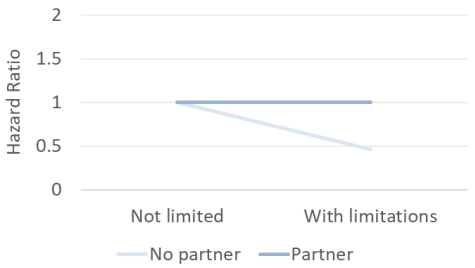
For women, there were only main effects observed, most clearly for network size, but also for contact frequency with family network members (Tables 5 and 7 in the Appendix; Figure 1). Women with three or more network members had a significantly lower hazard of dying than women with two members (HR 0.54, 95% CI 0.31 – 0.91; Table 5 in the Appendix; Figure 1). This translates to a survival benefit of around two years on average cumulatively over the whole observation period. The statistically significant association between network size and survival existed in a similar magnitude before including any control variables, indicating its independent relationship with survival. Women communicating with family members in their network several times a week had a significantly higher hazard of dying compared to those communicating with their family daily (HR 2.20, 95% CI 1.25 – 3.89, Table 5 in Appendix; Figure 1). This hazard increased and became statistically significant after accounting for practical support exchanges as well as for network size. Initially, never or rarely communicating with family members in the network had a significantly higher hazard ratio, indicating an independent association with survival; however, this decreased and disappeared after accounting for network size. Furthermore, initially reporting no or one child in the network was significantly associated with higher mortality risk, but this decreased and disappeared after accounting for network size. Therefore, the associations between survival and contact frequency with family as well as with reporting children as network members are dependent on network size, potentially reflecting their structural rather than functional nature. Unlike men, no significant buffering effects emerged among women, including no independent associations before accounting for any control variables (Table 7 in the Appendix; Figure 3).



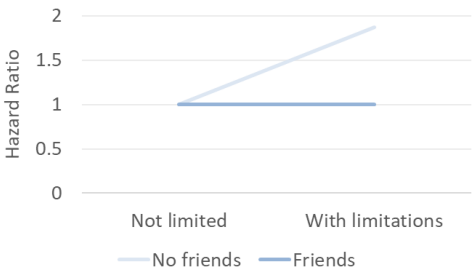
a) Network size



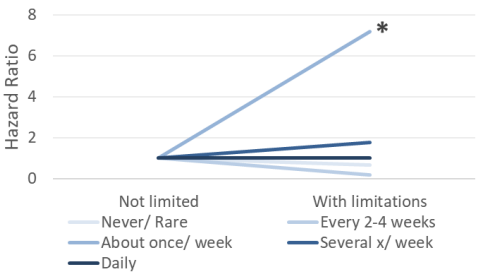
b) Number of children in the network



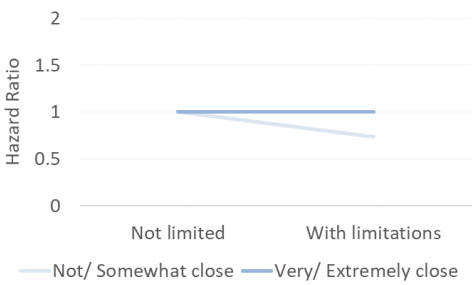
c) Confidant partner in the network



d) Number of friends in the network



e) Contact frequency with family members



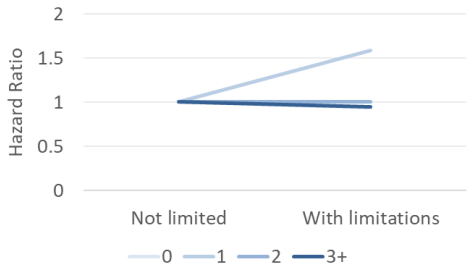
f) Emotional closeness with the network

Figure 2. Interaction terms (hazard ratios) between network characteristics (a–f) and everyday activity limitations for men, fully adjusted models.

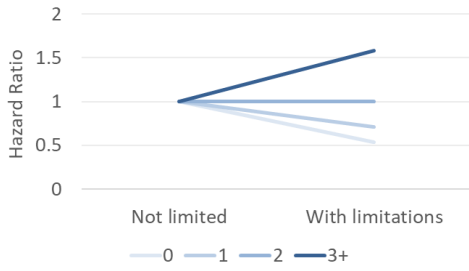
Reference categories: network size and children: 2; confidant partner and friends: yes; contact frequency: daily; emotional closeness: very/extremely close

Source: SHARE Estonia Waves 4–8, 2010–2020.

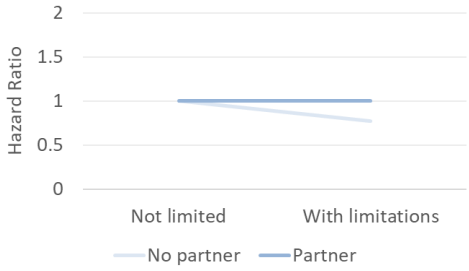
Notes: * Statistically significant finding ($p < 0.05$)



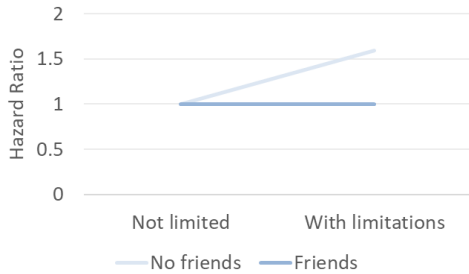
a) Network size



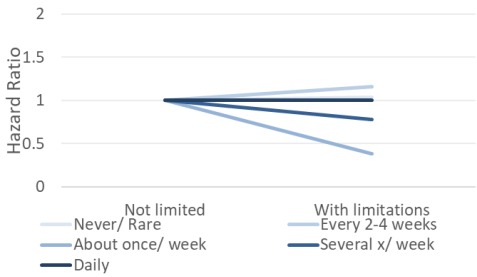
b) Number of children in the network



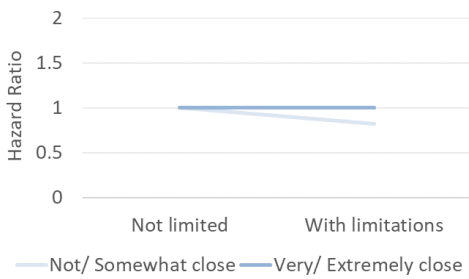
c) Confidant partner in the network



d) Number of friends in the network



e) Contact frequency with family members



f) Emotional closeness with the network

Figure 3. Interaction terms (hazard ratios) between network characteristics (a–f) and everyday activity limitations for women, fully adjusted models.

Reference categories: network size and children: 2; confidant partner and friends: yes; contact frequency: daily; emotional closeness: very/extremely close

Source: SHARE Estonia Waves 4–8, 2010–2020.

Discussion

This study is the first to investigate the impact of social network characteristics and emotional support exchange on survival in Estonia, focusing on middle-aged and older individuals with disabilities. While it finds some confirmation of the protective role of networks, health-related aspects still predominantly explain survival differences. The study aligns with previous findings emphasising the significance of network structure, particularly network size, for extended survival (e.g. Berkman & Syme, 1979; Ellwardt et al., 2015; Holt-Lunstad et al., 2010). Network size being independently associated with survival among middle-aged and older Estonian women refers to the much-cited beneficial outcomes arising from being part of or having a sense of belonging to one's social circles (Berkman & Syme, 1979; Ellwardt et al., 2015; Holt-Lunstad et al., 2010; Shor & Roelfs, 2015). These network members have usually been referred to as confidants due to their high emotional closeness, suggesting an overlap with emotional support (Stoeckel & Litwin, 2013; Thoits, 2021). However, these ties may reflect talking with others about a number of important matters relating to finance, health, personal topics, work or something else. Therefore, the relevance of network size may also reflect different types of information or advice exchanged within wider discussion circles that mitigate the daily hassles and stress that people experience (Small, 2013; Thoits, 2021). Besides support and knowledge functions, such networks may encompass people who are available to discuss important matters, but who are not necessarily close sources of emotional support (Small, 2013).

While frequent contact with family members in the network was found to be irrelevant or harmful previously due to this being potentially a stressor (Rentscher et al., 2023; Shor et al., 2013), Estonian women in general benefit from frequent contact with family confidants, supporting the expectations formulated for this study. Therefore, the relevance of frequent family contacts for coping with chronic strain in Estonia is somewhat confirmed, particularly since it is the only significant factor buffering stress among men with disabilities (however, the latter indicating wide confidence intervals). Descriptive findings indicated that more people survived over the observation period in Estonia if they received practical support, rather than when they provided practical support themselves. Accounting for practical support exchanges and their direction was also somewhat relevant in shaping the association with survival and contact frequency with family members in the network among women in the analysis. This indicates that the practical as well as less tangible support that family members exchange overlap in these networks (Thoits, 2021). Therefore, when Estonian middle-aged and older people mention their family members as part of their network, it is partly due to them fulfilling a functional or instrumental purpose. Moreover, emotional closeness did not appear relevant in this analysis.

Besides being support receivers, individuals can be support providers (Poulin et al., 2013). Unlike practical support exchange variables, it was not possible to distinguish the direction of less tangible support exchanges based on the social network measures available in this study. The descriptive as well as survival analyses indicate that the distribution of network characteristics and support exchanged via these networks are also somewhat gendered in the Estonian context, confirming our expectations. Women with larger networks and more frequent contact with (family) network members aids (independently from other factors) in exchanging different support elements with a wider circle. It may be that women report more network members with whom the different support elements can be exchanged, including providing, not only receiving, unlike men. This points to the interdependence between different life domains across time and (macro-, meso-, micro-) levels also having been a relevant shaping factor for women's lives in Estonia, especially regarding social interaction and support exchanges (Hagestad & Dykstra, 2016). From the macro-level perspective, this gendered outcome might be explained by mortality, health and living arrangement differences, which in the Estonian case are extremely large between men and women – women live on average 8.5 years longer than men in Estonia, and are overwhelmingly living alone in old age (Eurostat, 2025; Statistics Estonia, 2025). Therefore, these network members reflect the relations that middle-aged and older women engage in to discuss important matters. Due to the selective survival over time of people in somewhat better social positions, the results may indicate that women with initially better health status and ability to participate in wider reciprocal social circles have survived longer during the observation period. From the care burden

perspective, policies may not make men generally more caring, especially with regard to older generations (Hagestad & Dykstra, 2016), but raising awareness regarding the skills and benefits of discussing important matters with each other and how to exchange emotional support might improve its provision for everyone. Alternatively, reporting a larger number of discussants among women relates to differences in the revealing and avoidance aims in social interaction with close people, with the latter practice being central when relating to other people, but being more common among men (Small et al., 2024; Tambaum et al., 2019). While rooted in past identities and socialisation, fostering personal responsibility for social health and encouraging more men to engage in same-sex emotional support may help shift these outcomes (Tambaum et al., 2019; Thompson & Whearty, 2004).

Despite the expectation that reporting a confidant partner would be positively associated with survival, especially among men, this was not supported in this analysis. Therefore, not having a partner to discuss with becomes less relevant with old age in Estonia, similar to other contexts (Antonucci et al., 2010; Due et al., 1999; Penninx et al., 1997; Zhao et al., 2022). Alternatively, other factors, such as health or health behaviour related aspects, still exert a stronger effect on men's survival in Estonia than their social surroundings. Possibly the type of emotional support exchanged is not visible because of the measures used, and therefore their structural aspect (i.e. the availability of the ties instead of their function) appears more crucial. It is also possible that some people simply forget to mention their partner as a network member.

No buffering or protective effects emerged between network size and survival for people with disabilities, suggesting that social surroundings do not have a role in shaping survival outcomes for people with disabilities in Estonia. This result could indicate that people with disabilities prefer restricting (stressful) communication to regulate their emotional lives (Carstensen, 2021), given the long-term paternalistic and stigmatising attitudes towards people with disabilities (Hanga, 2018). Disability prevalence in Estonia is high, and the socioeconomic situation of people with disabilities remains worse than that of the other members of society (Hanga, 2018; Statistics Estonia, 2025; Verbrugge & Jette, 1994), which might make it difficult to establish connections within such a stigmatising social environment. However, no negative associations emerged either, which might refer to stable relationships with established priorities among people with disabilities (Weiss et al., 2022), their entrenched social positions, other coping strategies or resignation with regard to the source of stress (Aneshensel, 1992; Thoits, 1995). It may be that social surroundings operate in a similar manner for most people in the generations studied here, irrespective of disability, being one of the underreported outcomes of a lack of network effects in health (Schutter et al., 2022; Shor & Roelfs, 2015). These older cohorts in Estonia are relatively highly educated compared to other European countries (Eurostat, 2025), in which case, social networks play a minor role in life outcomes. People with higher education are more independent and selectively curate their social resources as it is not necessary to rely on social ties to access crucial information, services or social influence (Goldman, 2022). However, a methodological aspect might also explain these results. Previous cross-sectional analyses have shown that older adults with moderate activity limitations have the largest networks, while people with severe activity limitations have the smallest networks in most European countries (Abuladze & Sakkeus, 2013). This suggests a double mechanism: network members mobilise out of obligation during the onset of a disability but withdraw as the condition worsens and relationships become harder to maintain (Cornwell, 2009). These effects may have been counterbalanced in the current analysis due to not distinguishing different disability levels. Future research could disentangle these associations by different levels of disability when larger samples are available.

One of the main strengths of this study is the analysis of social relations before a clearly defined outcome – death – on a temporal axis. Potential bidirectional associations are addressed by creating time-varying variables behind changing one's social roles (Bowling & Grundy, 1998; Shor & Roelfs, 2015) as well as by analysing those without activity limitations at the onset, to better disentangle the relationship between network characteristics and health. Network characteristics are also defined as time-varying, which has not usually been the case. Exploring these associations with time-to-event data can be considered as the minimum setting in which the potential preceding and outcome events can be studied as they are clearly identified. By conceptualising network ties

and objective demographic indicators separately, this paper also clarifies the links between social relations and survival, without assuming that living arrangements are markers of support (Litwin, 1996; Stoeckel & Litwin, 2013).

The study explored the main and buffering associations between social networks and survival in an Eastern European context. The Estonian sample provided valuable insights into sub-groups, including the oldest participants. We have cross-checked the time of death of the respondents with population register information. However, the sample might still be selective due to the over-representation of people with lower education levels in the Estonian SHARE sample, affecting the overall worse outcomes in terms of everyday activity limitations compared with other countries (Spitzer, 2020). Furthermore, Wave 8 of SHARE was interrupted by the Covid-19 pandemic, potentially affecting the selectivity of responses. Analytical steps with regard to network characteristics were taken to mitigate this. However, previous analyses based on a shorter observation period yielded similar results. The SHARE survey collects ego network data, and has not been designed to be representative of the distribution of general social networks in a population. There may also be a bias in network information. However, this is a general problem in surveys collecting ego network data, as such a method often captures only the closest ties (Stoeckel & Litwin, 2013). The variables included as functional characteristics of networks, such as having friends or a partner or the number of children in the network might not entirely capture their functional aspect, but rather reflect a structural aspect of networks, despite network size being included as a control in all models for these variables. Finally, the measures used do not distinguish the directional flow of non-tangible support exchanged – neither conflicting nor negative or demanding aspects of relationships.

In conclusion, the study suggests that social network characteristics and support exchanges through these networks have a limited role in survival outcomes in Estonia, also based on the lack of independent associations found. While larger networks are beneficial for middle-aged and older women, and frequent contact with family network members may aid survival somewhat, addressing the unequal care burden, health disparities, and the social environment for people with disabilities remain important challenges in Estonia. To improve social interactions and support exchanges, increased state-level earnings and tax redistribution are recommended as crucial steps to address chronic resource deficits in the social care sphere (Murphy, 2023).

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Liili Abuladze is Research Fellow at Tallinn University. Her research interests are related to ageing, social networks, living arrangements, family forms and formation, life course, foreign-origin population, health, and population data quality.

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Appendix

Table 4. Main effects from finally adjusted Cox hazard models for each network characteristic, men

	HR	SE	P>z	95% CI		p	chi2	df	aic	bic	N (obs.)
Network size (ref: 2)											
0	1.248	0.416	0.506	0.650	2.397	0.000	48.434***	20	1469.8	1605.8	6641
1	1.212	0.269	0.387	0.784	1.873						
3+	1.245	0.291	0.348	0.788	1.967						
Children in the network (ref: 2)											
0	0.862	0.285	0.653	0.451	1.647	0.001	50.868***	23	1473.4	1629.8	6641
1	0.684	0.212	0.221	0.372	1.256						
3+	1.253	0.592	0.633	0.497	3.163						
Partner in the network (ref: Yes)											
No confidant partner	0.821	0.216	0.452	0.490	1.373	0.000	49.012***	21	1471.2	1614.0	6641
Friends in the network (ref: Yes)											
No friends	1.224	0.324	0.446	0.728	2.057	0.000	49.036***	21	1471.2	1614.0	6641
Contact frequency with family (ref: Daily)											
Never/ Rare	1.475	0.498	0.250	0.761	2.861	0.001	51.833***	24	1474.4	1637.6	6641
Every 2–4 weeks	1.826	0.855	0.198	0.730	4.570						
About once a week	0.800	0.314	0.569	0.370	1.727						
Several times a week	0.965	0.243	0.888	0.590	1.580						
Emotional closeness with network (ref: Very/ Extremely close)											
Not/ Somewhat close	1.185	0.261	0.443	0.769	1.825	0.000	101.838***	21	1851.6	1993.8	6449

Source: SHARE Estonia Waves 4–8, 2010–2020

Notes: Each network characteristic model controls for birth cohort, origin, marital status*, number of children, education level, employment status*, everyday activity limitations*, smoking, receipt of practical support*, and giving practical support*.

*Time-varying variables.

Table 5. Main effects from finally adjusted Cox hazard models for each network characteristic, women

	HR	SE	P>z	95% CI		p	chi2	df	aic	bic	N (obs.)
Network size (ref: 2)											
0	1.902	0.709	0.085	0.916	3.948	0.010	38.823*	21	931.5	1082.3	9723
1	0.947	0.251	0.836	0.562	1.593						
3+	0.535	0.146	0.022	0.313	0.912						
Children in the network (ref: 2)											
0	1.720	0.688	0.175	0.785	3.768	0.013	41.892*	24	934.4	1106.8	9723
1	1.787	0.647	0.109	0.879	3.634						
3+	0.934	0.747	0.932	0.195	4.480						
Partner in the network (ref: Yes)											
No confidant partner	0.883	0.288	0.704	0.466	1.675	0.014	38.968*	22	933.3	1091.3	9723
Friends in the network (ref: Yes)											
No friends	1.186	0.337	0.549	0.679	2.071	0.013	39.190*	22	933.1	1091.1	9723
Contact frequency with family (ref: Daily)											
Never/ Rare	1.412	0.591	0.409	0.622	3.206	0.004	47.618**	25	930.3	1109.9	9719
Every 2–4 weeks	2.110	0.964	0.102	0.861	5.168						
About once a week	1.296	0.592	0.571	0.529	3.175						
Several times a week	2.201	0.638	0.007	1.246	3.885						
Emotional closeness with network (ref: Very/ Extremely close)											
Not/ Somewhat close	1.342	0.440	0.371	0.705	2.553	0.044	34.456*	22	879.0	1036.7	9592

Source: SHARE Estonia Waves 4–8, 2010–2020

Notes: Each network characteristic model controls for birth cohort, origin, marital status*, number of children, education level, employment status*, everyday activity limitations*, smoking, receipt of practical support*, and giving practical support*.

*Time-varying variables.

Table 6. Interaction effects from finally adjusted Cox hazard models for each network characteristic, men

	HR	SE	P>z	95% CI		p	chi2	df	aic	bic	N (obs.)
Size (ref: Limitations # 2)											
Limitations # 0	0.353	0.267	0.169	0.080	1.554	0.000	56.237***	23	1468.0	1624.4	6641
Limitations # 1	0.508	0.231	0.136	0.208	1.238						
Limitations # 3+	1.372	0.637	0.496	0.552	3.410						
Children in the network (ref: Limitations # 2)											
Limitations # 0	0.388	0.189	0.052	0.149	1.009	0.001	55.176***	26	1475.1	1651.9	6641
Limitations # 1	0.382	0.215	0.087	0.127	1.152						
Limitations # 3+	0.311	0.304	0.233	0.046	2.116						
Confidant partner in the network (ref: Limitations # Partner in)											
Limitations # No partner in the network	0.461	0.184	0.053	0.211	1.010	0.000	52.769***	22	1469.5	1619.1	6641
Friends in the network (ref: Limitations # Friends in)											
Limitations # No friends in the network	1.872	1.048	0.263	0.625	5.607	0.001	50.350***	22	1471.9	1621.5	6641
Contact frequency with family (ref: Limitations # Daily)											
Limitations # Never/ Rare	0.662	0.345	0.430	0.238	1.841	0.000	66.059***	28	1468.2	1658.6	6641
Limitations # Every 2–4 weeks	0.175	0.200	0.128	0.018	1.654						
Limitations # About once/ week	7.181	6.099	0.020	1.359	37.945						
Limitations # Several x/ week	1.757	0.715	0.166	0.791	3.902						
Emotional closeness with network (ref: Limitations: Very/ Extremely close)											
Limitations # Not very/ Somewhat close	0.739	0.339	0.511	0.301	1.818	0.003	43.605**	21	1379.7	1521.9	6449

Source: SHARE Estonia Waves 4–8, 2010–2020

Notes: Each network characteristic model controls for birth cohort, origin, marital status*, number of children, education level, employment status*, everyday activity limitations*, smoking, receipt of practical support*, and giving practical support*. The models were run including both main and buffering effects together. People without activity limitations are included in the model, with all categories for this variable having a coefficient value of 1 (similarly to the reference groups).

*Time-varying variables.

Table 7. Interaction effects from finally adjusted Cox hazard models for each network characteristic, women

	HR	SE	P>z	95% CI		p	chi2	df	aic	bic	N (obs.)
Size (ref: Limitations # 2)											
Limitations # 0	0.936	0.706	0.930	0.213	4.108	0.016	39.965*	23	934.3	1099.5	9723
Limitations # 1	1.582	0.849	0.392	0.553	4.528						
Limitations # 3+	0.950	0.519	0.926	0.326	2.773						
Children in the network (ref: Limitations # 2)											
Limitations # 0	0.536	0.369	0.365	0.139	2.065	0.024	43.455*	27	938.8	1132.7	9723
Limitations # 1	0.708	0.483	0.613	0.186	2.696						
Limitations # 3+	1.585	2.490	0.770	0.073	34.467						
Confidant partner in the network (ref: Limitations # Partner in)											
Limitations # No partner in the network	0.768	0.357	0.571	0.309	1.909	0.018	39.458*	23	934.8	1100.0	9723
Friends in the network (ref: Limitations # Friends in)											
Limitations # No friends in the network	1.592	0.847	0.382	0.561	4.518	0.016	39.797*	23	934.5	1099.7	9723
Contact frequency with family (ref: Limitations # Daily)											
Limitations # Never/ Rare	1.032	0.660	0.961	0.294	3.618	0.012	48.916*	29	937.0	1145.3	9719
Limitations # Every 2–4 weeks	1.160	1.033	0.868	0.203	6.645						
Limitations # About once/ week	0.380	0.363	0.312	0.058	2.476						
Limitations # Several x/ week	0.781	0.424	0.649	0.270	2.262						
Emotional closeness with network (ref: Limitations: Very/ Extremely close)											
Limitations # Not very/ Somewhat close	0.819	0.447	0.715	0.281	2.388	0.057	34.584	23	880.9	1045.8	9592

Source: SHARE Estonia Waves 4–8, 2010–2020

Notes: Each network characteristic model controls for birth cohort, origin, marital status*, number of children, education level, employment status*, everyday activity limitations*, smoking, receipt of practical support*, and giving practical support*. The models were run including both main and buffering effects together. People without activity limitations are included in the model, with all categories for this variable having a coefficient value of 1 (similarly to the reference groups).

*Time-varying variables.