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# Confidant networks, disability, and survival among the middle-aged and older population in Estonia

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RU Series B No 69

Tallinn 2020

**ISBN 978-9985-9974-9-9**

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## Abstract

Confidants form part of the social environment that may alleviate or exacerbate disablement and survival in middle and older age through provision of emotional support. By conceptualising demographic and confidant network characteristics separately, we are better equipped to estimate the main and buffering effects of confidants on survival. We analysed the role of confidants in survival by disability status of the Estonian population aged 50+ in 2010–2017 using SHARE data. Men and women living alone or with others were analysed separately with Cox proportional hazard models. We find buffering effects for more network characteristics than in case of main effects. Reverse main and buffering effects for friends among men and women emerge, i.e. having friends does not benefit survival. Larger confidant networks benefit men with everyday activity limitations, while more mixed outcomes for this indicator appear among women. Having (more) children as confidants protects women with everyday activity limitations, and having one child as a confidant protects solo men with activity limitations from dying earlier. Although a higher proportion of people living alone die over the observation period, their mortality is not significantly higher from people in other household arrangements. Potential implications are discussed.



**Keywords**

Confidant networks, main effects, buffering effects, everyday activity limitations, survival, Estonia

## 1. Introduction

Developing disabilities as well as decreasing social networks become more common with age. In the context of population ageing, it becomes increasingly important to understand how social relations and different health outcomes interact with each other in various settings. Confidant ties – i.e. people with whom emotional support is exchanged – may play a crucial role in either alleviating or enhancing the development and progression of old age disablement, and through that affect also mortality.

Having people to rely on, in emotional terms, and the type of relations and support provided are both important. Social relations may impact health either directly through physical indicators and behaviour by mediating relevant information and knowledge or through influencing the perception of a stress situation with provision of meaning, esteem, and self-efficacy. Previously, the topic has often been studied using demographic indicators as proxies for networks and (emotional) support (Litwin 1996; Stoeckel & Litwin 2013); however, these may reflect only structural characteristics of families or living arrangements. The main purpose of the paper is to understand if, how, and which confidant network characteristics support longer survival generally as well as in chronic health stress situations among middle-aged and older persons, after accounting for various demographic indicators. Since important differences in morbidity, mortality, and social ties exist between genders as well as between different household types, we study the effects separately for men and women and for those living alone *versus* living with others.

Previous studies have analysed social relations and mortality in select countries, while Eastern Europe has been completely overlooked. Relatively fast population ageing coupled with underdeveloped social services in East European countries creates a setting where understanding the role of social relations becomes even more important. Due to demographic, historical, and social aspects, people in the region may lack social relations more than in other countries. Estonia has one of the largest gender gaps in life expectancy, in favour of women. Additionally, it has one of the largest proportions in Europe of older people living alone, and a large share of older people reporting activity limitations (Eurostat 2020). Such a context makes it intriguing to elaborate the interrelations between social ties, emotional support, disability, and mortality.

## 2. Background

### 2.1. Types of Social Relations and Sources of Support

Social relations are part of the analytical concept of social network according to which individuals and groups are linked through ties; usually social networks refer to informal ties (Due et al. 1999). Specifically, we focus on close, intimate ties which refer to confidants "with whom important matters are discussed" – information about them are collected through self-reports of an anchoring respondent or ego (Marsden 1987). Confidants are so-called strong ties, e.g. family members or good friends who remain in one's network when reciprocity in relations becomes less needed (Granovetter 1973; Wenger 1997). Such ties provide different types of support, such as esteem support that can respond to a wide range of stress triggers by offering appraisal, and emotional support via valuing and accepting people with their personal faults. Additionally, they can provide informational support which can similarly respond to various stress events, unlike instrumental support and social companionships which are more specific forms of support. Informational support provides help with defining, understanding, and coping with problems by giving advice or cognitive guidance (Cohen & Willis 1985). Relationships are complex though – one and the same confidant can be perceived and reported as too demanding because of providing critique; however, such relations may have a positive impact on health (Antonucci et al. 2010).

Family members such as partners and children make up the core confidant network members of middle-aged and older people (Townsend 1955; Wenger 1997). They have usually formed across the course of life and are therefore carried through life like convoys, forming an important pool for drawing emotional support in later life (Antonucci et al. 2014). A partner is considered one of the main support resources in later life, even though most relational strain often accompanies them (Due et al. 1999). While conflicts with partners decrease with age, spousal relationship quality remains stable or decreases in later age, and with children the quality increases (Due et al. 1999; Birditt et al. 2009; Antonucci et al. 2014). Children are usually one of the main sources of different types of support in old age, but, more often, adult children are the main support recipients (Kawachi & Berkman 2001; Albertini et al. 2007; Hämäläinen & Tanskanen 2017). The number of children one has may not make much of a difference in terms of interaction intensity – older adults with a higher number of children do not communicate with them much more than those with one or two children (Townsend 1955).

Also, older adults prefer to live separately from their adult children, but nearby (Townsend 1955).

As family ties form the main network members, geographical distance is usually close and contact frequency is relatively high with them, but there are variations by age and health status. Usually, the amount of confidants, the support received, support given, and contact frequency with close ties decrease with age (Orth-Gomer & Johnson 1987; Due et al. 1999). The oldest groups of people (aged 80 and above) with a severe level of activity limitation tend to have smaller and less diverse networks, as well as lower interaction and satisfaction with them, while older people with a moderate level of activity limitation have the most abundant networks with whom contact frequency is high (Abuladze & Sakkeus 2013). These findings point to the possibility that family members mobilise to provide support in difficult times when the need arises; however, due to difficulties in reciprocating when the health status worsens, networks dwindle (Cornwell 2009; Abuladze & Sakkeus 2013; Tough et al. 2017).

The role of non-kin networks in old age might increase with time as family structures change (Broese van Groenau et al. 2013). Friends usually form the main non-kin members in a network. They can be considered as special relationships because they are not prescribed or obligatory, but rather function based on choice or mutual preferences (Thoits 1995). Friends might provide additional self-efficacy and reflection of oneself that the family members do not give or which complements the existing image of oneself and/or a situation, thus being more highly valued than family members (Antonucci et al. 2010). Theoretically, it is assumed that if relations with friends are fostered across life, they too will follow to old age as convoys (Antonucci et al. 2014). However, it has been shown that with age there are fewer friends in one's social networks than family members (Due et al. 1999).

Structural changes in networks do not necessarily imply a change in the function of relations nor in the ability to create new connections in old age (Due et al. 1999). Therefore, in addition to the social convoy model, a competing explanation of the dynamics of social relations in old age has been proposed – the socio-emotional selectivity theory. This approach suggests that older people themselves decide and choose people to communicate with – such agency in forming relationships would explain changes in network size and composition in old age, as well as decreasing relational conflicts with age and variation in preferences regarding with whom to live (Townsend 1955; Due et al. 1999; Carstensen et al. 2003).

Besides providing self-esteem and self-efficacy, support may have a negative effect in case dependence is reinforced, i.e. when dependency on another network member increases and the level of reciprocity within a relationship becomes disproportionally skewed (Kawachi & Berkman 2001). Such skewness is important to consider in understanding gender differences in the distribution and effects of social relations. Women have more confidants than men, but the reason why women's health is more affected by social networks than that of men's might be due to women being more responsive to the stress of the people surrounding them (Thoits 1995; Due et al. 1999; Kawachi & Berkman 2001). Therefore, the effect of social relations on women's health is more ambiguous compared to men, as with (abundant) informal social relations there are also more demands for women, which affects women's survival negatively (Orth-Gomer & Johnson 1987). Demands on women are mainly related to different forms of caregiving or due to taking the stress of others on their shoulders – in short, these are often contacts that take more than they give (Due et al. 1993; Thoits 1995; Due et al. 1999; Kawachi & Berkman 2001). Women have larger and more diverse networks than men across cultures; older men usually tend to have their partner as the main and only support source; therefore, not being married or widowhood affects men negatively, whereas it might be the opposite for women (Due et al. 1999; Kawachi & Berkman 2001; Abuladze & Sakkeus 2013; Antonucci et al. 2014). These may be explained by differential access to different resources, unequal support distribution, or correspondence to support needs within couples (Kawachi & Berkman 2001). Children are usually present in women's lives (Kawachi & Berkman 2001), often due to being support receivers themselves (Albertini et al. 2007; Hämäläinen & Tanskanen 2017).

### 2.2. Main and Buffering Effects of Relations on Mortality

Two theoretical models have been proposed to explain the relationship between social support and health outcomes: the main effects and the buffering effects model (Cohen & Willis 1985; Kawachi & Berkman 2001). According to the main effects hypothesis, social networks have a general direct effect on health, either through affecting the immune system and/or through health behaviour, irrespective of whether a person experiences stress or not. At its most extreme, it is expected that an increase in support will lead to increased well-being, irrespective of the level of support. The name for this model comes from the statistical "main effects".

The buffering model assumes that support buffers the experience of stress. Stress is defined either as major life events, chronic strain, or daily hassles which bring about the need to adjust

to the changed circumstances after or while experiencing stress, and the stressor generally causes an emotional reaction. Disability can be understood as a form of chronic strain. (Thoits 1995). As theorised by Verbrugge & Jette (1994), social relations form part of the social environment that could have a positive effect on the health of those with illnesses or chronic conditions, thus potentially buffering people with health conditions from earlier death. The buffering effect may function by affecting the perception of the availability of support and being able to cope with stress thanks to this perception, or through reducing the reaction to stress by surrounding people providing a solution to a problem, decreasing the perceived magnitude of stress or by facilitating healthier behaviour. This effect can be determined via interactions between the stress and the support indicators, and can therefore be estimated only for people experiencing (chronic) stress. (Cohen & Willis 1985)

The number of confidants or network size is one of the main structural indicators of support. Having a larger number of ties as well as more frequent interactions has shown a positive association with physical health and a protective effect on mortality (Berkman & Syme 1979; Sugisawa et al. 1994; Orth-Gomer & Johnson 1987; Holt-Lunstad et al. 2010; Steptoe et al. 2013; Ellwardt et al. 2015). The relationships between social relations or different forms of social integration and mortality have been shown to be independent of health status and various behaviour factors by several authors (Berkman & Syme 1979; Orth-Gomer & Johnson 1987; Kaplan et al. 1988; Sugisawa et al. 1994; Penninx et al. 1997; Bowling & Grundy 2008; Steptoe et al. 2013; Ellwardt et al. 2015). These findings confirm the main effects hypothesis and suggest that social ties have a general benefit for everyone, irrespective of their health status.

Different types of relations may have different effects on health outcomes. Spouse and children are the main support resource in old age, which has often been addressed in studies with variables such as marital status or number of children (and thus are described in the next section). When quality of relationships with either spouse or children in relation to mortality has been analysed, no main or buffering effects were found for the first, while both effects were confirmed for children (in the US). However, it was the greater negative relationship quality (i.e. more demanding) with the child that contributed to longer survival. A reverse buffering effect for people with chronic illnesses was found – lower child relationship quality was associated with shorter survival. These findings suggest that too much support can reinforce dependence, but also that lower relationship quality may exacerbate stress situations (Antonucci et al. 2010).

The association between having friends and mortality is a less-researched aspect of social relations in old age, although the role of non-kin networks in the social lives as well as health may increase with time in societies (Broese van Groenau et al. 2013). Having more (contact with) friends in addition to family members is usually characteristic of a diverse network, and can therefore benefit health and survival (Berkman & Syme 1979; Giles et al. 2005; Litwin & Shiowitz-Ezra 2006; Ellwardt et al. 2015; Ellwardt et al. 2017). However, relationship quality analysis shows that greater negative relations (i.e. more demanding) with friends had a beneficial effect on survival, while for those with chronic illnesses a reverse buffering effect was again established, i.e. close ties exacerbate stressful situations by providing insufficient or inaccurate support (Antonucci et al. 2010). The influence of relationship quality is dependent on the individual's health status in this case.

The effect of structural indicators of social networks (i.e. size or contact frequency) is usually stronger or visible in case of the main effects, whereas functional characteristics of social support (type and quality) usually appear in case of buffering effects (Cohen & Willis 1985). Some studies show that when both aspects are included, functional and perceived aspects of support matter for survival more than its structural aspects – receiving a greater deal of instrumental support increased mortality of older adults, whereas a greater deal of emotional support decreased it (Penninx et al. 1997). However, even in this case no buffering effect of coping resources was found; only the direct effects of a *lack* of coping resources on mortality was confirmed. It might be that the main effect of support on health outcomes is apparent only when people in extreme social positions are compared (e.g. social isolates vs. those with abundant support) (Cohen & Willis 1985). In case of a longer observation period for the same Dutch dataset, structural characteristics (network size and diversity) and not functional characteristics (receipt of emotional support) were associated with mortality (Ellwardt et al. 2015), confirming that main effects emerge with structural rather than functional network characteristics (Sugisawa et al. 1994; Steptoe et al. 2013; Holt-Lunstad et al. 2015).

Interactions with other people may reflect the need of the support recipient, not of the ego. Research on this topic has usually not included provision of support, although middle-aged and older adults provide more often practical, emotional, and financial support to others than they are recipients of such transfers (Albertini et al. 2007; Hämäläinen & Tanskanen 2017). Therefore, both directions of support exchange should be taken into account when studying the

role of social ties in health outcomes, as networks capture support provision as well as receipt (Thoits 1995).

Although several studies do not find that social networks have been shaped as a response to a specific health situation (e.g. Kaplan et al. 1988), the possibility of reverse causality between disability and social relations has not been ruled out by the authors completely (e.g. Penninx et al. 1997). It may be that existing illnesses have led to a contraction in social networks, which then affects survival negatively, but the onset of such a development has not been observed in these studies. Additionally, the fact that more frequent interaction often shows an association with earlier mortality (e.g. Orth-Gomer & Johnson 1987) indicates that people with an increased support need also to interact more frequently with their confidants prior to death. Therefore, it might be primarily the physical health status rather than social relations that determine the mortality outcome.

### 2.3. Socio-Demographic Differentials in Mortality

Social networks, and especially confidants in old age are connected to demographic structures and characteristics. These characteristics on the societal level as well as within families should therefore always be included in the analysis of social networks to adjust for possible differences in them. Besides a clear gender- and age-dependency of mortality, it is well known that women live longer than men in modern societies. In Estonia, the female advantage has been observed at least since the end of the 19th century (Jaadla et al. 2017). Despite women living longer, their health is usually worse than that of men – known as the "health-survival paradox" (Oksuzyan et al. 2008). The number of years spent living with functional or mobility limitations in middle and older age is usually longer by a few years among women than men (Solé-Auro & Alcaiz 2015; Deeg et al. 2018). Younger cohorts of people who have reached middle age might in some cases even show expansion of morbidity and disability compared to previous cohorts; however, educational, cognitive, and technological developments and changes counteract these (Cambois et al. 2013; Bordone et al. 2015; Deeg et al. 2018). The role of social relations in these health developments is not established yet.

Population-level analyses often show that married people have the best survival outcomes compared to other marital statuses, especially among men (Koskinen et al. 2007; Drefahl 2012). However, this association is more nuanced when actual partnership status is taken into account. In this case, never married and/or those living alone have the highest mortality risk, especially

among men, while cohabiting people do not differ from those who are married, especially among women (Koskinen et al. 2007; Drefahl 2012). Studies conceptualising partnership in terms of social support, and which usually analyse survey data, have found mixed results: the positive role of partnership/marital status was significant among men in some studies (Berkman & Syme 1979; Kaplan et al. 1988), but no significant relation was found in others (Sugisawa et al. 1994; Penninx et al. 1997; Antonucci et al. 2010). Analyses looking into relationship quality with partners have found neither main nor buffering effects in mortality (Antonucci et al. 2010). These outcomes might be explained by the fact that the adverse effects of not having a partner are less relevant with age (Penninx et al. 1997; Due et al. 1999).

Often, living arrangements (e.g. living alone or not) and/or marital status are used as the main structural indicator of social relations or support, due to lack of data on actual support exchange with different people. When "living alone" is interpreted as lack of social and/or emotional support, it may be problematic because it is possible to live alone but to have a (large) supportive network (Holt-Lunstad et al. 2015). This is especially important to consider in cultures where solitary living is more common, such as in Estonia. Along the same lines, being married is not a guarantee of having an emotionally close or supportive relationship with a partner, so equating marital status with spousal support may disregard and overlook important nuances of the relationship. Therefore, in order to estimate the effects of emotional support better, structural differences in living arrangements and partnership should be first accounted for and conceptualised separately from social network indicators.

Survival may differ also by whether one has any children and by their total number. Population-level and register-based analyses show that childless men and women have the lowest survival, with the effect being stronger among women (Doblhammer 2000; Grundy & Kravdal 2010; Kravdal et al. 2012; Barclay et al. 2016). People with two children have the best survival; however, starting from the third parity the benefit decreases, and people with four or five children have the second highest mortality after childless people (Doblhammer 2000; Grundy & Kravdal 2010; Barclay et al. 2016). Having experienced the death of a child in the past elevates mortality risks, especially among women (Drefahl 2012). Similarly to living arrangements and marital status, accounting only for the number of children one has had might not give any reference about the support exchange or quality of the relationship with the child(ren), and therefore conceptualisation of these two aspects regarding children should be separate from

each other. Studies analysing children as network members of older adults have not found them to be related to mortality (Giles et al. 2005).

Lower education might play a role in lifestyle and health behaviour differences as well as socio-economic opportunities, which in turn influence health and mortality. Socio-economic differences may explain some of the disparities in survival by partnership status among men in some countries (Grundy & Kravdal 2010; Drefahl 2012), but have been less pronounced in other contexts (Koskinen et al. 2007). Socio-economic differences in survival have been observed for both historical as well as contemporary settings in Estonia, though not always in a gradual manner (Mackenbach et al. 2008; Jaadla et al. 2017). Additionally, regional disparities in health outcomes exist – mortality has been historically higher in urban settings across industrialised European countries, including Estonia (Jaadla et al. 2017). Contemporary societies are often assumed to exhibit the opposite trend: urban populations have better survival which may be due to differential access to health services and social support, although evidence for this claim is still inconclusive (Kašpar et al. 2017, Woods 2003). Migration between different regions may be an important contributing factor to urban-rural mortality differentials, for example, due to younger, healthier people moving out of rural areas or healthier older people moving to rural areas (Riva et al. 2011).

### 2.4. The Estonian Setting

Population ageing has been developing in Estonia over the last century and more, similarly to other European countries. The share of the 50+ population in Estonia was 37.1%, 65+ comprised 17.4% by 2011, and these proportions are increasing in recent years (Statistics Estonia 2020). The ageing process has been driven by increasing life expectancy and below-replacement fertility levels. Life expectancy for women reached 82.7 and for men 74 years by 2018 – this gender gap is still one of the highest in Europe, due to one of the lowest male life expectancies. Despite the increases in life expectancy, health status (in old age) has not improved. The number of healthy life years (HLY) at birth is the third and second lowest for Estonian men and women in Europe at 52.7 and 55 years, respectively. The number of healthy life years at age 65 is similarly low, at 5.6–5.8 years in 2018, and it has not improved since 2010 (Eurostat 2020).

The reason behind low HLY is a relatively large number of people who are impaired. About 38% of the 50+ population in Estonia reported having everyday activity limitations in 2018, up

from 30% in 2010. This increases with age, at almost 70% among those aged 65 and above. Almost 40% of disabled older (65+) people report medium-level activity limitations, and the rest severe limitations. The latter group is more prevalent among women (30.9%) than men (24.7%), and it has increased more among women since 2010 (Statistics Estonia 2020, Börsch-Supan 2020).

Disparities by urban-rural residence area and origin should also be mentioned. According to the last census, life expectancy at birth was 71 years for urban men and 71.3 for rural men, 81.2 years for urban women, and 81.1 for rural women. The number of HLY expected at ages 65-69 was 5.6 for urban men and 4.8 for rural men; it was 6.5 years for urban women and 6 for rural women (Statistics Estonia 2020).

One quarter of the Estonian population is comprised of a foreign-born population – the majority being of Russian origin (Sakkeus 2007). The foreign-origin population in Estonia is characterised by earlier family formation than the native population, with an official marriage being the prevalent (first) union form, while overall migrant fertility is lower compared to natives (Rahnu 2016; Puur et al. 2017). The foreign-born population consists of larger shares of women due to higher immigration rates of women and a larger gender gap in life expectancy among migrants. The gender gap in life expectancy among migrants is around 10 years; the number of HLY at age 65 is almost two years lower for migrant women, and over a year lower for migrant men than corresponding natives (Statistics Estonia 2020). The migrants' worse health and mortality status has been explained by differential health and morbidity structures and somewhat different health behaviours (Sakkeus & Karelson 2012; Abuladze et al. 2017), despite the foreign-born population having equivalent or in some cohorts higher education levels than the natives (Sakkeus 2007). The foreign-born population in Estonia is concentrated in urban areas, with access to services, media, and education available in their own language. The migrant population aged 50-63 years in Estonia reports more ties residing further away, those who are close reside also geographically more nearby, and intergenerational family support exchange is higher than among the native population (Kiilo et al. 2016).

Living arrangements give an idea of potential sources of confidant relations. Over time, the living arrangements of middle-aged and older people in Estonia have transformed somewhat. Living alone and/or with a child/grandchild have been the most common arrangement types for women, while living with a partner has been most common among men. According to the

Estonian 2011 census, 20.8% of men and 37% of women aged 50+ lived alone, up from 16% and 33.7% four decades earlier (Herm, Abuladze & Puur, in progress). The proportion of the 50+ population living with a partner differed between men and women as well, but did not change much across time for men: 44.1% of men and 27.6% of women lived with a spouse in 2011, while the corresponding numbers were 44.2% and 23.8% in 1979. The proportion of people living with children or grandchildren increased only slightly for men, reaching 4.1%, and decreased for women to 18% in 2011 (from 3.9% for men and 22.6% for women in 1979). The living arrangements among the oldest groups – 85 years and older – showed gender differences as well. Among women, almost half (46.6%) were living alone by 2011 (up from 37.2% in 1979) and slightly over a third (35.2%) were living with a child or grandchild by the time of the most recent census, having decreased from the level of 48.1% four decades earlier. Among men in this age range, living with a partner was still the most common arrangement in 2011 (39.1%, up from 32.9% in 1979), followed by living alone (29.3% in 2011, 28.9% in 1979) and living with a child or grandchild (15.6% in 2011, down from 22.3% in 1979).

Older people in Europe have on average two people in their personal networks. Middle-aged and older people in Estonia report slightly smaller and somewhat more family-based networks than in Northern and Western Europe (Stoeckel & Litwin 2013). People with severe activity limitations in Estonia have especially small networks and low satisfaction with them (Abuladze & Sakkeus 2013). This reflects various demographic and social aspects. Having one of the highest proportions of older people living alone coupled with a large gender gap in life expectancy may deprive people of a wider range of potential emotional support sources. This is further exacerbated by the large proportion of older people living in rural areas from which children may have moved out, and access to health and social services may be more limited[1]. On the other hand, this might decrease the support burden that older people place on their adult children. Low population density[2] may not be a favourable context for creating new ties in more remote areas. Finally, socio-political measures and reforms undertaken since 2016 in Estonia to

[1] There are relatively large regional disparities in health and access to health services (Karelson 2016; Kantar Emor 2017). Also, the proportion of people in Estonia reporting unmet health care needs is one of the largest, compared to the rest of Europe; however, according to 2015 Eurostat data it was larger in cities than rural areas (Eurostat 2020)

[2] Estonian population density was 30.4 people per square kilometre in 2018, having the fifth lowest density in Europe after the Nordic countries (Eurostat 2020).

increase access to different services for the large number of disabled people may have not reached those most in need, especially in more remote areas.[3]

## 3. Research Contribution, Aim, and Questions

Despite several studies on the topic, there is still consensus lacking on the conceptualisation of social networks and their role in health outcomes and mortality. One of the most common strategies in the literature has been interchangeable use of demographic indicators as indicators of social network, relations, or support. The main purpose of the current paper is to use distinct concepts for these dimensions in order to be able to conclude more definitely about the role of social relations in health and mortality. Often, indicators of specific network members and their characteristics have not been studied separately, but in network type constructs, which does not give an idea of the relation of each network indicator with the outcome. Moreover, the role of networks and their separate characteristics in buffering health-related stress has not been studied much, especially in the context of our geographical focus. The analysis is based on the example of the middle-aged and older Estonian population, a country with some extreme indicators in ageing, and enlarging the geographical scope of the topic.

The study aims to find answers to the following main research questions:

1) How much of the survival differences are explained by demographics and to which extent by social network characteristics?

2) Which network characteristics explain survival differences by disability status among the middle-aged and older Estonian population and how?

3) Which effect – main or buffering effect of social network characteristics – emerges in the relationship between disability and mortality in the Estonian case?

4) Which effect – main or buffering effect of social network characteristics – emerges in the relationship between disability and mortality among the middle-aged and older Estonian population living alone?

## 4. Data and Methods

We use the SHARE Estonia survey data collected from 2010 to 2017 (Waves 4–7). Wave 4 was the first time the survey was carried out in Estonia. The probability sample was drawn from all people aged 50+ who resided in Estonia in the beginning of 2010 according to the national

[3] Disabled people are not satisfied with access to health care in rural areas, among several other concerns reported in 2018.

population registry, representative of age and sex of the same target population. Additionally, information on deceased people was cross-checked with information from the population registry prior to each wave. Interviewers conducted computer-based face-to-face interviews with the respondents. The individual response rates were 58% for Wave 4, 86% for Wave 5, 52% for Wave 6, and 80% for Wave 7 (Malter & Börsch-Supan 2013, 2015, 2017, Bergmann et al. 2019).

We included in the analysis people who were at least 50 years of age at the baseline and who were interviewed in 2010–2011 until their death or last interview date. Only one person from the household was included, in order to avoid overlaps with partnership and social network characteristics; however, models were also run including all household members as well as with a weighted sample (results not presented).

The analytical sample size including only main respondents was 4646 (1706 men and 2940 women), of whom 15.8% or 732 people died (332 men (19.5%) and 400 women (13.6%)) during the observation period. Ten people were excluded due to missing values on different variables. The second step of the analysis included only those living alone (337 men (24% or 81 died) and 1254 women (17.1% or 215 died)).

### 4.1. Variables

The dependent variable was time until death or last interview (in ages). Independent variables with information at the baseline were included, such as socio-demographic indicators: age, origin (born in the country or not), area of residence (urban or rural), education level (none-basic level, (post)secondary non-tertiary and tertiary), employment status (unemployed/homemaker/ill, employed and retired) and marital status (married / registered partnership, divorced/separated, never married, widowed). Area of residence was constructed based on a five-category variable from which categories of big city, suburbs of the city, a large town and a small town were grouped as "urban", and a rural area or village was grouped as "rural". This was asked from only one household member, and values had to be copied to other household members. Some missing values emerged, but these cases were kept in the models in order not to lose too many people from the analysis.

Education level categorisation was based on the ISCED classification. According to this, post-secondary non-tertiary education levels in Estonia can be grouped together into the second level

(UNESCO 2012). In addition, actual partnership status (having or not having a partner in the household), household size (1, 2 or 3+), and the number of children (0, 1, 2, 3, 4+[4]) were included. Actual partnership and marital status were not included in the models simultaneously, but they were tested separately. We present models with marital status, as it differentiates various statuses that are relevant in old age and that have been analysed in earlier studies, and which appear to have opposite outcomes among men and women. The main health status indicator was a dichotomous variable showing whether a person had any everyday activity limitations or not. This was constructed based on the validated GALI indicator (Jagger et al. 2010). Smoking was included as a health behaviour control (never smoked, former smoker, currently smoking). Dichotomous variables of receipt as well as provision of practical or personal support either from anyone inside or outside the household during the last year were included to adjust for this type of support exchange.

Confidant networks were collected using a name-generating method – respondents were asked to name up to seven people with whom important matters were discussed during the last year, irrespective of the communication mode (face-to-face, phone, etc.). Additional characteristics of the mentioned network member were also collected. Such a method elicits the closest ties of the *ego*, and can be called ego confidant networks (Marsden 1987; Stoeckel & Litwin 2013). The following social network variables were included, covering its structural, functional as well as perceived aspects. Firstly, network size (0, 1, 2, 3, 4+) and contact frequency with family members (no (family) network, (almost) daily, several times a week, seldom/never) indicate structural characteristics of one's confidant network. The presence of friends, spouse (both dichotomous), and number of children in the network (0, 1, 2+[5]) are indicators of the functional aspect of a network, as they reflect the type of relationship and potential sources for different support. Finally, the level of emotional closeness with the closest network member (not close/somewhat close or very/extremely close) indicates the qualitative aspect of the perceived intimacy of ties. All interaction models of the different characteristics control for network size.

[4] A continuous variable of the number of children one has had (0–10) was also tested, but that did not explain much of the survival differences, and possibly mixes different effects of having 0 vs. 4+ children, which has shown to be important in previous studies (Doblhammer 2000; Grundy & Kravdal 2010; Barclay et al. 2016). Also, a continuous household size variable was tested, but similarly to the children variable, it did not explain survival differences.

[5] Additionally, a variable differentiating a higher number of children (3+ or 4+) in the network was tested, but since the number of cases in these higher order groups was too small, it could not be used in survival analysis. A continuous variable might mix different aspects of having 0 vs. 3+ children, for example, which was another argument against using more detailed groups for this variable.

We also calculated an adapted version of the network diversity score following the Social Network Index in Cohen et al. (1997). As in the SHARE survey it was possible to record up to 7 confidants, we identified seven different types of possible relations with whom people communicated at least every two weeks: spouse/ex-spouse, parent/step-parent/parent-in-law, sibling, child/stepchild, other relative (child-in-law, aunt, uncle, niece, nephew, grandchild, etc.), friend/colleague, other (neighbour, therapist, clergy, housekeeper). There was a relatively low proportion of people with diverse networks (only 3.6% had three or more different types of relations), and also it did not contribute to explaining survival differences, so it was not included in the final models. Earlier, geographic distance of network members as well satisfaction level with the network was also included, but they did not explain health outcome differences.

### 4.2. Analytical Strategy

Descriptive analysis and Chi-square tests were run to characterise the distributions of those who died, disappeared, or stayed alive during the observation period. Cox proportional hazards models were run to estimate hazards of survival/mortality over the 7-year period. Using survival analysis of time-to-event data enables better disentanglement of the potential cause-and-effect events than cross-sectional data or regular regression models.

Entry age was set for everyone at age 50 in order to standardise the risk time. Since the dependent variable is used in ages, the age group is not included in the Cox models as an additional independent variable. We present models separately for men and women, first including socio-demographic and health variables, and secondly including all social network variables. Finally, interactions between the disability status and network variables are presented. According to Cohen & Willis (1985), main effects can be determined from the statistical direct effects, so these are inferred from the second set of models. Buffering effects are based on interactions and inform us about the effects of characteristics among those with everyday activity limitations – these are inferred from the third or last set of models. Every interaction model controls also for network size, except the interaction model with size itself.

## 5. Results

### 5.1. Descriptive Findings

In general, more men (19.5%) than women (13.6%) experience death during the seven-year observation period. The differences start from the 50–54-year-olds, and the doubling of mortality rates happens with every other age group (Table 1). Mortality rates by age are twice higher than in the Berkman & Syme (1979) study, reflecting higher mortality among the Estonian population. This is probably primarily because our sample is older than in the referred study (Berkman & Syme analysed people aged 30–69 over a nine-year period)[6]. Also, rates are higher in our sample than in the general population of the same age groups (Statistics Estonia 2020).

Table 1. Age-specific mortality rates per 100[7] (all causes) men and women, ages 50–103, Estonia, 2010–2017, SHARE survey

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| **Age group** | **Respondents** | **Deaths** | **% died** | **Respondents** | **Deaths** | **% died** |
| 50-54 | 336 | 20 | 6.0 | 476 | 11 | 2.3 |
| 55-59 | 313 | 30 | 9.6 | 393 | 13 | 3.3 |
| 60-64 | 288 | 40 | 13.9 | 444 | 28 | 6.3 |
| 65-69 | 241 | 43 | 17.8 | 409 | 21 | 5.1 |
| 70-74 | 242 | 66 | 27.3 | 489 | 62 | 12.7 |
| 75-79 | 175 | 67 | 38.3 | 375 | 84 | 22.4 |
| 80-84 | 84 | 46 | 54.8 | 243 | 107 | 44.0 |
| 85+ | 27 | 20 | 74.1 | 111 | 75 | 67.6 |
| Total | 1706 | 332 | 19.5 | 2940 | 401 | 13.6 |

Age-specific mortality rates are higher among those living alone (Table 2), with the differences being to the benefit of those living with other household members starting already in the age group of 50–54, especially among men.

[6] The age-specific mortality rates are similar when all persons are considered, with the proportions being slightly higher in all age groups. The total rate for men is 20.2 and for women 12.4.

[7] Age-specific mortality rates are presented here per 100 instead of the usual per 1000 people in order to be able to show the percentage of deaths as well.

Table 2. Age-specific mortality rates per 100 (all causes) men and women living alone, ages 50–103, Estonia, 2010-2017, SHARE survey

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| **Age group** | **Respondents** | **Deaths** | **% died** | **Respondents** | **Deaths** | **% died** |
| 50-54 | 57 | 6 | 10.5 | 107 | 3 | 2.8 |
| 55-59 | 54 | 10 | 18.5 | 116 | 6 | 5.2 |
| 60-64 | 70 | 13 | 18.6 | 154 | 11 | 7.1 |
| 65-69 | 42 | 8 | 19.0 | 189 | 15 | 7.9 |
| 70-74 | 48 | 11 | 22.9 | 247 | 28 | 11.3 |
| 75-79 | 41 | 15 | 36:6 | 227 | 50 | 22.0 |
| 80-84 | 17 | 12 | 70.6 | 153 | 62 | 40.5 |
| 85+ | 8 | 6 | 75.0 | 64 | 40 | 62.5 |
| Total | 337 | 81 | 24.0 | 1257 | 215 | 17.1 |

In general, there are slightly more women in older ages, secondary and tertiary education groups, among the foreign-origin population group, and in urban residence areas who are retired and have everyday activity limitations compared to men. Also, more women (57.8%) than men (24.3%) are living without a partner, are widowed (34.7%) or divorced/separated (18.3%), report having a lower number of children, and more often living alone, and more women have received (28.7%) as well as given personal or practical help (27.3%) than men (20.3% and 25.4%, respectively).

Living alone is more prevalent among women (42.8%) than men (19.8%). Our sample includes more women living alone than was the case in the general 50+ population in 2011 (37%). Also, among those aged 85 and older, 61.1% of women in our sample lived alone, while in the general population the proportion was again lower (48%). In the case of men, the proportion of those living alone in our sample resembled the general population[8].

Among men, there are more without any confidants (6%) than among women (3.6%), and, correspondingly, women have a larger network size. More men also have no children as confidants (58.2%) compared to women (41.9%). Women also report a higher number of children as confidants, more often do not have a partner in the network (12.2% among women

[8] Among the 50+ population, 19.8% of men lived alone according to our sample (vs. the general population: 20.8%). Among the 85+ population, 30% of men lived alone according to our sample (vs. the general population: 29%). When analysing all household members, the proportions of solo dwellers were smaller for both women and men than in the general population, and solo men were underrepresented, whereas solo women remained overrepresented in our sample.

vs. 8.1% among men), but report friends in the network (33% vs. 18.3% among men), have lower contact frequency with confidants, and slightly more of them report higher emotional closeness with confidants (86.6% vs. 82.8% among men)[9]. There are significant differences in the distribution of deaths in most of the variables, except for the residence area (among men and women), origin, and number of children in networks (among men). The proportion of deaths is larger among people with a lower network size – this holds for both men and women, those living with someone else, as well as for those living alone.

Among those living alone, the proportion of men without any confidants is almost three times higher (15.5%) than among women (5.4%)[10]. However, there are no significant differences between different categories of network size in experiencing death among men. In general, there are fewer variables with significant differences in the distribution of deaths among men than variables without differences. Differences exist by age, education, employment status, everyday activity limitations, receipt of help, giving help, and emotional closeness with confidants. Among women, significant differences exist in almost all variables, except for the residence area and contact frequency with family members. Distributions between all variables and experiencing death are shown in Table 3, and for those living alone in Table 4 (Appendix).

### 5.2. All Living Arrangements

#### 5.2.1 Findings for Men

Men with up to basic education who were unemployed / stayed at home (incl. due to illness), those who were divorced/separated or never married, and current smokers had significantly higher mortality than corresponding reference groups (Table 5)[11]. Additionally, retired men had significantly lower mortality (HR 0.39, 95% CI 0.26–0.56) than those employed. After adding social network characteristics, the significant associations for divorced/ separated and currently smoking men disappeared.

[9] Among men with network members, the majority report partner as a confidant (73.4%), and less report children (26.8%) and friends (18.3%). Among women with network members, children are reported in 39.5% of the cases, partner in 33.7% and friends in 33% of the cases.

[10] Among solo men with network members, friends are reported most often as confidants (38.8%), followed by friends (25.2%) and partner (8.7%). Among solo women with network members, children are most common (40.4%) as well as friends (38%) and finally a partner (1.3%).

[11] Models using the partnership variable instead of marital status indicated that men without a partner in the household had 37–70% higher mortality than men living with a partner, but it was not statistically significant.

Main effects can be observed for only one social network characteristic among men – the existence of friends in the confidant network. The fact that those who do not report close friends in their network have significantly lower mortality (HR 0.59, 95% CI 0.40–0.89) than those who have friends is an indication of reverse direction of the main effect. Support in terms of having friends does not help with surviving longer, but rather has the opposite, detrimental effect – this is valid for all, irrespective of their health situation. However, reverse buffering effects for the same variable are also found. Men with everyday activity limitations and no friends have significantly lower hazard (HR 0.53, 95% CI 0.35–0.79) of dying over the observation period than men with activity limitations and friends as confidants. While the same reverse buffering effects are seen also with weighted samples, main effects for men in weighted samples do not appear.

Interaction effects also point to another buffering outcome. Network size buffers mortality among men with everyday activity limitations – especially when comparing those with no confidants to those with two or more confidants (HR 1.88, 95% CI 1.12–3.18). The same outcome appears in weighted sample analysis. Buffering effects of contact frequency with family members emerge in an expected direction – men with no family or no contact with family members have a significantly higher mortality hazard than those with (almost) daily contact (HR 1.77, 95% CI 1.03–3.07). Although the direction of the effect for this indicator is similar in weighted sample analysis, the differences are not significant.

### 5.2.2 Findings for women

Despite descriptive analysis showing that the share of deaths is highest among the widowed (21.9%), survival analysis does not confirm this group's higher mortality among women. Widowed as well as divorced/separated women have a significantly lower mortality hazard (HR 0.46, 95% CI 0.33–0.65 and HR 0.60, 95% CI 0.39–0.91) compared to those married/partnered (Table 6)[12]. Similar directions, though non-significant, remain in the next model after including social network variables. This suggests that social interaction differences between people in various marital status groups explain mortality differentials to some extent. However, the average age at death for those married is 10 years younger than for those widowed (63 vs. 73), which indicates a selection bias. Those widowed have been simply older than those

[12] A similar outcome emerged when including the variable of partnership instead of marital status – women without a partner in the household indicated significantly better survival than women living with a partner (HR 0.44, 95% CI 0.31 – 0.62).

married/partnered, and the finding may not be necessarily interpreted as widowed people having an advantage in survival over those married/partnered, but rather as an effect of age structure differences not fully taken into account in the model. Women with no children indicate a significantly lower mortality hazard (HR 0.50, 95% CI 0.32–0.78) than women with two children (also in weighted sample). This finding is similar to men, but the effect is even stronger.

Main effects for survival can be found for two network variables. Firstly, women with two confidants have higher mortality than people with all other network size categories, but especially compared to those with three and four or more confidants (HR 0.66, 95% CI 0.47–0.94 and 0.60, 95% CI 0.40–0.89). This confirms partly the expectation that more support is beneficial for health, at least for women, irrespective of the current health status. However, the fact that women with 0 (and 1) confidants showed also lower mortality hazard than those with two confidants, even though the significance level is weak or missing, suggests that there are multiple dynamics happening. It is likely that some of the closest confidants (one or two) mobilise when the need arises, i.e. before death.

Similarly to men, reverse main and buffering effects for the existence of friends in the network is found for survival – women with no friends as confidants have significantly lower mortality (HR 0.64, 95% CI 0.47–0.88) than those who report having friends in the network. Also, women with everyday activity limitations and no friends have a lower mortality hazard (HR 0.63, 95% CI 0.46–0.85) than those with limitations and friends in the network. Similar findings emerge in weighted analysis as well.

Additional buffering effects are confirmed for network size and the number of children in the network. In the case of the first characteristic, buffering outcome can be observed for women with everyday activity limitations who report having four or more confidants (HR 0.61, 95% CI 0.40–0.91) in comparison to those with two confidants. However, it is rather weak evidence of a buffering effect: firstly, due a moderate significance level ($p = 0.016$); and secondly, because women with no confidants also indicate a lower mortality hazard (HR 0.87, 95% CI 0.55–1.39) and those with one confidant indicate a higher one (HR 1.09, 95% CI 0.82–1.43) than those with two confidants. The latter differences are not statistically significant though. Again, there are likely multiple dynamics at play with women's networks.

Regarding the number of children in the network, a buffering gradient appears. Women with everyday activity limitations and no children as confidants have the highest mortality (HR 1.12, 95% CI 0.83–1.52), while those with two or more confidant children have the lowest mortality (HR 0.63, 95% CI 0.45–0.96). Only the latter group is significantly different from women with everyday activity limitations and one child as a confidant.

### 5.3. Living Alone

#### 5.3.1 Findings for Men

Among men, those of foreign-born origin who are unemployed or at home (including on sick leave) and current smokers have a significantly higher mortality hazard (Table 7). Emerging differences by origin are somewhat surprising, as there were no significant differences in the distribution of deaths by origin among men, although a higher proportion (25%) of native-born men died over the 7-year period than among the foreign-born men (20.3%). Higher mortality hazard for foreign-born men increases slightly also after including social network variables (the same in weighted sample analysis).

No main effects of social network variables were found for men. Buffering effects were found for the number of children as confidants. Men with everyday activity limitations and with no children as confidants indicated a significantly higher mortality (HR 2.16, 95% CI 1.02–4.61) than those with one child as a confidant. Men with two or more children in the network had a higher mortality as well, though it was not significantly different. This hints again to a possibility that interaction with children increases when the need arises, i.e. before death. Similar findings were confirmed in weighted samples.

#### 5.3.2 Findings for Women

Foreign-origin women had significantly lower mortality than native women (HR 0.72, 95% CI 0.52–0.99), corresponding to a larger share of deaths among foreign-origin solo women dwellers (20.9%) than native women (15.9%). The direction of the effect remained the same, but the significance level disappeared after including social network variables. Although the direction of the effect was the same in weighted sample analysis, mortality differences by origin were not significant. Women with no children indicated a significantly lower mortality hazard (HR 0.37, 95% CI 0.21–0.65) compared to women with two children. In fact, mortality hazard increased with each parity, being highest for those with four or more children (although non-significant). The same outcome emerged in weighted analysis.

Neither main nor buffering effects of social network variables were found for solo women's mortality.

## 6. Discussion

Expansion of morbidity in ageing societies is a likely future scenario which has created the need to understand the factors contributing to or alleviating disablement and mortality. Social relations form part of the wider social environment, which may alleviate or exacerbate the disablement process (Verbrugge & Jette 1994). This paper combines demographic and sociological knowledge on health and mortality, exploring the role of social relations in survival. Demographers usually do not study relationships, but strictly family compositions, while social relations have often been researched using demographic indicators due to lack of more suitable data (Litwin 1996; Stoeckel & Litwin 2013). By conceptualising confidant ties and objective demographic indicators separately, this paper contributes to the study of the main and buffering effects of confidant relations on mortality. These effects have not been studied usually based on core confidant networks. Also, the question whether social ties can protect from adverse health outcomes by soothing stress situations, is under-researched in the Eastern European context.

Although demographic characteristics contributed more to the explanation of general mortality differences than social network characteristics in our analysis, the latter still had some effects and are therefore relevant in studying health and mortality developments. For example, some of the mortality differences among men and women with different partnership and marital statuses were explained by differences in social network characteristics. Among both men and women smoking, employment and marital status explained the most of the mortality differences, among women living alone the number of children explained more than the marital status did. Other demographic variables explained differences to a smaller extent. Although more people living alone died during the observation period, mortality differences between solo dwellers and others did not reach statistical significance. Since our sample overrepresented women living alone compared to the general 50+ population, it is possible that different outcomes would emerge from a total population analysis. In general, women living alone showed to be significantly older and men to be younger on average than corresponding groups in other household types, which suggests possibly that some selection bias occurred in terms of who responded to the survey in the first place.

Similar to other international findings, gender differences in morbidity, mortality, and confidant networks emerged. Slightly more women (61.3%) than men (57.8%) report having everyday activity limitations, while the mortality rate is higher among men (19.5%) than women (13.6%). Solo dwellers, especially men, have the highest mortality (24%), despite being younger on average. Middle-aged and older women have larger and more diverse confidant networks than men in Estonia, while more men report not having any confidants, especially when living alone. These outcomes emerge irrespective of the fact that more women are divorced, separated, widowed, and living without a partner, confirming previous findings that men rely on their partner, while women interact with a wider circle of people (Due et al. 1999). The larger role of social networks in mortality for women than men is also confirmed by the fact that demographic variables explained more of the male mortality differences than for women, while social network characteristics explained more of the female mortality differences than for men. The same held also for those living alone. Main and buffering effects with both structural as well as functional network characteristics were found.

The expectation that more emotional support is beneficial for longer survival was confirmed partly, with some caveats. Most detrimental consequences of not having any confidants or contact with them emerged for men (in all household types) who have everyday activity limitations. This group is most vulnerable in case of smaller confidant networks, especially when not having any close people to rely on – a result in line with previous findings (Litwin 2011; Abuladze & Sakkeus 2013). For men with everyday activity limitations, having two or more confidants and daily contact frequency with family members protect them from dying earlier. Also, the vulnerability is not a result of or related to living alone, but the lack of emotional support confidant(s). Such an outcome emerges possibly because the group of men with no confidants is a very small (n=33) and thus a selective one. Similar findings have been previously observed when people in extreme positions are compared (Cohen & Willis 1985); thus, the findings may not necessarily be interpreted substantially and should be tested further.

The dynamics are slightly different for women: larger networks starting from three or four members protect them from mortality in general as well as in chronic stress situations. Having two confidants in the network actually raises mortality risk; however, the fact that women with zero confidants showed lower mortality hazards (although not significant) suggests that there are multiple mechanisms occurring. Firstly, since women are usually care and support providers

themselves, performing emotional work for another close person in need might have a detrimental effect on women's health. That is why we observe the highest mortality among women with two confidants, whereas it is lower for both those with no as well as abundant confidants. A similar direction of the effects can be seen for men living alone – among them mortality is highest for those with two confidants (although not significant) while among women living alone the effects are more mixed. Alternatively, since we have not observed the onset of disability in this analysis, we cannot eliminate the possibility that the closest confidants have mobilised because the need for emotional support had already increased earlier. This may have happened at the initiative of the ego or the confidant. Previously, it has also been found that people with no confidants and lower contact frequency with their closest people are healthy, which does not call for the need to have close family and friends around (Abuladze & Sakkeus 2013). Similarly, keeping in touch with a larger set of confidants is more common among women in circumstances needing less reciprocity and when one is better equipped to provide support to others. The finding that women with no as well as abundant confidants survive longer might also support the socioemotional selectivity theory, which states that people reaching old age choose their companions more carefully and regulate their emotional lives more successfully (Carstensen 2003). However, to confirm the hypothesis, these associations would have to be studied more thoroughly in further studies.

Fewer people report friends as their confidants than partner and children, especially among men in all household arrangements. An unexpected finding – but a result which held for both men and women – was that significant reverse main and buffering effects emerged according to whether one has or does not have friends as confidants. Having friends is interpreted as a functional emotional support indicator similarly to the number of children in the network, because it potentially represents a different support source and type, and also because network size was adjusted for. However, both main and buffering effects were in the opposite direction than expected based on the theoretical hypothesis, i.e. more support (having friends) resulted in worse survival outcomes. It is possible that close friends mobilise only when the need for emotional support is so great that all they can do is "be there" at the end of the person's life. Alternatively, close friends exacerbate the stress situation, as has been found earlier for the US (Antonucci et al. 2010). This might happen either because of the mismatch between the type of support friends (can) provide and the type of support the older person actually needs, or due to lack of knowledge and skills in providing the needed support. When more detailed characteristics of friendships in mid- and old age have been available, it has been found that it is

the lower positive quality (i.e. wanting to help, feeling supported and encouraged, etc.) of the relationship with friends that explains such a *reverse* buffering effect (Antonucci et al. 2010). If friends will become more important in personal networks over time, the relationship dynamics and quality should be researched more attentively. Possibly, awareness of emotional support exchange has to be risen in the future to avoid the negative effect of friendships on health.

People with no children have the lowest mortality risk, being significantly lower among women – a finding which holds also in analyses with weighted samples. Those women who have (borne) four children or more have the highest mortality risk, although not significant, but the direction of the result is in line with international findings elsewhere (Doblhammer 2000; Grundy & Kravdal 2010; Barclay et al. 2016). In stress situations, middle-aged and older women benefit in terms of emotional support from having (more) children in the network. A gradual buffering effect emerged: women with everyday activity limitations and higher number of children as confidants had significantly lower mortality than those with no or one child in the network. The protective effect in stress situations really kicks in with two or more children in the network. Thus, a larger pool of children as confidants enables exchange of different types of advice and emotional support, as well as sharing support tasks among several children. This result is not dependent on how many confidants or children one has (had), as these differences were adjusted for. Therefore, the outcome in this case can be interpreted as a functional aspect of support exchanged through relations with children. Despite a larger proportion of men reporting more children than women, mothers have been more successful in maintaining relations with children over time, so that these relations protect them from dying earlier.

The fact that the general indicator of the number of children and the network indicator of the number of children as confidants show different results suggests that there are (almost) opposite mechanisms captured with either of these variables. It may be that the more children one has given birth to (corresponding to the first measure), the more health or socio-economic strains one has experienced, and ultimately this relates to earlier mortality. This measure is therefore a poor indicator of actual (emotional) support exchanged between an adult child and their parents, and the number of children one reports as confidants suits better for that purpose.

Population-level circumstances likely explain the importance of children in women's lives in Estonia. Women reaching old age in Estonia do not have a partner to rely on for emotional support due to the large gender gap in life expectancy. Additionally, as our findings show,

confidant friends do not provide the necessary support. Therefore, children form the main available relation in old age to turn to when in need, but also – as mothers are the sole living parent – adult children have the possibility to turn only to them. Additionally, there do appear some differences in the effects of the spousal relationship role – although not significant, men *without* a partner and women *with* a partner in the network indicate slightly higher mortality (than men with or women without a partner). Therefore, some signs of uneven distribution of the emotional care burden are visible: partners drain women but benefit men, and such unevenness indicates somewhat opposite mortality effects for men and women. However, as the mortality differences are not as strong as reported elsewhere (Due et al. 1999; Kawachi & Berkman 2001; Antonucci et al. 2014), this assumption should be studied further.

Although the majority of solo men do not have children as confidants, men with everyday activity limitations who report one child in the network are protected from dying earlier. Therefore separating from a partner is somewhat substituted with emotional support exchange with children among men.

### 6.1. Limitations and Strengths

Firstly, there are possible sample biases and selection issues to consider. In our sample, women living alone are overrepresented, compared to the general 50+ population in Estonia. Therefore, the findings by household type or for the group of those living alone might differ if the sample were more representative of the general population in terms of living arrangements. Additionally, although death information was complemented by data from the population registry prior to each wave, it is possible that the most recent deaths have been undercounted. The first survey wave in Estonia (2010–2011) was carried out mostly among the community-dwelling population, and very few people living in institutional settings were included. Even though the proportion of the institutionalised population is relatively small in Estonia, it is possible that people with more severe health conditions are underrepresented in our sample. Higher age-specific mortality rates in our sample compared to the same age groups in the general population suggests that we have had a more selective sample.

Secondly, the SHARE survey collects ego network data, not complete network information. Although the sample selection is usually based on important characteristics of the general population, the survey has not been sampled specifically to be representative of the distribution

of social networks in a population. Therefore, in addition to population distribution bias there might exist a potential bias in social network information.

Exploring the role of social relations in survival with time-to-event data has enabled us to understand the possible dynamics better than cross-sectional analysis. Such an approach can be considered as the minimum setting in which causal relations may be studied – the potential cause and effect are set on a temporal axis and are thus easier to identify. However, social relations (and health status) are not fixed in time. Since we have not observed the development of confidant ties in relation to disablement dynamics, it is still plausible that causal relationships have not been completely uncovered in our analysis. The first onset of impairment might have occurred before our observation period, which may have led to a deterioration of some of the networks by the time of the baseline survey wave. Also, we have now included network data only at the baseline time point and have not taken into account potential change in networks as well as in health status over time. Important changes and dynamics in both processes occur in mid- and old age, as has been shown elsewhere (Cornwell & Laumann 2015), and should be analysed in-depth in future studies.

The current study is the first to estimate main and buffering effects of confidant networks on mortality based on an Eastern European setting. We have used a large enough sample representative of the 50+ population in Estonia that has enabled us to study these effects also in smaller sub-groups. Adjusting for demographic factors, we find more buffering effects than main effects of networks, indicating that emotional support is one of the relevant factors in protecting against earlier mortality, but also bearing some negative effects.

**Acknowledgements**

The preparation of this study was supported by grant PRG71 from the Estonian Research Council.

Until July 2011, Survey of Health, Ageing and Retirement in Europe (SHARE) was reviewed and approved by the Ethics Committee of the University of Mannheim. Since then, the Ethics Council of the Max Planck Society for the Advancement of Science (MPG) is responsible for ethical reviews and the approval of the study.

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## Appendix

**Table 3. Distribution of deaths by all variables in the analytical sample, Estonia, SHARE 2011**

| | | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | N (died) | % (died) | N (total) | p | N (died) | % (died) | N (total) | p |
| Age | 50-64 | 90 | 9,6 | 937 | 0.000 | 52 | 4,0 | 1313 | 0.000 |
| | 65-79 | 176 | 26,8 | 658 | | 167 | 13,1 | 1273 | |
| | 80+ | 66 | 59,5 | 111 | | 182 | 51,4 | 354 | |
| Education | None-Basic | 180 | 31,3 | 575 | 0.000 | 216 | 23,4 | 925 | 0.000 |
| | Secondary | 107 | 13,6 | 788 | | 137 | 9,9 | 1383 | |
| | Tertiary | 45 | 13,1 | 343 | | 48 | 7,6 | 632 | |
| Origin | Born in Estonia | 240 | 18,6 | 1294 | 0.091 | 270 | 12,5 | 2155 | 0.004 |
| | Foreign-born | 92 | 22,3 | 412 | | 131 | 16,7 | 785 | |
| Area | Urban | 212 | 19,9 | 1063 | | 271 | 13,7 | 1983 | |
| | Rural | 103 | 19,3 | 535 | | 106 | 14,2 | 748 | |
| | Missing | 17 | 15,7 | 108 | 0.569 | 24 | 11,5 | 209 | 0.605 |
| Employment | Unemployed/home/ ill | 38 | 16,2 | 235 | 0.000 | 23 | 9,5 | 243 | 0.000 |
| | Retired | 250 | 30,2 | 829 | | 358 | 19,9 | 1796 | |
| | Employed | 44 | 6,9 | 642 | | 20 | 2,2 | 901 | |
| Everyday activity limitations | No limitations | 78 | 10,8 | 720 | 0.000 | 79 | 7,0 | 1137 | 0.000 |
| | With limitations | 254 | 25,8 | 986 | | 322 | 17,9 | 1803 | |
| Partner in household | Yes | 231 | 17,9 | 1291 | 0.004 | 98 | 7,9 | 1240 | 0.000 |
| | No | 101 | 24,3 | 415 | | 303 | 17,8 | 1700 | |
| Marital status | Partnered | 219 | 18,7 | 1172 | 0.005 | 90 | 8,1 | 1109 | 0.000 |
| | Divorced/ Separated | 38 | 16,0 | 238 | | 42 | 7,8 | 539 | |
| | Never married | 34 | 21,4 | 159 | | 44 | 16,7 | 263 | |
| | Widowed | 41 | 30,4 | 135 | | 224 | 21,9 | 1021 | |
| | Missing | | | | | 0 | 0,0 | 1 | |
| No. of children | 0 | 44 | 26,7 | 165 | 0.000 | 54 | 17,1 | 315 | 0.000 |
| | 1 | 89 | 24,1 | 369 | | 144 | 17,8 | 810 | |
| | 2 | 135 | 19,1 | 706 | | 130 | 11,1 | 1176 | |
| | 3 | 39 | 13,7 | 285 | | 48 | 11,3 | 425 | |
| | 4+ | 25 | 13,8 | 181 | | 25 | 11,7 | 214 | |
| Household size | 1 | 81 | 24,0 | 337 | 0.000 | 215 | 17,1 | 1257 | 0.000 |
| | 2 | 215 | 21,6 | 996 | | 136 | 11,1 | 1229 | |
| | 3+ | 36 | 9,7 | 373 | | 50 | 11,0 | 454 | |
| Receipt of help | No help received | 194 | 15,2 | 1278 | 0.000 | 199 | 9,7 | 2059 | 0.000 |
| | Received help | 126 | 36,3 | 347 | | 200 | 23,7 | 844 | |
| | Missing | 12 | 14,8 | 81 | | 2 | 5,4 | 37 | |
| Giving help | No help given | 280 | 22.01 | 1272 | 0.000 | 349 | 16.33 | 2137 | 0.000 |
| | Gave help | 52 | 11.98 | 434 | | 52 | 6.48 | 803 | |
| Network size | 0 | 33 | 32,0 | 103 | 0.000 | 32 | 30,5 | 105 | 0.000 |
| | 1 | 141 | 21,9 | 645 | | 139 | 18,3 | 760 | |
| | 2 | 83 | 19,6 | 423 | | 132 | 16,3 | 812 | |
| | 3 | 44 | 15,2 | 290 | | 53 | 8,6 | 616 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 4+ | 31 | 12,7 | 245 | | 45 | 7,0 | 647 | |
| No. of children in network | 0 | 196 | 19,8 | 992 | 0.087 | 166 | 15,0 | 1109 | 0.000 |
| | 1 | 93 | 21,7 | 429 | | 172 | 15,4 | 1120 | |
| | 2+ | 43 | 15,1 | 285 | | 63 | 8,9 | 711 | |
| Partner in network | No partner in nw | 27 | 19,4 | 139 | 0.002 | 26 | 7,3 | 358 | 0.000 |
| | Partner in nw | 205 | 17,4 | 1177 | | 73 | 7,6 | 956 | |
| | No partner | 67 | 23,4 | 286 | | 270 | 17,8 | 1521 | |
| | No network | 33 | 32,0 | 103 | | 32 | 30,5 | 105 | |
| | Missing | 0 | 0,0 | 1 | | | | | |
| Friends in network | No network | 33 | 32,0 | 103 | 0.003 | 32 | 30,5 | 105 | 0.000 |
| | No friend in nw | 250 | 19,1 | 1310 | | 277 | 14,6 | 1899 | |
| | Friend in nw | 49 | 16,7 | 293 | | 92 | 9,8 | 936 | |
| Contac frequency with family | No (family) network | 61 | 29,2 | 209 | 0.001 | 75 | 18,8 | 399 | 0.011 |
| | Daily- Often | 173 | 18,2 | 950 | | 167 | 12,4 | 1345 | |
| | Several times a week/ month | 73 | 16,8 | 434 | | 121 | 12,7 | 956 | |
| | Seldom/ Never | 25 | 22,1 | 113 | | 38 | 16,0 | 237 | |
| | Missing | | | | | 0 | 0,0 | 3 | |
| Emotional closeness with network | No network | 33 | 32,0 | 103 | 0.000 | 32 | 30,5 | 105 | 0.000 |
| | Not very/ Somewhat close | 50 | 26,3 | 190 | | 49 | 17,4 | 281 | |
| | Very/ Extremely close | 249 | 17,6 | 1412 | | 319 | 12,5 | 2547 | |
| | Missing | 0 | 0,0 | 1 | | 1 | 14,3 | 7 | |
| Smoking | Never smoked | 76 | 16.14 | 471 | 0.197 | 323 | 15.02 | 2151 | 0.000 |
| | Former smoker | 140 | 20.62 | 679 | | 41 | 9.93 | 413 | |
| | Current smoker | 115 | 20.95 | 549 | | 32 | 8.89 | 360 | |
| | Mising | 1 | 20.00 | 5 | | 4 | 44.44 | 9 | |
| Total | | | | 1706 | | | | 2940 | |

**Table 4. Distribution of deaths by all variables in the analytical sample, living alone, Estonia, SHARE 2011**

| | | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | N (died) | % (died) | N (total) | p | N (died) | % (died) | N (total) | p |
| Age | 50-64 | 29 | 16,0 | 181 | 0.000 | 20 | 5,3 | 376 | 0.000 |
| | 65-79 | 34 | 26,0 | 131 | | 93 | 14,0 | 663 | |
| | 80+ | 18 | 72,0 | 25 | | 101 | 46,8 | 216 | |
| Education | None-Basic | 44 | 31,9 | 138 | 0.016 | 116 | 25,0 | 465 | 0.000 |
| | Secondary | 28 | 19,7 | 142 | | 79 | 14,3 | 552 | |
| | Tertiary | 9 | 15,8 | 57 | | 19 | 8,0 | 238 | |
| Origin | Born in Estonia | 67 | 25,0 | 268 | 0.414 | 141 | 15,6 | 905 | 0.026 |
| | Foreign-born | 14 | 20,3 | 69 | | 73 | 20,9 | 350 | |
| Area | Urban | 49 | 24,8 | 198 | 0.477 | 148 | 16,7 | 884 | 0.840 |
| | Rural | 24 | 21,1 | 114 | | 51 | 18,2 | 280 | |
| | Missing | 8 | 32,0 | 25 | | 15 | 16,5 | 91 | |
| Employment | Unemployed/home/ ill | 18 | 25,0 | 72 | 0.000 | 12 | 15,0 | 80 | 0.000 |
| | Retired | 58 | 32,6 | 178 | | 193 | 21,8 | 886 | |
| | Employed | 5 | 5,8 | 87 | | 9 | 3,1 | 289 | |
| Everyday activity limitations | No limitations | 22 | 15,4 | 143 | 0.001 | 44 | 9,7 | 452 | 0.000 |
| | With limitations | 59 | 30,4 | 194 | | 170 | 21,2 | 803 | |
| Marital status | Partnered | 2 | 11,8 | 17 | 0.125 | 1 | 10,0 | 10 | 0.000 |
| | Divorced/ Separated | 26 | 20,6 | 126 | | 26 | 7,7 | 339 | |
| | Never married | 20 | 22,2 | 90 | | 32 | 18,6 | 172 | |
| | Widowed | 33 | 31,7 | 104 | | 155 | 21,2 | 733 | |
| | Missing | | | | | 0 | 0,0 | 1 | |
| No. of children | 0 | 54 | 25,0 | 216 | 0.790 | 97 | 19,1 | 507 | 0.015 |
| | 1 | 17 | 23,6 | 72 | | 87 | 18,1 | 480 | |
| | 2+ | 10 | 20,4 | 49 | | 30 | 11,2 | 268 | |
| Receipt of help | No help received | 51 | 20,0 | 255 | 0.002 | 97 | 12,1 | 802 | 0.000 |
| | Received help | 30 | 36,6 | 82 | | 116 | 25,8 | 450 | |
| | Missing | | | | | 1 | 33,3 | 3 | |
| Giving help | No help given | 67 | 27.13 | 247 | 0.028 | 193 | 19.40 | 995 | 0.000 |
| | Gave help | 14 | 15.56 | 90 | | 22 | 8.40 | 262 | |
| Network size | 0 | 16 | 31,4 | 51 | 0.069 | 21 | 30,9 | 68 | 0.000 |
| | 1 | 33 | 27,7 | 119 | | 81 | 22,6 | 359 | |
| | 2 | 20 | 22,5 | 89 | | 61 | 17,4 | 350 | |
| | 3 | 10 | 22,7 | 44 | | 31 | 12,2 | 255 | |
| | 4+ | 2 | 5,9 | 34 | | 20 | 9,0 | 223 | |
| No. of children in network | 0 | 54 | 25,0 | 216 | 0.790 | 97 | 19,1 | 507 | 0.015 |
| | 1 | 17 | 23,6 | 72 | | 87 | 18,1 | 480 | |
| | 2+ | 10 | 20,4 | 49 | | 30 | 11,2 | 268 | |
| Partner in network | No partner in nw | 5 | 15,6 | 32 | 0.302 | 1 | 1,9 | 52 | 0.000 |
| | Partner in nw | 4 | 16,0 | 25 | | 1 | 6,3 | 16 | |
| | No partner | 56 | 24,5 | 229 | | 191 | 17,1 | 1119 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | No network | 16 | 31,4 | 51 | | 21 | 30,9 | 68 | |
| Friends in network | No network | 16 | 31,4 | 51 | 0.201 | 21 | 30,9 | 68 | 0.000 |
| | No friend in nw | 44 | 25,1 | 175 | | 139 | 18,9 | 736 | |
| | Friend in nw | 21 | 18,9 | 111 | | 54 | 12,0 | 451 | |
| Contac frequency with family | No (family) network | 38 | 29,9 | 127 | 0.077 | 54 | 21,4 | 252 | 0.161 |
| | Daily- Often | 10 | 24,4 | 41 | | 53 | 15,2 | 349 | |
| | Several times a week/ month | 16 | 15,4 | 104 | | 79 | 15,7 | 503 | |
| | Seldom/ Never | 17 | 26,2 | 65 | | 28 | 18,5 | 151 | |
| Emotional closeness with network | No network | 16 | 31,4 | 51 | 0.000 | 21 | 30,9 | 68 | 0.006 |
| | Not very/ Somewhat close | 32 | 36,8 | 87 | | 29 | 18,4 | 158 | |
| | Very/ Extremely close | 33 | 16,6 | 199 | | 164 | 15,9 | 1029 | |
| Smoking | Never smoked | 17 | 17.53 | 97 | 0.276 | 179 | 18.74 | 955 | 0.001 |
| | Former smoker | 31 | 27.43 | 113 | | 17 | 9.77 | 174 | |
| | Current smoker | 32 | 25.60 | 125 | | 14 | 11.86 | 118 | |
| | Missing | 1 | 50 | 2 | | 4 | 50 | 8 | |
| Total | | | | 337 | | | | 1255 | |

**Table 5. Mortality hazard ratios from Cox proportional hazards models for men living in all household types (N = 1699), SHARE 2010-2017**

| | Model 1 | | Model 2 | | Models 3 | | | |
|---|---|---|---|---|---|---|---|---|
| | HR (95% CI) | SE | HR (95% CI) | SE | | | HR (95% CI) | SE |
| Foreign-Born (ref: Native) | 1,2 (0,93-1,55) | 0,157 | 1,19 (0,92-1,56) | 0,16 | **Model 3a: Network size** | | | |
| Residence area (ref: Urban) | | | | | ref: With limitations#2 members | No limitations#0 members | 1,36 (0,68-2,72) | 0,48 |
| n/a | 1,28 (0,75-2,19) | 0,350 | 1,14 (0,66-1,98) | 0,32 | | No limitations#1 member | 0,98 (0,61-1,56) | 0,23 |
| Rural | 1,00 (0,77-1,31) | 0,135 | 1,06 (0,81-1,38) | 0,14 | | No limitations#2 members | 0,81 (0,46-1,44) | 0,24 |
| Education (ref: Tertiary) | | | | | | No limitations#3 members | 0,93 (0,44-2,00) | 0,36 |
| None-Basic | 1,44 (1,01-2,04) * | 0,258 | 1,48 (1,03-2,13) * | 0,27 | | No limitations#4+ members | 0,62 (0,31-1,24) | 0,22 |
| Secondary | 1,30 (0,90-1,86) | 0,240 | 1,36 (0,94-1,98) | 0,26 | | With limitations#0 members | 1,88 (1,12-3,18) ** | 0,50 |
| Employment status (ref: Employed) | | | | | | With limitations#1 member | 1,02 (0,74-1,42) | 0,17 |
| Not working, home, ill, etc. | 3,28 (2,00-5,39) *** | 0,830 | 3,26 (1,95-5,45) *** | 0,85 | | Wtih limitations#3 members | 0,90 (0,58-1,37) | 0,19 |
| Retired | 0,39 (0,26-0,56) *** | 0,074 | 0,37 (0,25-0,54) *** | 0,07 | | With limitations#4+ members | 0,87 (0,52-1,45) | 0,23 |
| Household size (ref: 2) | | | | | LR | | 232,24 | |
| Solo dwellers | 1,04 (0,69-1,59) | 0,223 | 0,87 (0,52-1,44) | 0,22 | **Model 3b: Number of children in network** | | | |
| 3+ members | 0,98 (0,68-1,42) | 0,186 | 1,00 (0,69-1,45) | 0,19 | ref: With limitations#1 child | No limitations#no children in nw | 1,04 (0,66-1,66) | 0,25 |
| Marital status (ref: Married/ Partnered) | | | | | | No limitations#1 child in nw | 0,47 (0,25-0,89) ** | 0,15 |
| Divorced/Separated | 1,60 (1,02-2,50) * | 0,365 | 1,51 (0,94-2,41) | 0,36 | | No limitations#2+ children in nw | 0,86 (0,43-1,71) | 0,30 |
| Never married | 1,99 (1,19-3,30) ** | 0,516 | 1,93 (1,12-3,30) ** | 0,53 | | With limitations#no children in nw | 1,05 (0,72-1,51) | 0,20 |
| Widowed | 0,66 (0,41-1,06) | 0,161 | 0,70 (0,41-1,19) | 0,19 | | With limitations#2+ children in nw | 0,69 (0,41-1,14) | 0,18 |
| Number of children (ref: 2) | | | | | LR | | 238,81 | |
| 0 | 0,75 (0,49-1,16) | 0,165 | 0,70 (0,45-1,10) | 0,16 | **Model 3c: Friends in network** | | | |
| 1 | 0,92 (0,70-1,22) | 0,130 | 0,84 (0,62-1,13) | 0,13 | ref: With limitations#Friends in nw | No limitations#no network | 0,76 (0,35-1,62) | 0,30 |
| 3 | 0,92 (0,64-1,32) | 0,170 | 0,92 (0,63-1,33) | 0,17 | | No limitations#no friend in network | 0,47 (0,29-0,76) ** | 0,11 |
| 4+ | 0,86 (0,54-1,35) | 0,199 | 0,87 (0,55-1,38) | 0,20 | | No limitations#friend in network | 0,74 (0,39-1,42) | 0,25 |
| Everyday activity limitations (ref: Have limitations) | | | | | | With limitations#no friend in network | 0,53 (0,35-0,79) ** | 0,11 |
| No activity limitations | 0,88 (0,66-1,17) | 0,129 | 0,86 (0,64-1,16) | 0,13 | LR | | 241,63 | |
| Support receipt (ref: Has received) | | | | | **Model 3d: Spouse in network** | | | |
| NA/DK/Ref | 1,87 (0,99-3,53) | 0,607 | 1,66 (0,87-3,17) | 0,55 | ref: With limitations#Spouse in network | No limitations#no spouse in nw | 1,06 (0,46-2,47) | 0,46 |
| Has not received | 1,01 (0,79-1,29) | 0,126 | 0,97 (0,76-1,25) | 0,12 | | No limitations#spouse in nw | 0,92 (0,64-1,32) | 0,17 |
| Given support (ref: None) | 1,04 (0,76-1,41) | 0,162 | 0,99 (0,72-1,35) | 0,16 | | No limitations#no spouse | 0,79 (0,39-1,60) | 0,28 |
| Smoking (ref: Former smoker) | | | | | | No limitations#no nw | 0,72 (0,33-1,54) | 0,28 |

| | | | | |
|---|---|---|---|---|
| Never smoked | 0,76 (0,57-1,02) | 0,113 | 0,71 (0,53-0,96) ** | 0,11 |
| Current smoker | 2,80 (2,13-3,68) *** | 0,392 | 2,74 (2,07-3,63) *** | 0,39 |
| Network size (ref: 2) | | | | |
| 0 | | | 0,99 (0,46-2,13) | 0,39 |
| 1 | | | 1,01 (0,69-1,46) | 0,19 |
| 3 | | | 0,94 (0,62-1,42) | 0,20 |
| 4+ | | | 0,76 (0,46-1,25) | 0,19 |
| Number of children in the network (ref: 1) | | | | |
| No children in nw | | | 1,05 (0,72-1,53) | 0,20 |
| 2+ | | | 0,92 (0,58-1,46) | 0,22 |
| Friends in network (ref: Has friends) | | | | |
| No friends | | | 0,59 (0,40-0,89) ** | 0,12 |
| Spouse in network (ref: Has spouse) | | | | |
| No spouse in nw | | | 1,07 (0,66-1,72) | 0,26 |
| No spouse | | | 0,80 (0,46-1,40) | 0,23 |
| Contact frequency with family (ref: (Almost) Daily) | | | | |
| No (family) network | | | 1,14 (0,61-2,12) | 0,36 |
| Several times a week - Once a month | | | 1,01 (0,72-1,43) | 0,18 |
| Seldom/ Never | | | 1,13 (0,65-1,96) | 0,32 |
| Emotional closeness (ref: Very/ Extremely close) | | | | |
| Not very/ Somewhat close | | | 1,42 (0,96-2,11) | 0,29 |
| LR | 221,99 | | 246,32 | |

| | | | |
|---|---|---|---|
| | With limitations#no spouse in nw | 1,36 (0,85-2,17) | 0,32 |
| | With limitations#no spouse | 0,94 (0,55-1,61) | 0,26 |
| LR | | 233,50 | |
| **Model 3e: Contact frequency with family members** | | | |
| ref: With limitations#(Almost) Daily | No limitations#no (family) nw | 1,53 (0,74-3,14) | 0,56 |
| | No limitations#(Almost)Daily | 0,91 (0,60-1,36) | 0,19 |
| | No limitations#Several times a week | 0,70 (0,38-1,29) | 0,22 |
| | No limitations#Seldom/Never | 1,55 (0,66-3,64) | 0,68 |
| | With limitations#no (family) nw | 1,78 (1,03-3,07) * | 0,50 |
| | With limitations#Several times a week | 1,11 (0,78-1,58) | 0,20 |
| | With limitations#Seldom/Never | 1,01 (0,57-1,78) | 0,29 |
| LR | | 238,02 | |
| **Model 3f: Emotional closeness with confidants** | | | |
| ref: With limitations#Very/Extremely close | No limitations#no network | 0,73 (0,34-1,56) | 0,28 |
| | No limitations#not very/ somewhat close | 1,44 (0,68-3,06) | 0,55 |
| | No limitations#very/ extremely close | 0,89 (0,64-1,23) | 0,15 |
| | With limitations#not very/ somewhat close | 1,46 (0,97-2,19) | 0,30 |
| LR | | 235,83 | |

*** p < 0,001; ** p < 0,01; * p < 0,05
Model 1: Demographic variables; Model 2: Demographic + network variables; Models 3: Demographic variables + interaction term

**Table 6. Mortality hazard ratios from Cox proportional hazards models for women living in all household types (N = 2924), SHARE 2010-2017**

| | Model 1 | | Model 2 | | Models 3 | | | |
|---|---|---|---|---|---|---|---|---|
| | **HR (95% CI)** | **SE** | **HR (95% CI)** | **SE** | | | **HR (95% CI)** | **SE** |
| Foreign-Born (ref: Native) | 0,90 (0,72-1,14) | 0,11 | 0,87 (0,69-1,11) | 0,11 | **Model 3a: Network size** | | | |
| Residence area (ref: Urban) | | | | | ref: With limitations#2 members | No limitations#0 members | 1,45 (0,65-3,25) | 0,60 |
| n/a | 1,13 (0,71-1,81) | 0,27 | 1,10 (0,68-1,77) | 0,27 | | No limitations#1 member | 0,77 (0,50-1,18) | 0,17 |
| Rural | 1,03 (0,80-1,32) | 0,13 | 1,05 (0,81-1,36) | 0,14 | | No limitations#2 members | 0,99 (0,60-1,63) | 0,25 |
| Education (ref: Tertiary) | | | | | | No limitations#3 members | 0,45 (0,24-0,83) ** | 0,14 |
| None-Basic | 0,88 (0,62-1,24) | 0,15 | 0,89 (0,63-1,26) | 0,16 | | No limitations#4+ members | 0,77 (0,40-1,48) | 0,26 |
| Secondary | 1,09 (0,77-1,53) | 0,19 | 1,09 (0,77-1,54) | 0,19 | | With limitations#0 members | 0,87 (0,54-1,54) | 0,21 |
| Employment status (ref: Employed) | | | | | | With limitations#1 member | 1,09 (0,82-1,43) | 0,15 |
| Not working, home, ill, etc. | 3,90 (1,97-7,73) *** | 1,36 | 3,40 (1,69-6,87) ** | 1,02 | | Wtih limitations#3 members | 0,85 (0,59-1,24) | 0,16 |
| Retired | 0,70 (0,42-1,16) | 0,18 | 0,70 (0,42-1,16) | 0,18 | | With limitations#4+ members | 0,61 (0,40-0,91) ** | 0,13 |
| Household size (ref: 2) | | | | | LR | | 155,13 | |
| Solo dwellers | 1,17 (0,87-1,57) | 0,18 | 1,17 (0,85-1,60) | 0,19 | **Model 3b: Number of children in network** | | | |
| 3+ members | 1,13 (0,79-1,60) | 0,20 | 1,14 (0,79-1,66) | 0,22 | ref: With limitations#1 child | No limitations#no children in nw | 1,09 (0,71-1,68) | 0,24 |
| Marital status (ref: Married/ Partnered) | | | | | | No limitations#1 child in nw | 0,79 (0,53-1,18) | 0,16 |
| Divorced/Separated | 0,59 (0,39-0,91) * | 0,13 | 0,73 (0,37-1,43) | 0,25 | | No limitations#2+ children in nw | 0,45 (0,23-0,89) ** | 0,16 |
| Never married | 0,80 (0,50-1,26) | 0,19 | 0,96 (0,47-1,93) | 0,34 | | With limitations#no children in nw | 1,12 (0,83-1,52) | 0,17 |
| Widowed | 0,46 (0,33-0,65) *** | 0,08 | 0,52 (0,27-1,02) | 0,18 | | With limitations#2+ children in nw | 0,66 (0,45-0,96) ** | 0,13 |
| Number of children (ref: 2) | | | | | LR | | 158,32 | |
| 0 | 0,65 (0,45-0,94) * | 0,12 | 0,50 (0,32-0,78) ** | 0,11 | **Model 3c: Friends in network** | | | |
| 1 | 0,98 (0,77-1,25) | 0,12 | 0,80 (0,61-1,05) | 0,11 | ref: With limitations#Friends in nw | No limitations#no network | 1,79 (0,74-4,36) | 0,81 |
| 3 | 0,98 (0,69-1,39) | 0,17 | 0,98 (0,69-1,40) | 0,18 | | No limitations#no friend in network | 0,48 (0,32-0,71) *** | 0,10 |
| 4+ | 1,19 (0,74-1,89) | 0,28 | 1,19 (0,74-1,91) | 0,29 | | No limitations#friend in network | 0,90 (0,53-1,51) | 0,24 |
| Everyday activity limitations (ref: Have limitations) | | | | | | With limitations#no friend in network | 0,63 (0,46-0,85) ** | 0,10 |
| No activity limitations | 0,82 (0,63-1,07) | 0,11 | 0,86 (0,66-1,13) | 0,12 | LR | | 163,05 | |
| Support receipt (ref: Has received) | | | | | **Model 3d: Spouse in network** | | | |
| NA/DK/Ref | 1,61 (0,38-6,74) | 1,18 | 1,59 (0,38-6,67) | 1,16 | ref: With limitations#Spouse in network | No limitations#no spouse in nw | 1,06 (0,47-2,38) | 0,44 |
| Has not received | 1,16 (0,93-1,44) | 0,13 | 1,15 (0,92-1,44) | 0,13 | | No limitations#spouse in network | 0,97 (0,55-1,73) | 0,29 |
| Given support (ref: No support given) | 0,98 (0,72-1,35) | 0,16 | 0,97 (0,70-1,33) | 0,16 | | No limitations#no spouse | 0,55 (0,27-1,14) | 0,20 |
| Smoking (ref: Former smoker) | | | | | | No limitations# | 1,73 (0,70-4,24) | 0,79 |

| | | | | |
|---|---|---|---|---|
| Never smoked | 0,87 (0,62-1,22) | 0,15 | 0,86 (0,61-1,22) | 0,15 |
| Current smoker | 5,45 (3,31-8,98) *** | 1,39 | 5,03 (3,02-8,39) *** | 1,31 |
| Network size (ref: 2) | | | | |
| 0 | | | 0,52 (0,22-1,22) | 0,23 |
| 1 | | | 0,97 (0,73-1,28) | 0,14 |
| 3 | | | 0,66 (0,47-0,94) ** | 0,12 |
| 4+ | | | 0,60 (0,40-0,89) ** | 0,12 |
| Number of children in the network (ref: 1) | | | | |
| No children in nw | | | 1,14 (0,83-1,58) | 0,19 |
| 2+ | | | 0,71 (0,50-1,02) | 0,13 |
| Friends in network (ref: Has friends) | | | | |
| No friends | | | 0,64 (0,47-0,88) ** | 0,10 |
| Spouse in network (ref: Has spouse) | | | | |
| No spouse in nw | | | 0,92 (0,56-1,51) | 0,23 |
| No spouse | | | 0,80 (0,40-1,58) | 0,28 |
| Contact frequency with family (ref: (Almost) Daily) | | | | |
| No (family) network | | | 0,86 (0,55-1,34) | 0,20 |
| Several times a week - Once a month | | | 1,16 (0,89-1,50) | 0,15 |
| Seldom/ Never | | | 0,85 (0,57-1,27) | 0,17 |
| Emotional closeness (ref: Very/ Extremely close) | | | | |
| Not very/ Somewhat close | | | 0,96 (0,69-1,24) | 0,16 |
| | | | | |
| LR | 138,15 | | 168,39 | |

*** p < 0,001; ** p < 0,01; * p < 0,05

Model 1: Demographic variables; Model 2: Demographic + network variables; Models 3: Demographic variables + interaction term

| | | | |
|---|---|---|---|
| | With limitations#no spouse in nw | 0,89 (0,51-1,54) | 0,25 |
| | With limitations#no spouse | 0,77 (0,39-1,51) | 0,27 |
| LR | | 153,43 | |
| **Model 3e: Contact frequency with family members** | | | |
| ref: With limitations#(Almost)Daily | No limitations#no (family) nw | 1,13 (0,62-2,09) | 0,35 |
| | No limitations#(Almost)Daily | 0,76 (0,50-1,16) | 0,16 |
| | No limitations#Several times a week | 0,94 (0,58-1,53) | 0,23 |
| | No limitations#Seldom/Never | 0,75 (0,40-1,42) | 0,24 |
| | With limitations#no (family) nw | 1,07 (0,72-1,61) | 0,22 |
| | With limitations#Several times a week | 1,12 (0,85-1,48) | 0,16 |
| | With limitations#Seldom/Never | 0,82 (0,52-1,29) | 0,19 |
| LR | | 152,53 | |
| **Model 3f: Emotional closeness with confidants** | | | |
| ref: With limitations#Very/Extremely close | No limitations#no network | 1,64 (0,67-3,98) | 0,74 |
| | No limitations#not very/ somewhat close | 0,57 (0,23-1,41) | 0,26 |
| | No limitations#very/ extremely close | 0,82 (0,61-1,09) | 0,12 |
| | With limitations#not very/ somewhat close | 1,02 (0,72-1,44) | 0,18 |
| LR | | 151,68 | |

**Table 7. Mortality hazard ratios from Cox proportional hazards models for men living living alone (N = 335), SHARE 2010-2017**

| | Model 1 | | Model 2 | | Models 3 | | | |
|---|---|---|---|---|---|---|---|---|
| | **HR (95% CI)** | **SE** | **HR (95% CI)** | **SE** | | | **HR (95% CI)** | **SE** |
| Foreign-Born (ref: Native) | 2,67 (1,34-5,31) ** | 0,94 | 3,34 (1,55-7,21)** | 1,31 | **Model 3a: Network size** | | | |
| Residence area (ref: Urban) | | | | | ref: With limitations#2 members | No limitations#0 members | 1,12 (0,41-3,04) | 0,57 |
| n/a | 2,56 (0,99-6,58) | 1,23 | 2,40 (0,88-6,58) | 1,23 | | No limitations#1 member | 0,70 (0,24-2,03) | 0,38 |
| Rural | 0,60 (0,33-1,09) | 0,18 | 0,69 (0,35-1,34) | 0,23 | | No limitations#2 members | 0,28 (0,07-1,12) | 0,20 |
| Education (ref: Tertiary) | | | | | | No limitations#3 members | 3,67 (0,91-14,78) | 2,61 |
| None-Basic | 1,94 (0,82-4,61) | 0,86 | 2,34 (0,88-6,19) | 1,16 | | No limitations#4+ members | 0,30 (0,04-2,53) | 0,33 |
| Secondary | 2,09 (0,88-4,95) | 0,92 | 2,35 (0,92-5,98) | 1,12 | | With limitations#0 members | 0,70 (0,24-2,07) | 0,39 |
| Employment statyus (ref: Employed) | | | | | | With limitations#1 member | 0,53 (0,26-1,08) | 0,19 |
| Not working, home, ill, etc. | 11,28 (3,31-38,39) *** | 7,05 | 15,16 (3,91-58,76) *** | ### | | Wtih limitations#3 members | 0,45 (0,17-1,21) | 0,23 |
| Retired | 0,64 (0,22-1,84) | 0,35 | 0,69 (0,23-2,10) | 0,39 | | With limitations#4+ members | 0,67 (0,08-5,67) | 0,73 |
| Marital status (ref: Married/ Partnered) | | | | | LR | | 123,53 | |
| Divorced/Separated | 3,22 (0,63-16,52) | 2,69 | 3,54 (0,59-21,20) | 3,23 | **Model 3b: Number of children in network** | | | |
| Never married | 4,04 (0,77-21,18) | 3,41 | 3,90 (0,62-24,38) | 3,65 | ref: With limitations#1 child | No limitations#no children in nw | 3,18 (1,21-8,36) * | 1,57 |
| Widowed | 1,15 (0,22-5,90) | 0,96 | 1,26 (0,21-7,64) | 1,16 | | No limitations#1 child in nw | 0,43 (0,08-2,19) | 0,36 |
| Number of children (ref: 2) | | | | | | No limitations#2+ children in nw | 2,07 (0,47-9,04) | 1,56 |
| 0 | 1,04 (0,44-2,45) | 0,45 | 0,76 (0,30-1,90) | 0,36 | | With limitations#no children in nw | 2,16 (1,02-4,61) * | 0,83 |
| 1 | 1,59 (0,79-3,18) | 0,56 | 1,79 (0,83-3,88) | 0,71 | | With limitations#2+ children in nw | 1,23 (0,38-3,99) | 0,74 |
| 3 | 1,25 (0,59-2,67) | 0,48 | 1,18 (0,51-2,70) | 0,50 | LR | | 123,33 | |
| 4+ | 2,01 (0,54-7,42) | 1,34 | 2,33 (0,57-9,66) | 1,66 | **Model 3c: Friends in network** | | | |
| Everyday activity limitations (ref: Have limitations) | | | | | ref: With limitations#Friends in nw | No limitations#no network | 1,48 (0,46-4,72) | 0,88 |
| No activity limitations | 1,16 (0,66-2,07) | 0,34 | 1,25 (0,66-2,36) | 0,41 | | No limitations#no friend in network | 0,49 (0,16-1,54) | 0,29 |
| Support reveipt (ref: Has received) | | | | | | No limitations#friend in network | 1,13 (0,39-3,29) | 0,62 |
| Has not received | 0,92 (0,53-1,57) | 0,25 | 0,99 (0,56-1,74) | 0,28 | | With limitations#no friend in network | 0,63 (0,30-1,34) | 0,24 |
| Given support (ref: No support given) | 0,77 (0,40-1,48) | 0,26 | 0,80 (0,40-1,59) | 0,28 | LR | | 116,87 | |
| Smoking (ref: Former smoker) | | | | | **Model 3e: Contact frequency with family members** | | | |
| Never smoked | 0,63 (0,31-1,29) | 0,23 | 0,65 (0,31-1,38) | 0,25 | ref: With limitations#(Almost)Daily | No limitations#no (family) nw | 2,31 (0,72-7,39) | 1,37 |
| Current smoker | 4,13 (2,14-7,96) *** | 1,38 | 4,74 (2,35-9,56) *** | 1,70 | | No limitations#(Almost)Daily | (omitted) | |
| Network size (ref: 2) | | | | | | No limitations#Several times a week | 0,43 (0,08-2,24) | 0,36 |
| 0 | | | 1,05 (0,18-6,17) | 0,95 | | No limitations#Seldom/Never | 0,94 (0,28-3,15) | 0,58 |

| | | |
|---|---|---|
| 1 | 0,62 (0,28-1,34) | 0,24 |
| 3 | 0,92 (0,37-2,30) | 0,43 |
| 4+ | 0,51 (0,11-2,44) | 0,41 |
| Number of children in the network (ref: 1) | | |
| No children in nw | 2,09 (0,81-5,35) | 1,00 |
| 2+ | 1,57 (0,54-4,55) | 0,85 |
| Friends in network (ref: Has friends) | | |
| No friends | 0,84 (0,38-1,83) | 0,33 |
| Spouse in network (ref: Has spouse) | | |
| No spouse in nw | 2,97 (0,58-15,25) | 2,48 |
| No spouse | 1,28 (0,33-5,00) | 0,89 |
| Contact frequency with family (ref: (Almost) Daily) | | |
| No (family) network | 0,86 (0,27-2,76) | 0,51 |
| Several times a week - Once a month | 1,14 (0,42-3,13) | 0,59 |
| Seldom/ Never | 0,80 (0,29-2,19) | 0,41 |
| Emotional closeness (ref: Very/ Extremely close) | | |
| Not very/ Somewhat close | 1,52 (0,75-3,08) | 0,55 |
| LR | 111,59 | 148,87 |

| | | | |
|---|---|---|---|
| With limitations#no (family) nw | 1,19 (0,45-3,18) | 0,60 |
| With limitations#Several times a week | 0,93 (0,33-2,61) | 0,49 |
| With limitations#Seldom/Never | 0,55 (0,20-1,54) | 0,29 |
| LR | 126,29 | |
| **Model 3f: Emotional closeness with confidants** | | |
| ref: With limitations#Very/Extremely close | No limitations#no network | 1,38 (0,43-4,40) | 0,82 |
| | No limitations#not very/ somewhat close | 2,86 (0,90-9,03) | 1,68 |
| | No limitations#very/ extremely close | 0,82 (0,32-2,10) | 0,39 |
| | With limitations#not very/ somewhat close | 1,43 (0,72-2,86) | 0,51 |
| LR | 117,91 | |

*** p < 0,001; ** p < 0,01; * p < 0,05

Model 1: Demographic variables; Model 2: Demographic + network variables; Models 3: Demographic variables + interaction term

**Table 8. Mortality hazard ratios from Cox proportional hazards models for women living living alone (N = 1247), SHARE 2010-2017**

| Model 1 | | | Model 2 | | Models 3 | | | |
|---|---|---|---|---|---|---|---|---|
| | **HR (95% CI)** | **SE** | **HR (95% CI)** | **SE** | | | **HR (95% CI)** | **SE** |
| Foreign-Born (ref: Native) | 0,72 (0,52-0,99) * | 0,12 | 0,74 (0,53-1,03) | 0,12 | **Model 3a: Network size** | | | |
| Residence area (ref: Urban) | | | | | ref: With limitations#2 members | No limitations#0 members | 2,34 (0,91-6,05) | 1,13 |
| n/a | 1,02 (0,54-1,96) | 0,34 | 0,82 (0,41-1,62) | 0,29 | | No limitations#1 member | 0,76 (0,42-1,36) | 0,23 |
| Rural | 1,18 (0,83-1,69) | 0,21 | 1,23 (0,86-1,77) | 0,23 | | No limitations#2 members | 1,09 (0,52-2,28) | 0,41 |
| Education (ref: Tertiary) | | | | | | No limitations#3 members | 0,41 (0,18-0,94) * | 0,17 |
| None-Basic | 1,00 (0,58-1,72) | 0,28 | 1,03 (0,60-1,79) | 0,29 | | No limitations#4+ members | 0,69 (0,21-2,27) | 0,42 |
| Secondary | 1,25 (0,74-2,13) | 0,34 | 1,34 (0,78-2,30) | 0,37 | | With limitations#0 members | 1,06 (0,56-2,02) | 0,35 |
| Employment statyus (ref: Employed) | | | | | | With limitations#1 member | 1,23 (0,84-1,81) | 0,24 |
| Not working, home, ill, etc. | 3,50 (1,25-9,82) * | 1,84 | 3,45 (1,20-9,94) * | 1,86 | | Wtih limitations#3 members | 1,27 (0,76-2,14) | 0,34 |
| Retired | 0,51 (0,24-1,05) | 0,19 | 0,47 (0,23-0,98) * | 0,18 | | With limitations#4+ members | 0,73 (0,41-1,31) | 0,22 |
| Marital status (ref: Married/ Partnered) | | | | | LR | | 81,44 | |
| Divorced/Separated | 0,97 (0,13-7,31) | 1,00 | 0,58 (0,03-12,55) | 0,91 | **Model 3b: Number of children in network** | | | |
| Never married | 1,30 (0,17-9,78) | 1,34 | 0,84 (0,04-18,54) | 1,32 | ref: With limitations#1 child | No limitations#no children in nw | 1,04 (0,58-1,87) | 0,31 |
| Widowed | 0,76 (0,10-5,54) | 0,77 | 0,41 (0,02-8,95) | 0,65 | | No limitations#1 child in nw | 0,72 (0,42-1,24) | 0,20 |
| Number of children (ref: 2) | | | | | | No limitations#2+ children in nw | 0,29 (0,09-0,99) * | 0,18 |
| 0 | 0,59 (0,38-0,92) * | 0,13 | 0,37 (0,21-0,65) ** | 0,11 | | With limitations#no children in nw | 1,34 (0,88-2,03) | 0,29 |
| 1 | 1,02 (0,72-1,43) | 0,18 | 0,80 (0,55-1,19) | 0,16 | | With limitations#2+ children in nw | 0,71 (0,40-1,25) | 0,20 |
| 3 | 0,99 (0,56-1,76) | 0,29 | 1,07 (0,59-1,95) | 0,33 | LR | | 79,73 | |
| 4+ | 1,23 (0,56-2,72) | 0,50 | 1,37 (0,61-3,05) | 0,56 | **Model 3c: Friends in network** | | | |
| Everyday activity limitations (ref: Have limitations) | | | | | ref: With limitations#Friends in nw | No limitations#no network | 2,27 (0,80-6,46) | 1,21 |
| No activity limitations | 0,71 (0,49-1,03) | 0,13 | 0,69 (0,48-1,01) | 0,13 | | No limitations#no friend in network | 0,41 (0,24-0,73) ** | 0,12 |
| Support reveipt (ref: Has received) | | | | | | No limitations#friend in network | 0,65 (0,31-1,34) | 0,24 |
| Has not received | 0,98 (0,72-1,33) | 0,15 | 0,92 (0,67-1,26) | 0,15 | | With limitations#no friend in network | 0,67 (0,44-1,01) | 0,14 |
| Given support (ref: No support given) | 0,76 (0,47-1,23) | 0,19 | 0,71 (0,43-1,16) | 0,18 | LR | | 81,20 | |
| Smoking (ref: Former smoker) | | | | | **Model 3e: Contact frequency with family members** | | | |
| Never smoked | 1,14 (0,66-1,97) | 0,32 | 1,19 (0,68-2,09) | 0,34 | ref: With limitations#(Almost)Daily | No limitations#no (family) nw | 1,25 (0,60-2,57) | 0,46 |
| Current smoker | 6,69 (3,11-14,43) | 2,62 | 6,00 (2,68-13,44) *** | 2,47 | | No limitations#(Almost)Daily | 0,40 (0,17-0,91) * | 0,17 |
| Network size (ref: 2) | | | | | | No limitations#Several times a week | 0,69 (0,37-1,29) | 0,22 |
| 0 | | | 1,25 (0,06-27,10) | 1,97 | | No limitations#Seldom/Never | 0,61 (0,26-1,41) | 0,26 |
| 1 | | | 1,00 (0,68-1,48) | 0,20 | | With limitations#no (family) nw | 0,99 (0,60-1,65) | 0,26 |

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|---|---|---|
| 3 | 0,92 (0,56-1,50) | 0,23 |
| 4+ | 0,66 (0,37-1,20) | 0,20 |
| Number of children in the network (ref: 1) | | |
| No children in nw | 1,42 (0,87-2,32) | 0,35 |
| 2+ | 0,65 (0,38-1,13) | 0,18 |
| Friends in network (ref: Has friends) | | |
| No friends | 0,74 (0,48-1,14) | 0,16 |
| Spouse in network (ref: Has spouse) | | |
| No spouse in nw | 0,27 (0,01-6,13) | 0,42 |
| No spouse | 1,35 (0,07-26,66) | 2,06 |
| Contact frequency with family (ref: (Almost) Daily) | | |
| No (family) network | 0,74 (0,39-1,38) | 0,24 |
| Several times a week - Once a month | 1,06 (0,73-1,53) | 0,20 |
| Seldom/ Never | 0,76 (0,45-1,28) | 0,20 |
| Emotional closeness (ref: Very/ Extremely close) | | |
| Not very/ Somewhat close | 1,12 (0,71-1,78) | 0,26 |
| LR | 68,80 | |

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|---|---|---|---|
| With limitations#Several times a week | 1,05 (0,70-1,56) | 0,21 |
| With limitations#Seldom/Never | 0,71 (0,39-1,27) | 0,21 |
| LR | 80,25 | |
| **Model 3f: Emotional closeness with confidants** | | |
| ref: With limitations#Very/Extremely close | | |
| No limitations#no network | 2,17 (0,76-6,20) | 1,16 |
| No limitations#not very/ somewhat close | 0,39 (0,12-1,27) | 0,24 |
| No limitations#very/ extremely close | 0,70 (0,46-1,06) | 0,15 |
| With limitations#not very/ somewhat close | 1,37 (0,86-2,19) | 0,33 |
| LR | 79,54 | |

| | | |
|---|---|---|
| LR | 86,75 | |

*** p < 0,001; ** p < 0,01; * p < 0,05

Model 1: Demographic variables; Model 2: Demographic + network variables; Models 3: Demographic variables + interaction term