Archives of Gerontology and Geriatrics 89 (2020) 104080

Contents lists available at ScienceDirect

Archives of Gerontology and Geriatrics

journal homepage: www.elsevier.com/locate/archger

Which factors contribute to loneliness among older Europeans? Findings from the Survey of Health, Ageing and Retirement in Europe Determinants of loneliness

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ARTICLE INFO

Keywords:
Loneliness
Functional impairment
Depressive symptoms
Chronic diseases
Cognition
Longitudinal study
Self-rated health
Loss of spouse
Isolation

ABSTRACT

Background: While previous studies have examined the determinants of loneliness (i) using a longitudinal approach and (ii) using data from nationally representative samples, only few studies have done both at once. Hence, the purpose of our study was to clarify which factors are associated with loneliness longitudinally based on nationally representative data.

Methods: Data were taken from wave 5 to 7 of the "Survey of Health Ageing, and Retirement in Europe "(SHARE; covering 27 European countries and Israel in total) (in our analytical sample, n = 101,909 observations). Loneliness was assessed using the three-item loneliness scale. As explanatory variables, we included age, marital status, income, self-rated health, depressive symptoms, functional decline, cognitive functioning and chronic diseases. Exploiting the features of panel data and mitigating the problem of unobserved heterogeneity, linear FE regressions were used.

Results: FE regressions showed that loneliness increased with increasing age (β = .02, $p < .001$), changes from married and living together with spouse/registered partnership to another marital status (β=-.71, $p < .001$), decreases in log income (β=-.01, $p < .05$), worsening self-rated health (β = .04, $p < .001$), functional decline (β = .09, $p < .001$), increases in depressive symptoms (β = .13, $p < .001$) and decreases in cognitive functioning (β=-.01, $p < .001$), whereas it was not associated with changes in chronic diseases.

Conclusion: Our longitudinal study based on nationally representative SHARE data contributed to identify the determinants of loneliness among older Europeans using panel data methods. Tackling the identified risk factors may assist in avoiding loneliness in older adults living in Europe.

1. Introduction

Loneliness is often defined as a state in which the social network is smaller or less satisfying than desired (Luanaigh and Lawlor, 2008a). Since various critical life events (e.g., loss of spouse, admission to nursing home, loss of functional abilities) occur in later life, loneliness is frequent in old age and has been shown to be an increasing challenge (Huxhold, Engstler, & Hoffmann, 2019). Examining the determinants of loneliness is of great importance because it can lead to decreases in subjective well-being (Pinquart and Sörensen, 2000). Furthermore, it is associated with subsequent morbidity and mortality (Luanaigh and Lawlor, 2008b; Holt-Lunstad et al., 2015).

To date, most of the current evidence stems from cross-sectional studies (Sundström et al., 2009; Hajek and König, 2017). There is only a small body of evidence based on longitudinal nationally representative samples (Dahlberg et al., 2018; Yang and Gu, 2019; Yin et al., 2019). Furthermore, evidence based on specifically designed regression models for panel data is sparse (van den Broek and Grundy, 2018; Hajek & König, 2019b; Kristensen et al., 2019). In conclusion, there is a lack of *longitudinal studies* using *panel regression models* to identify the determinants of loneliness *based on nationally representative samples*. A few studies fulfilling these criteria, for example, demonstrated that the onset of multimorbidity and the onset of obesity are associated with greater loneliness (Hajek & König, 2019b; Kristensen et al., 2019). Therefore, using panel regression models our aim was to clarify which factors are associated with loneliness longitudinally among older Europeans - based on the well-known Survey of Health, Ageing and Retirement in Europe (SHARE) data.

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https://doi.org/10.1016/j.archger.2020.104080
Received 15 November 2019; Received in revised form 6 April 2020; Accepted 10 April 2020
Available online 24 April 2020

2. Methods

2.1. Sample

Data were taken from wave 5, wave 6 and wave 7 from the SHARE study (Börsch-Supan et al., 2008), a multidisciplinary longitudinal study of non-institutionalized individuals aged 50 years and over in Europe as well as in Israel. All individuals ≥ 50 years and their partners (irrespective of their age) were interviewed in the selected household. Due to data constraints, previous waves were excluded. The analytical sample was composed of 101,909 observations (individuals with changes in loneliness scores between wave 5 to wave 7). For example, in wave 5, the following countries were covered: Austria, Germany, Sweden, Netherlands, Spain, Italy, France, Denmark, Switzerland, Belgium, Israsel, Czech Republic, Luxembourg, Slovenia, and Estonia. Further details regarding the SHARE study have been provided elsewhere (Börsch-Supan et al., 2013).

Prior to the CAPI interview consent was given verbal and then documented by the interviewers. This consent procedure was approved by the ethics committees. The ethical commission agreed that a verbal consent is sufficient and that written consent statements are not necessary for the conduction of SHARE interviews.

2.2. Outcome measure

To assess loneliness, a short three-item version (Hughes et al., 2004) of the Revised UCLA Loneliness scale (Russell et al., 1978; Russell et al., 1980) was used (in each case with three options: “often”, “some of the time”, “hardly ever or never”). A sum score was computed, therefore the scale ranges from 3 (not lonely) to 9 (very lonely). The exact wording of the items were: “How often do you feel isolated from others?”, “How often do you feel you lack companionship?”, “How often do you feel left out?”. It has been shown that this tool has favorable psychometric characteristics (Hughes et al., 2004).

2.3. Independent variables

As explanatory variables, we included in regression analysis socioeconomic factors as follows: age, marital status (registered partnership/married and living together with spouse; others (married, living separated from spouse; never married; divorced; widowed)) and income (log household net income (per year) in Euro).

Furthermore, health-related variables were included: self-rated health (ranging from 1 = excellent to 5 = poor), functional decline (“Instrumental Activities of Daily Living Index”; sum of reported difficulties in performing “telephone calls”, “taking medications” and “managing money”; ranging from 0 to 3, with higher values reflecting higher functional impairment; scale was adapted from Lawton and Brody (Lawton and Brody, 1969)), depressive symptoms (12-item European Depression (EURO-D) scale (Prince et al., 1999), which ranges from 0 (absence of depressive symptoms) to 12 (severe depressive symptoms)), cognitive functioning (adapted from the Ten-Word Delay Recall Test, ranging from 0 = worst to 10 = best) (Prince et al., 2003)) and a count score for chronic illnesses (high blood pressure or hypertension; high blood cholesterol; stroke or cerebral vascular disease; diabetes or high blood sugar; chronic lung disease; arthritis, including osteoarthritis, or rheumatism; cancer or malignant tumor; stomach or duodenal ulcer, peptic ulcer; Parkinson’s disease; cataracts; hip fracture or femoral fracture).

2.4. Statistical analysis

Controlling for unobserved heterogeneity is key in well-being (Ferrer-i-Carbonell and Frijters, 2004) and loneliness research (Hajek & König, 2019a). Hence, linear fixed effects (FE) regressions were used in our study. Relying on quite weak model assumptions, they yield estimates that are consistent – even when there is a link between unobserved time-constant factors and the independent variables (Cameron and Trivedi, 2005) – when the strict exogeneity assumptions holds. FE regressions solely rely on changes within units (here: individuals) longitudinally. For example, changes in self-rated health or cognitive functioning within individuals over time are used in FE regressions. Thus, it was for example examined whether intraindividual changes in self-rated health are associated with intraindividual changes in loneliness.

More technically, the error components model can be written as (with individual-specific time-invariant error term α_i and a time-varying error term ε_{it}):

$$y_{it} = \beta x_{it} + \alpha_i + \varepsilon_{it}$$

Person-specific means over time t:

$$\overline{y}_i = \beta \overline{x}_i + \alpha_i + \bar{\varepsilon}_i$$

The data can be demeaned (within transformation):

$$y_{it} - \overline{y}_i = \beta (x_{it} - \overline{x}_i) + (\varepsilon_{it} - \bar{\varepsilon}_i)$$

Thus, individual-specific time-invariant unobserved heterogeneity is wiped and only within variation remains in FE regression models.

For all models, standard errors were corrected (cluster-robust standard errors). Statistical significance was assessed at $p < .05$. Statistical analyses were conducted using Stata 15.1 (Stata Corp., College Station, Texas).

3. Results

3.1. Sample characteristics

Sample characteristics of the analytical sample (observations used in linear FE regressions) are depicted in Table 1. Average age equaled 68.2 years (± 9.4 years) and 56.8% were female. The average loneliness score was 3.8 (± 1.3). Table 1 provides further details.

3.2. Regression analysis

In accordance with previous recommendations (Cameron and Trivedi, 2005), it was first examined whether our variables have sufficient variation within individuals over time in order to get precise estimates (using ‘xttab’ and ‘xttrans’ in Stata 15.1). Since this was the case (results not shown, but available upon request), linear FE regressions were estimated with the explanatory variables mentioned in the methods section.

Results of linear FE regressions are presented in Table 2. An exemplary descriptive interpretation of the findings is: after losing their spouse, loneliness scores of the individuals decrease by .71 ($p < .001$). In total, FE regressions revealed that loneliness increased with increasing age ($\beta = .02$, $p < .001$), changes from married and living together with spouse/registered partnership to another marital status ($\beta = -.71$, $p < .001$), decreases in log income ($\beta = -.01$, $p < .05$), worsening self-rated health ($\beta = .04$, $p < .001$), functional decline ($\beta = .09$, $p < .001$), increases in depressive symptoms ($\beta = .13$, $p < .001$) and decreases in cognitive functioning ($\beta = -.01$, $p < .001$). In contrast, changes in loneliness were not associated with changes in chronic diseases.

4. Discussion

Drawing on SHARE data the purpose of our study was to clarify which time-varying factors are associated with changes in loneliness longitudinally. FE regressions showed that loneliness increased with increasing age, changes from married and living together with spouse/registered partnership to another marital status, decreases in log income, worsening self-rated health, functional decline, increases in

Table 1
Characteristics of observations included in fixed effects regression analysis (n = 101,909 observations; wave 5 to wave 7)

Variables	N/Mean	%/(SD)
Female: N (%)	57,836	56.8%
Education (ISCED-97):		
- Low education	36,687	38.4%
- Medium education	38,446	38.2%
- High education	23,552	23.4%
Age in years: Mean (SD)	68.2	(9.4)
Marital status: married and living together with spouse; registered partnership: N (%)	70,247	68.9%
Household net income (per year) in Euro: Mean (SD)	30,792.2	(50,604.2)
Self-rated health (from 1 to 5, with higher values reflecting worse self-rated health)	3.1	(1.0)
Functional decline (ranging from 0 to 3, with higher values reflecting functional impairment)	0.1	(0.3)
Depressive symptoms (from 0 to 12, with higher values reflecting more depressive symptoms)	2.3	(2.2)
Cognitive functioning (from 0 to 10, with higher values reflecting better cognitive functioning)	5.4	(1.8)
Number of chronic diseases (from 0 to 10, with higher values reflecting more chronic diseases)	1.2	(1.2)
Loneliness (Loneliness Scale): Mean (SD)	3.8	(1.3)

Please note that time-invariant factors (education and sex) were only displayed for descriptive purposes. Furthermore, it is worth noting that there is a small proportion of missing values (3.2%) for educational level.

Table 2
Determinants of loneliness. Results of linear fixed effects regressions (wave 5 to wave 7)

Independent variables	Loneliness
Age	0.02***
	(0.00)
Marital status: married and living together with spouse or registered partnership (Reference category: others (married, living separated from spouse; never married; divorced; widowed))	−0.71***
	(0.05)
Log household net income	−0.01*
	(0.00)
Self-rated health (from 1 to 5, with higher values reflecting worse self-rated health)	0.04***
	(0.01)
Functional decline (ranging from 0 to 3, with higher values reflecting functional impairment)	0.09**
	(0.03)
Depressive symptoms (from 0 to 12, with higher values reflecting more depressive symptoms)	0.13***
	(0.00)
Cognitive functioning (from 0 to 10, with higher values reflecting better cognitive functioning)	−0.01**
	(0.00)
Number of chronic diseases (from 0 to 10, with higher values reflecting more chronic diseases)	−0.00
	(0.01)
Constant	2.57***
	(0.17)
Observations	101,909
Number of Individuals	46,483
R^2	0.06

Beta-coefficients were reported; cluster-robust standard errors in parentheses; *** p < 0.001, ** p < 0.01, * p < 0.05, + p < 0.10

depressive symptoms, and decreases in cognitive functioning, while it was not associated with changes in chronic diseases.

Thus far, little is known about the factors contributing to increased loneliness scores based on nationally representative samples and exploiting the features of panel data (van den Broek and Grundy, 2018; Hajek & König, 2019b; Kristensen et al., 2019). Generally, our study is difficult to compare with other studies mostly because there are large differences in statistical approaches (e.g., cross-sectional regression models vs. linear FE regression models).

In our study, an increase in age was associated with increases in loneliness scores. It appears plausible that loneliness increased with age because it may become more difficult to maintain relationships in late life due to mobility restrictions. Moreover, old age is accompanied by the loss of friends and acquaintances which may contribute to feelings of loneliness. Similarly, the loss of the spouse was associated with increases in loneliness scores in our study. These findings are well in line with previous research, mainly based on cross-sectional studies (Beutel et al., 2017; Menec et al., 2019; von Soest et al., 2020).

Financial losses (in terms of income) were also associated with increases in loneliness scores in our study which adds to the existing knowledge largely based on cross-sectional studies (de Jong Gierveld et al., 2015). A possible explanation may be that losses in income can act as an indicator for financial hardship. Thus, individuals may avoid activities they could afford before (e.g., activities with friends like visiting a theater). This may lead to increased feelings of loneliness because they may feel left out from society.

Like some recent studies also showed (Menec et al., 2019; von Soest et al., 2020), worsening self-rated health, functional decline and increases in depressive symptoms were all associated with increases in loneliness scores in our study. These decreases in health-related factors may lead to the fact that individuals tend to avoid social activities (e.g., social engagement) or to isolate from society. This social withdrawal may increase feelings of loneliness.

In our study, an increase in loneliness was associated with a decrease in cognitive functioning. This supports the findings of a previous systematic review (Boss et al., 2015) (including ten studies: five cross-sectional and five longitudinal studies) showing an association between greater loneliness and lower cognitive function. We assume that a decrease in cognitive functioning is also accompanied by a social withdrawal (for example, due to feelings of shame) which ultimately may result in increased loneliness scores.

Unexpectedly and in contrast to a recent German study (Kristensen et al., 2019), we did not find a link between increases in chronic conditions and increases in loneliness in our study. We assume that these differences may be mainly explained by differences in the assessment of chronic diseases. Future research is required to clarify this link.

Some strengths and limitations are worth highlighting. Longitudinal data were drawn from the widely acknowledged SHARE study. To tackle the issue of unobserved heterogeneity, linear FE regressions were used (Brüderl and Ludwig, 2015). This is important because differences in time-constant factors (e.g., genetic factors – which are almost impossible to measure in large observational studies) can easily result in biased estimates when other regression models are used (Brüderl and Ludwig, 2015). Furthermore, variables were quantified using well-established scales. However, we cannot dismiss the possibility of endogeneity bias (e.g., loneliness can also contribute to, for example, increased depressive symptoms scores (de la Fuente et al., 2018)). In the SHARE study, a small sample selection as well as a small attrition bias have been detected (Palgi et al., 2015). In the current study, we focused

on the determinants of loneliness among older Europeans. However, it appears plausible that there are differences in the determinants of loneliness in Europe. Thus, future research focusing on cultural differences may contribute to our understanding.

5. Conclusions

Our longitudinal study based on nationally representative SHARE data contributed to identify the determinants of loneliness among older Europeans using panel data methods. Risk factors include increasing age, changes from married and living together with spouse/registered partnership to another marital status, decreases in income, worsening self-rated health, functional decline, increases in depressive symptoms, and decreases in cognitive functioning. Tackling the identified risk factors may assist in avoiding loneliness in older adults living in Europe.

6. CRediT role statement

AH: Conceptualization; Data curation; Methodology; Project administration, Visualization; Roles/Writing - original draft, Writing - review & editing, Formal analysis

HHK: Conceptualization; Resources; Writing - review & editing; Supervision; Visualization

Declarations of interests: none

Acknowledgements

This paper uses data from SHARE Waves 5, 6 and 7 (DOIs: 10.6103/SHARE.w5.700, 10.6103/SHARE.w6.700, 10.6103/SHARE.w7.700), see Börsch-Supan et al. (2013) for methodological details.(1) The SHARE data collection has been funded by the European Commission through FP5 [QLK6-CT-2001-00360], FP6 [SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812], FP7 [SHARE-PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982] and Horizon 2020 [SHARE-DEV3: GA N°676536, SERISS: GA N°654221] and by DG Employment, Social Affairs & Inclusion. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging [U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C] and from various national funding sources is gratefully acknowledged (see www.share-project.org).

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