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## Long-term predictors of loneliness in old age: results of a 20-year national study

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### ABSTRACT

**Objectives:** The understanding of social phenomena is enhanced if individuals can be studied over longer periods. Regarding loneliness in old age, there is a general lack of longitudinal research. The aim of this study was to examine whether there is an association between loneliness in old age and social engagement 20 years earlier, as stated by life course theory and the convoy model.

**Method:** Data from the nationally representative Swedish Panel Study of Living Conditions of the Oldest Old (2002 and 2011 data collection waves) and the Swedish Level of Living Survey (1981 and 1991 data collection waves) were used. The sample included 823 individuals with an average age of 62.2 years at baseline and 82.4 years at follow-up.

**Results:** Each form of social engagement in old age was significantly associated with the same form of social engagement 20 years earlier. Close forms of social engagement were associated with loneliness in old age; as were more distant forms of social engagement, but only when they were considered solely in old age.

**Conclusion:** Patterns of social engagement in old age were established at least 20 years earlier and close forms of social engagement are long-term predictors of loneliness, although current social engagement tended to be more influential on loneliness. The study underlines the importance of interventions targeted at close relationships that can provide social support in old age.

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### KEYWORDS

Loneliness; social factors; life course; convoy model; longitudinal

### Introduction

Loneliness among older people is a risk factor for health problems and mortality (e.g. Hawkey & Cacioppo, 2010; Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; O'Lunaigh & Lawlor, 2008). An understanding of which conditions influence loneliness is essential for the development of effective interventions to prevent and reduce loneliness.

Previous research on risk factors for loneliness among older people has been dominated by cross-sectional studies (cf. O'Lunaigh & Lawlor, 2008; Victor & Bowling, 2012) and existing longitudinal studies have mainly focused on short-term rather than long-term risk factors for loneliness, even though conditions important to loneliness in old age may have been established earlier in life.

In these analyses, we use data from two linked, nationally representative studies to explore whether loneliness in old age (age ~ 80) is associated with social engagement 20 years earlier. We use the term 'social engagement' as a collective term with a number of components: marital status, social support, social contacts, social activity and religious activity.

### Conceptual framework

Loneliness has been defined as 'a discrepancy between one's desired and achieved levels of social relations' (Perlman & Peplau, 1981, p. 32; see also Sermat, 1978). The discrepancy may be in either the number or the intimacy of the relationships (Fokkema, Gierveld, & Dykstra, 2012).

To better understand living conditions and experiences in old age, it can be helpful to consider them in the context of the life course. A key principle of life course theory is that old

age is shaped by earlier conditions and habits (Elder, Johnson, & Crosnoe, 2003). For example, social activity in old age is more common among those who participated in such activities earlier in life (Agahi, Ahacic, & Parker, 2006). Long-term patterns have also been found regarding social contacts (Wrzus, Hanel, Wagner, & Neyer, 2013). This study does not cover the entire life course, but can test the following hypothesis:

**Hypothesis 1:** Social engagement in old age is associated with the same forms of social engagement 20 years earlier.

The longitudinal nature of social relationships has been conceptualised in the convoy model, developed by Antonucci and Kahn (Antonucci, 2001; Kahn & Antonucci, 1980). This model applies a life course perspective to social relationships and suggests that people are part of a dynamic network, a convoy. An individual's convoy includes people who support and are supported by that individual. As the individual ages, people are added and subtracted to the convoy as a response to internal and external events. People in the convoy closest to the individual, such as a spouse or a close friend, are perceived as his or her most important support-providers and can be difficult to replace if lost. An older person's social contacts are thus influenced by conditions over the life course but also by recent events such as the loss of a partner (Antonucci, 2001; Kahn & Antonucci, 1980; see also Wrzus et al., 2013). Although there is a well-established association between social engagement and loneliness (Routasalo & Pitkala, 2003), social engagement earlier in life has rarely been included in research on loneliness in old age. To explore this association, we will test the following hypothesis:

**Hypothesis 2:** Loneliness in old age is associated with social engagement 20 years earlier.

When describing the convoy model, Antonucci (2001, p. 431) argues that people 'differentiate their relationships hierarchically, from very close to much less close', that most people see their relationships with their immediate family members as their closest relationships and that these close relationships are important for social support (Kahn & Antonucci, 1980; for a similar discussion of strong and weak ties, see Granovetter, 1973). Close relationships are more strongly associated with well-being (Antonucci, 2001), and it can be assumed that close relationships – or in our terminology, close forms of social engagement – also provide protection against loneliness. We will thus test the following hypothesis:

**Hypothesis 3:** Close forms of social engagement earlier in life and in old age are more important for loneliness in old age than distant forms of social engagement.

### *Previous research on social engagement and loneliness*

To the best of our knowledge, only two previous studies on loneliness in old age have followed people for 20 years or more. Aartsen and Jylhä (2011) found that loss of one's partner, loss of friends and reduced social activity at follow-up were each associated with an increased risk of loneliness. Similarly, Wenger and Burholt (2004) found that loss of one's partner, relatives, friends and close neighbours contributed to loneliness in old age.

The present study takes the convoy model as its theoretical starting point. This model has rarely, if ever, been used in studies of loneliness in old age. Still, a substantial body of research shows that people with larger social support networks are less likely to report loneliness than those with smaller social networks (e.g. Cohen-Mansfield, Shmotkin, & Goldberg, 2009; Dykstra & Fokkema, 2007; Victor & Bowling, 2012), and that both emotional support and a larger social network provide important protection against loneliness in old age (Cohen-Mansfield et al., 2009; Victor & Bowling, 2012). Social support can be broadly described as assistance to/from others. Emotional support is a key attribute of social support (House & Kahn, 1985; Langford, Bowsher, Maloney, & Lillis, 1997) and involves caring, empathy, love and trust (Antonucci, 2001; Langford et al., 1997).

Sometimes, the availability of a partner for companionship in various activities has been seen as a form of social support (Wills & Shinar, 2000; see also Östberg & Lennartsson, 2007). Having a close relationship protects against loneliness, and the loss of a partner is an important risk factor for loneliness (e.g. Aartsen & Jylhä, 2011; Brittain et al., *in press*; Dahlberg, Andersson, McKee, & Lennartsson, 2015; Dykstra, van Tilburg, & de Jong Gierveld, 2005).

Furthermore, loneliness is more common among people with limited engagement in social activities (Aartsen & Jylhä, 2011; Newall et al., 2009), although it is unclear whether any specific activities are particularly important for loneliness. One form of activity, religious activity – or church affiliation – has been described as an 'integrating structure of society' (de Jong Gierveld, 1998, p. 74), and can alleviate feelings of loneliness (Rote, Hill, & Ellison, 2013). Although social activity is often included in longitudinal studies on loneliness in old age, religious activity has rarely been specifically examined in such studies.

To sum up, loneliness in old age may be associated with social engagement earlier in life, and it would be valuable to

take such engagement into account when studying loneliness in old age. However, the lack of long-running longitudinal studies has limited the potential to do so. Therefore, the extent to which various forms of social engagement in earlier in life may be protective against loneliness in old age remains unclear.

The overall aim of this study was to examine whether there is an association between loneliness in old age and social engagement 20 years earlier. We will examine whether there is an association between forms of social engagement at baseline (when the participants were around 60 years of age) and the same forms of engagement 20 years later. Thereafter, we will examine whether social engagement at baseline and at follow-up is associated with loneliness at follow-up. Finally, we will explore whether lack of close forms of social engagement at baseline and at follow-up are more important for loneliness in old age than lack of more distant forms of social engagement.

## **Methods**

### *Design, participants and procedure*

This study used data from the Swedish Level of Living Survey (LNU), which started in 1968, and the Swedish Panel Study of Living Conditions of the Oldest Old (SWEOLD), which started in 1992. These are nationally representative and longitudinal studies. LNU includes approximately 1 out of every 1000 people in the adult population of Sweden up to 75 years of age (see Fritzell & Lundberg, 2007). SWEOLD builds on LNU by recruiting all people aged 76 years or older who were part of the LNU sample (see Lennartsson et al., 2014).

In this study, baseline conditions were examined via analysis of data from the 1981 and 1991 waves of LNU, and conditions at follow-up were analysed using data from the 2002 and 2011 waves of SWEOLD. Response rates for LNU were 76.1% in 1981 and 72.7% in 1991. For SWEOLD, the response rates were 87.3% in 2002 and 86.2% in 2011. A total of 494 people participated both in LNU 1981 and in SWEOLD 2002, and another 516 people participated in LNU 1991 and SWEOLD 2011, providing a gross sample size of 1010.

Data were collected via structured interviews, primarily done face-to-face. When the participant preferred, interviews were carried out via telephone or, as a last resort, via a postal questionnaire. Indirect or mixed interviews were carried out when the participants were unable to answer the questions, for example, because of cognitive impairment or physical frailty. Questionnaire responses ( $n = 60$ ) and indirect interviews ( $n = 119$ ) were excluded from the current analyses, as information on loneliness was not gathered in interviews using these interview modes for all years. In addition, face-to-face or telephone interviews in which information on the outcome variable was missing ( $n = 8$ ) were excluded from the analyses. The final sample included 823 participants.

The majority of participants were women (59.0%). Participants' average age was 62.2 years at baseline and 82.4 years at follow-up. This is a good representation of the population of Sweden in these age groups (Lennartsson et al., 2014).

Informed verbal consent was obtained prior to each interview. Ethical approval for SWEOLD, including longitudinal analysis of LNU data, was provided by the Ethics Committee of Karolinska Institutet (KI Dnr 03-413) and the Regional Ethical Review Board in Stockholm (Dnr 2010/403-31/4).

## Materials

In line with the majority of studies on loneliness in old age (Pinquart & Sörensen, 2003), loneliness was measured via a single item: 'Are you ever bothered by feelings of loneliness?', with four response options. This item was transformed into a dichotomous variable, which reflected being frequently lonely (response categories merged: nearly always and often) and rarely lonely (response categories merged: seldom and almost never). Loneliness was only measured at follow-up.

Five items measuring social engagement were included in this study: marital status, social support, social contacts, social activity and religious activity. Here, marital status and social support are seen as indicators of close forms of social engagement, whereas social contacts, social activity and religious activity are seen as more distant forms of social engagement. There were a few internal missing values for social support, social contacts and social activity. For each of these, values were imputed on the basis of the mean value of all participants who were of the same sex and age as the participant with missing value (details below).

Marital status was measured via the item 'What is your present civil status?' This variable was dichotomised into married/partnered and not married/partnered (hereafter called 'married' and 'not married'). In 1981 and 1991, all of those who were married also lived with their partner. Two individuals (0.24%) in 2002 and 12 individuals (1.46%) in 2011 were married but did not live with their partner.

Social support was measured via the item 'Do you have a relative or close friend who is there for you if you need to talk to someone about personal worries?' (yes; no). Those who answered no to this question were considered to lack social support. Missing 1981 values were imputed ( $n = 1$ ). In 2011, the SWEOLD survey used a shorter postal questionnaire as a final interview mode. The social support item was not part of this questionnaire, and for this reason, all participants who completed this questionnaire ( $n = 60$ ) were excluded from the analyses.

A social contacts summary scale was constructed from four individual items: visiting relatives, having relatives over to visit, visiting friends, having friends over to visit (response alternatives: no (coded as 0); yes, sometimes (1); yes, often (2)), with a scale range from 0 through 8. Missing 1981 data were imputed ( $n = 1$ ).

Regarding social activity, participants were asked both at baseline and follow-up: 'Which of the following activities do you usually do?' followed by a list of items. An activity scale was constructed from four items that were included in all waves and that have previously been found to be social in nature (Lennartsson & Silverstein, 2001). These were: cultural activities (going to the movies, theatre, concerts, museums and exhibitions); going to restaurants; dancing; participating in a study circle (response alternatives: no (0); yes, sometimes (1); yes, often (2)). A social activity summary scale was constructed that ranged from 0 through 8. Missing 1981 data were imputed ( $n = 1$ ).

In 1981, participants were asked if they attended religious services (yes; no) and how frequently they participated: less than once a month, approximately once a month, a couple of times a month or once a week. The same items were included in the 1991 data collection wave, although the response alternatives were slightly different: about once a year, a couple of times a year, once a month, several times a month, once a

week. At follow-up in 2002 and 2011, religious activity was measured via the question 'Have you attended a religious service at any time during the last year?' Response alternatives in 2002 were: never, a few times a year, about once a month, a few times a month and once a week or more. Response alternatives in 2011 were: no; yes, sometimes; and yes, often. Responses of no (1981, 1991, 2011) or never (2002) were coded as 'never' (0); a couple of times a month (1981), several times a month (1991), a few times a month (2002), sometimes (2011) or less frequently were coded as 'sometimes' (1); at least once a week (1981, 1991, 2002) and often (2011) were coded as 'often' (2).

## Data analysis

Descriptive analyses of variables measured in both 1981/1991 and 2002/2011 were performed for the total sample. Thereafter, the first hypothesis was tested via bivariate analyses to determine whether there were any associations between the five social engagement variables at baseline and the same forms of social engagement at follow-up. In the analysis of associations, McNemar's binomial distribution test was used for dichotomous variables (marital status and social support), Pearson's correlation coefficient for continuous variables (social contact and social activity) and Kendall's Tau-b for categorical ordinal variables (religious activity).

To test the second hypothesis, bivariate logistic regression analyses were conducted to identify associations between social engagement variables at baseline and follow-up and loneliness at follow-up. These analyses also tested the third hypothesis, that is, whether lack of close forms of social engagement were more important for loneliness than lack of more distant forms of social engagement. Finally, logistic regression analyses were undertaken to examine the association between lack of social engagement at baseline and loneliness at follow-up while adjusting for social engagement at follow-up. All observations in the regression analyses were not independent (133 participants were interviewed in all four waves of data collection). To correct for intra-individual correlations, statistical analyses were carried out using Huber-White sandwich estimator of variance in Stata (13.0) through which robust standard errors are obtained. All other analyses were conducted in the IBM Statistical Package for Social Science (SPSS) 22.0 for Windows. The criterion for test significance was  $p < .05$ .

## Results

### Descriptive analyses

At follow-up, 12.8% of the participants reported being bothered by feelings of loneliness (not shown in table). Table 1 shows that 78.3% of the sample were married at baseline, whereas 44.6% were married 20 years later. During the study period, 35.1% of the participants lost their partner through death or divorce. A total of 1.46% of the participants who were not married at baseline were married at follow-up.

Ninety-five per cent of the sample had access to social support at baseline. This proportion decreased somewhat over the study period; 7.0% of the participants lost access to social support between baseline and follow-up. Still, most people (88.0%) had social support at both baseline and follow-up,

**Table 1.** Prevalence of and associations between different forms of social engagement at baseline and the same forms of social engagement at follow-up ( $n = 823$ ).

1981/1991	2002/2011			$p$
	No	Yes	Total	
Was married				
No (%)	20.3	1.46	21.7	
Yes (%)	35.1	43.1	78.3	
Total (%)	55.4	44.6	100.0	<.001
Had social support				
No (%)	1.6	3.4	5.0	
Yes (%)	7.0	88.0	95.0	
Total (%)	8.6	91.4	100.0	.002
	1981/1991	2002/2011		$r$
Social contacts				
$M$ (SD)	5.23 (1.72)	3.32 (1.99)		.343***
Social activity				
$M$ (SD)	2.25 (1.74)	1.49 (1.48)		.444***
1981/1991	2002/2011			$\Upsilon$
	Never	Sometimes	Often	Total
Religious activity				
Never (%)	31.5	4.0	0.2	35.7
Sometimes (%)	31.3	24.2	3.4	58.9
Often (%)	0.9	1.0	3.5	5.3
Total (%)	63.7	29.2	7.2	100.0

Notes: Loneliness was not measured in 1981 and 1991, so associations between baseline and follow-up loneliness could not be analysed. McNemar test, binomial distribution used for being married and social support; Pearson's correlation coefficient used for social contacts and social activities; Kendall's Tau-b used for religious activity. \*\*\*<0.001; \*\*<0.05.

but a small group (1.6%) reported lack of access to social support at both baseline and follow-up.

Another form of social engagement was to visit and to be visited by relatives and friends. Between baseline and follow-up, social contacts decreased for 71.3% of the participants and increased for 9.84% (not shown in table). The mean score on the social contact scale decreased from 5.23 (out of 8) at baseline and 3.32 at follow-up.

Involvement in social activities followed a similar pattern to that of social contacts. Activity decreased for the majority of people (51.3%), but increased for a smaller group (20.0%) (not shown in table). On average, social activity score decreased from 2.25 out of 8 at baseline to 1.49 at follow-up.

Attending religious services is not generally common in Sweden, and in this study 91.0% of the participants attended religious services sometimes or not at all at both baseline and

follow-up. Five per cent of the participants attended a religious service on a weekly basis at baseline. Two-thirds of the participants in this group also did so 20 years later, whereas one-third had stopped attending religious services on a weekly basis. A small proportion of the participants intensified their religious activity.

To sum up, the proportions of participants who were married had social contacts and participated in social activities generally decreased from baseline to follow-up, whereas the proportions of participants who had social support and attended religious services remained fairly stable.

### Bivariate analysis to test hypothesis 1

Table 1 also presents the results of the analyses that tested the first hypothesis. There were significant associations between each form of social engagement at baseline and the same form of social engagement at follow-up. In other words, even in very old age social engagement was predicted by the same form of social engagement 20 years earlier.

### Bivariate and multivariable analyses to test hypotheses 2 and 3

Table 2 presents the results of the analyses to test the second and third hypotheses. There was a strong association between marital status at follow-up and loneliness in old age (see Table 2). Not being married at follow-up was associated with more than five times higher odds of loneliness than being married at follow-up. Although the association between marital status at baseline and loneliness in old age was not significant, it showed the same trend.

Social support was also important for loneliness. Both lack of social support at baseline and at follow-up were associated with loneliness in old age. The odds of loneliness in old age were more than twice as high among individuals who lacked access to social support at baseline than among those who had access to social support at baseline, even after controlling for social support at follow-up.

Social contacts and social activity at baseline were not significantly associated with loneliness, whereas social contacts and social activity at follow-up were associated with loneliness. However, there was a significant negative association between low levels of social activity at baseline and loneliness at follow-up after controlling for social activity at follow-up,

**Table 2.** Logistic regression of associations between social engagement (in 1981/1991 and 2002/2011) and loneliness (in 2002/2011) ( $n = 823$ ).

	Model 1			Model 2		
	OR	$p$	95% CI	OR	$p$	95% CI
Was not married 1981/1991	1.528	0.079	0.951–2.452	0.831	0.467	0.504–1.370
Was not married 2002/2011	5.320	0.000	3.064–9.236			
No social support 1981/1991	2.684	0.007	1.302–5.534	2.280	0.034	1.066–4.879
No social support 2002/2011	2.167	0.012	1.187–3.956			
Low level of social contacts 1981/1991 (8–0)	0.998	0.971	0.886–1.124	0.924	0.250	0.807–1.057
Low level of social contacts 2002/2011 (8–0)	1.197	0.001	1.073–1.335			
Low level of social activity 1981/1991 (8–0)	0.955	0.441	0.850–1.073	0.864	0.029	0.759–0.985
Low level of social activity 2002/2011 (8–0)	1.234	0.003	1.074–1.417			
Religious activity 1981/1991						
Sometimes	1.085	0.721	0.694–1.694	1.171	0.512	0.731–1.875
Often	1.644	0.240	0.717–3.772	1.599	0.391	0.548–4.664
Religious activity 2002/2011						
Sometimes	0.801	0.364	0.496–1.293			
Often	1.346	0.431	0.642–2.820			

Note: Model 1: bivariate associations between loneliness and different forms of social engagement at baseline and at follow-up. Model 2: associations between loneliness and social engagement at baseline adjusting for social engagement at follow-up. Standard errors adjusted for clustering within observations.

that is, people who were socially active at baseline but not at follow-up were more likely to report loneliness than others.

Loneliness in old age was not significantly associated with religious activity at baseline or follow-up.

## Discussion

The study aimed to determine whether there was an association between loneliness in old age and social engagement 20 years earlier, thereby testing three hypotheses derived from life course theory (Elder et al., 2003) and the convoy model (Antonucci, 2001; Kahn & Antonucci, 1980).

Drawing on the life course theory, our first hypothesis stated that social engagement in old age is associated with the same forms of social engagement 20 years earlier. Our study confirms this hypothesis, as it shows that each form of social engagement at baseline was associated with the same form of social engagement at follow-up.

The second hypothesis stated that social engagement at baseline was associated with loneliness in old age. The present study found associations between loneliness in old age and some but not all forms of social engagement 20 years earlier. These findings partly confirm our second hypothesis.

Finally, based on the convoy model, our third hypothesis stated that close forms of social engagement are more influential on loneliness in old age than more distant forms of social engagement. This hypothesis was partly supported in the present study. There were associations between loneliness in old age and close but not distant forms of social engagement 20 years earlier. However, both close and more distant forms of social engagement were associated with loneliness at follow-up.

Although not significant, the odds of loneliness in old age were higher among those who were not married at baseline than among those who were married. Still, marital status in old age had a stronger association with loneliness than marital status at baseline; the odds of loneliness were almost five times higher in people who were not married than in those who were married in old age. The importance of marital status to loneliness echoes the findings of previous longitudinal research on loneliness in old age that covered longer time periods (Aartsen & Jylhä, 2011; Wenger & Burholt, 2004). Naturally, being married and having access to social support can be linked, since partners may be key sources of support and since people who have recently lost their partners may have an elevated need for support.

Our study shows that the odds of loneliness in old age were more than twice as high among those who lacked access to social support at baseline than among those who did not, even after controlling for social support at follow-up. Social support was included in one of the longitudinal studies mentioned earlier (Wenger & Burholt, 2004). The authors of that study emphasised that appropriate social support can alleviate both loneliness and social isolation, and they also underlined the need for support that may follow the loss of a partner.

Social contacts, social activity and religious activity at baseline were not significantly associated with loneliness in old age. These can be seen as more distant forms of social engagement than marital status and social support (Antonucci, 2001). Still, at follow-up, social contacts and social activity were associated with loneliness in old age. Importantly, though, social activity at baseline became significantly

associated with loneliness at follow-up after controlling for social activity at follow-up, meaning that people who were socially active at baseline but not at follow-up were more likely to report loneliness than others. These feelings of loneliness may be a result of losing arenas for social engagement or being unable to maintain social activities that used to be a part of everyday life.

Previous longitudinal research that covers longer periods of time has found that loss of social contacts, such as contacts with friends, is associated with loneliness in old age (Aartsen & Jylhä, 2011; Wenger & Burholt, 2004). One of these studies also examined social activity and found that reduced social activity was associated with loneliness (Aartsen & Jylhä, 2011). Religious activity has rarely been included in longitudinal research on loneliness in old age, but some cross-sectional research has found an association between religious activity and loneliness (e.g. Rote et al., 2013). In the present study, no significant association was found between religious activity and loneliness. This may be explained by generally low levels of attendance in religious services in Sweden (Pettersson, 2009). However, it is also important to bear in mind that our item on religious activity only concerned attendance of religious services.

## Study strengths and limitations

LNU and SWEOLD cover a relatively long study period and include a number of dimensions of social engagement, which enables an examination of the long-term and short-term associations of social engagement with loneliness in old age. This study of the long-term predictors of loneliness in old age is unique, as it is the only study of its kind that is based on a nationally representative sample. To the best of our knowledge, only two previous studies of risk factors for loneliness in old age have covered 20 years or more, and both of them were based on local or regional samples of older people: in the Finnish town Tampere (Aartsen & Jylhä, 2011) and in rural Wales (Wenger & Burholt, 2004). Furthermore, our study is the first to test hypotheses about the long-term predictors of loneliness that are derived from life course theory and the convoy model.

Each wave of data collection had high response rates, that is, participants were highly representative of the population. Our study was limited to only two points in time. Variations in levels and forms of social engagement, as well as in people involved in such engagement may have occurred several times during this period, and such variations may influence the findings (cf. Barrett, 2000). Although it is hardly possible to collect data on and fully consider all possible variations in social engagement, future studies with more measurement points may be able to further illuminate relevant patterns in social engagement.

Unfortunately loneliness was not measured at baseline, which means that we could not explore the development of loneliness over the study period. There are many ways in which individuals can be socially engaged, and both LNU and SWEOLD include many different items addressing social engagement, but these analyses were limited to those forms of social engagement that were included in all waves of data collection.

Finally, some previous studies have emphasised the importance of the quality of social engagement (Pinquart & Sörensen, 2003; Shiovitz-Ezra & Leitsch, 2010) and its meaning

(Ayalon, Shiovitz-Ezra, & Palgi, 2013; Victor, Scambler, & Bond, 2009) for loneliness. The quality of social relationships has also been emphasised in research on the convoy model (Antonucci, Ajrouch, & Birditt, 2014). In this study, we did not have the opportunity to consider subjective evaluations of social engagement.

### Conclusions and implications for practice

Our study demonstrates that patterns of social engagement in old age were established at least 20 years earlier and that loneliness in old age had an association with social engagement. It is not unlikely that these patterns were established even earlier, that is, that people may be able to lower the risk of loneliness in old age by being socially engaged at younger ages. This study illustrated that the life course theory and the convoy model can be useful in research on loneliness in old age.

For most forms of social engagement, current engagement is more influential on loneliness in old age than engagement 20 years earlier, but patterns of social engagement earlier in life are important since this is the time when an active social life is established. Close relationships, including having a spouse or a partner and access to social support, are of particular importance to avoid loneliness. This underlines the importance of interventions to facilitate close, supportive relationships.

In order to enhance the understanding of long-term patterns of social engagement and how this is related to loneliness, further longitudinal studies that cover long periods of time are needed. There is also a need for research that explores people's evaluations of the quality of their social engagement, and for research on the effectiveness of interventions to alleviate loneliness in old age (see Cattán, White, Bond, & Learmouth, 2005; Cohen-Mansfield & Perach, 2015). For example, the effectiveness of interventions may vary depending on whether loneliness is a result of long-standing low levels of social engagement or whether loneliness is a response to recent events.

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