


ARTICLE

# Educational gradients in older adults' personal network size, diversity and social support: a widening gap between haves and have nots across birth cohorts?

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(Accepted 19 April 2022; first published online 19 July 2022)

## Abstract

Societal change related to individualisation has likely made individual resources more important for the maintenance of social ties. This raises the question whether lower-educated adults are more disadvantaged in later-born cohorts in personal network structure and function. Observations are from 4,886 individuals aged 55 and over from the Longitudinal Aging Study Amsterdam (LASA), who are followed over a timespan of a maximum of 24 years between 1992 and 2016. Multi-level regression models are estimated to determine cohort differences. Network size is larger in later-born cohorts, and more so for the higher-educated than for the lower-educated adults. Network diversity increases across birth cohorts irrespective of educational level. Lower- and higher-educated women, and lower-educated men give more instrumental support in later-born cohorts, whereas higher-educated men do not show such a steep increase. More emotional and instrumental support is also received in later-born cohorts irrespective of educational level, but higher-educated adults receive more emotional support in all birth cohorts. Thus, lower-educated older adults are not necessarily worse off socially in later-born cohorts. Instead, they are even more likely to be active givers of support. Also, most of the gains in personal networks of older adults in later-born cohorts are independent of educational level, suggesting that the social landscape for older adults today is much richer.

**Keywords:** cohort analysis; social change; socio-economic status; social networks

## Introduction

Earlier research on educational gradients in personal networks has consistently found that lower-educated older adults have smaller network sizes and less diversity in the network than higher-educated adults (Krause and Borawski-Clark, 1995;

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Broese van Groenou and Van Tilburg, 2003; Ajrouch *et al.*, 2005). Having larger and more diverse network ties is important for receiving sufficient social support (Fiori *et al.*, 2007) and for better wellbeing and mental health in later life (Cheng *et al.*, 2009; Litwin and Shiovitz-Ezra, 2011). Social networks determine individuals' access to resources, social influence and control, opportunities, and shape attitudes and perceptions (Lin, 2017). In general, lower-educated adults tend to have fewer social, psychological and cognitive resources, as well as fewer opportunities to gain and maintain social relationships across the lifecourse (Ajrouch *et al.*, 2005). They also, on average, have an earlier onset of health decline and show more disadvantaged health trajectories across the lifecourse (Leopold, 2018; Wetzel and Van Houtte, 2020).

Lower-educated adults might be at a particularly large risk for adverse network outcomes in contemporary society, such as small and non-diverse networks that provide little social support. In postmodern societies, individuals are more reliant on their own efforts, preferences and needs to gain and maintain social relationships across the lifecourse (Allan, 2008). Both protection as well as constraints of traditional communities like churches, extended families and neighbourhoods are assumed to have lost strength. In such a societal context, having more skills, resources and opportunities to maintain social relationships individually likely becomes more rather than less important. Previous studies on cohort differences on social networks indeed suggest a larger disadvantage of lower-educated older adults: lower-educated older adults seem to profit less from the development towards more non-kin in personal networks in later-born cohorts (Ajrouch *et al.*, 2007; Suanet and Antonucci, 2017). Notwithstanding this inconclusive evidence, it largely remains an open question if and to what extent societal change has altered the educational gradient in network structure and function in later life. In the current study, the aim is therefore to examine systematically cohort differences in the network size, diversity, and total received and given emotional and instrumental support in relation to educational level. Data are employed from the Longitudinal Aging Study Amsterdam (LASA) to compare the personal networks of older adults' born between 1908 and 1957 across a timespan of a maximum 24 years, from 1992 to 2016.

### **Understanding educational gradients in personal network size, diversity and social support**

Former studies have established that lower-educated older adults tend to be disadvantaged socially. They have smaller network sizes (Broese van Groenou and Van Tilburg, 2003; Ajrouch *et al.*, 2005), less-frequent contact with friends (Krause and Borawski-Clark, 1995) and less support from non-kin network members (Broese van Groenou and Van Tilburg, 2003). People with a lower socio-economic status (including education) also lose more network members over time, and they are less able to replace them with new network members (Cornwell, 2015). Explanations for the observed educational gradient in personal networks have focused on differences in skills, resources as well as opportunities to maintain social relationships across the lifecourse. First, education is assumed to be an indicator of cognitive skills and resources that are necessary to develop and sustain personal

relationships (Broese van Groenou and Van Tilburg, 2003). Low socio-economic status people also have on average fewer social skills and social competence (Hogg and Heller, 1990). Second, higher-educated older adults likely have more resources that can help maintain a reciprocal balance in support exchange in social relationships. In more distant non-kin ties such as acquaintances, and people known through schools, clubs or volunteering, this is more important for continuance of relationships than in close kin ties (Suanet and Van Tilburg, 2019). As such, lower-educated older adults might have less diversity in the type of network members than higher-educated older adults. Also, due to considerable homophily in networks (Snijders and Lomi, 2019), lower-educated older adults might have network members who have fewer resources, who are less able to provide them with social support. Finally, educational level is also linked to having a professional occupation and higher income (Grundy and Holt, 2001). Higher-educated adults tend to have more opportunities to meet people in the workplace and are more geographically mobile, resulting in larger and more-diverse personal networks (Ajrouch *et al.*, 2005).

### **Cohort differences in the impact of educational level on personal network structure and function**

Lower-educated adults might become more disadvantaged in personal networks in postmodern society. As emphasised in theories on individualisation and de-traditionalisation, in the first half of the 20th century a wide range of societal roles were available from participation within traditional social communities, such as religious groups, extended families and neighbourhoods (Giddens, 1990; Beck and Beck-Gernsheim, 2002). Since the 1970s, these communities have weakened considerably, resulting in both less protection as well as more freedom from these social structures. The rise of the so-called postmodern society therefore brings forward a number of challenges and uncertainties, as well as opportunities. When social life is more liquid and less socially rooted, possibilities, necessity as well as ideological support to exercise agency over one's own life increases (Bauman, 2013). Thus, individuals need and often want to become more active in constructing their own personal network. Salience of personal relationships is likely to have increased rather than decreased in this context, although these relationships are presently seen as more flexible and voluntary (Allan, 2008). Within these theories on postmodern societies, it has been claimed that social class is 'dead' (Beck and Beck-Gernsheim, 2002). This is not so much to imply that objective social inequalities have disappeared, but rather that social identity and community belonging are increasingly untied from social class position. Traditionally, networks of those in lower socio-economic status groups (including those with low education) were more centred around concrete neighbourhoods and physical communities, rather than the one-on-one friendships that were more often found among higher socio-economic groups (Allan, 2008). As lower-educated adults on average tend to have fewer individual skills, resources and opportunities to maintain social relationships individually, the development towards more active individual management of social relationships might provide a particularly challenging societal context for lower-educated adults. The significance of non-kin

relationships is also likely magnified, because these relationships are voluntary and are sustained through feelings of solidarity or affection rather than obligation (Merz and Huxhold, 2010). As stated above, we already know that lower-educated adults have profited less from the shift to more non-kin in networks (Suanet *et al.*, 2013), and also that the networks of lower-educated adults are traditionally more family-orientated (Suanet and Antonucci, 2017). Finally, the rise of communication technology has also made it feasible to maintain contact with distant network members (Harper *et al.*, 2020), but these new communication technologies also demand new skills. Particularly for lower-educated older adults, learning these new skills and constantly updating them might be a challenging enterprise. One counter-argument to this larger disadvantage for lower-educated adults in contemporary Western societies would be their longstanding reliance on and integration in more traditional communities and their stronger intergenerational ties which could allow them to keep these social relationships intact, even in the face of processes of individualisation. Also, there is at least some evidence that those from lower socio-economic classes have self-concepts that are more communal in nature and emphasise relationships to others, whereas those with a higher socio-economic class emphasise personal agency and uniqueness in their self-concepts (Kraus *et al.*, 2012). This more communal and relational self-concept should provide a motivation even in more individualised societies to gain and maintain social relationships with others, and act as a counterweight to the broader societal context that emphasises individual agency. This is not so for higher-educated individuals for whom the societal context and self-concept are more congruent, but the focus on personal agency can come at the expense of focusing on social relationships and community.

In the present study, societal changes are perceived as gradual rather than tied to a specific point in time. For example, although individualisation is argued by Allan (2001) to have started in the 1970s, it is also acknowledged that the speed and strength of these developments differ between categories of people and societal contexts. We can, however, assume that later-born cohorts of older adults have been influenced more strongly by societal changes. In a nutshell, as the societal context demands a more active construction of the personal network, the difference between haves and have nots might increase as skills, resources and opportunities for an individual to maintain social relationships are likely to play an even more vital role in gaining and maintaining social relationships than before. Therefore, one could expect that the disadvantage of lower-educated adults in network size, diversity, and given and received social support becomes larger in later-born cohorts.

## Methods

### Data

Data from the LASA, a cohort-sequential and multi-disciplinary research programme on physical, cognitive, social and emotional functioning of older adults, is employed (Huisman *et al.*, 2011). This data collection has been carried out by trained interviewers, and is managed and co-ordinated at the Amsterdam Medical Center, location VUmc, since 1992. Data from the LASA database are

available for secondary data analysis for specific research questions provided that an agreement is made up (for the procedure, see <https://lasa-vu.nl/en/request-data/>). The nationally representative sample was drawn from the population registers of nine Dutch municipalities (after municipality mergers, originally 11 municipalities) in three geographic regions that vary in religious climate and degree of urbanisation. The oldest old, primarily the eldest men, were oversampled. A total of 3,107 respondents born 1908–1937 were included in the first LASA observation (1992–1993). The response rate was 63 per cent. In 2002 (N = 1,002; born 1938–1947) and 2012 (N = 1,023; born 1948–1957), new samples aged 55–64 were added following an identical sampling frame to study cohort differences in functioning. Response rates were 62 and 63 per cent, respectively. In subsequent observation cycles, respondents from this new cohort were combined with those from the original cohort. Follow-up observations have been conducted every three or four years. Observations were conducted in 1992–1993 (N = 3,107), 1995–1996 (N = 2,545), 1998–1999 (N = 2,076), 2001–2002 (N = 2,693), 2005–2006 (N = 2,165), 2008–2009 (N = 1,818), 2012–2013 (N = 2,545) and 2015–2016 (N = 2,024). In total, there are 15,781 person-year observations from 4,886 individuals. On average, there are 3.2 person-year observations available per respondent. The average age at interview is 70.4, and 53 per cent are female across all observations.

## Measurements

### *Personal network variables*

In each observation, a domain-specific approach for network delineation was employed that encompasses the following classification of personal relationships: household members, children and their partners, other family members, neighbours, contacts through work and school, members of associations, and other non-kin relationships. For each of the seven domains, the following question was asked: ‘Name the people you have frequent contact with and who are also important to you’ (Van Tilburg, 1998). The criteria of importance were left to the interpretation of the respondent and only persons older than age 18 could be considered. The identification method was similar across observations. *Network size* was measured by counting all identified contacts in the personal network (0–80). *Network diversity* was assessed using a slightly adapted version of the Social Network Index of Cohen *et al.* (1997). This is the number of social roles in which a respondent has regular, which is biweekly or more often, contact with at least one person. For each role that is covered by their regular contacts they receive one point. Contacts were classified into 13 social roles: spouse, child, child-in-law, sibling, sibling-in-law, parent, (other) relative, close friend, acquaintance, neighbour, (former) colleague, voluntary organisation, and ‘other’ group. A higher sum score reflects a greater diversity in the personal network. As the categories 12 and 13 roles had very low numbers, these were collapsed into the category of having 11 roles. Because of time constraints, questions concerning support were collected only for nine relationships (except the spouse) with the highest contact frequency. For each of the (maximum) nine network members, one question on *received emotional support* and one on *received instrumental support* were posed, just as for *given emotional support* and *given instrumental support*. These are: How often

did it occur in the last year that ... helped you with daily chores in and around the house, such as prepare meals, clean the house, transportation, small repairs, fill in forms?' 'How often did it occur in the last year that you helped ... with daily chores in and around the house, such as prepare meals, clean the house, transportation, small repairs, fill in forms?' 'How often did it occur in the last year that you told ... about your personal experiences and feelings?' 'How often did it occur in the last year that ... told you about his/her personal experiences and feelings?' Answer categories ranged from 'never' (1) 'seldom', 'sometimes' to 'often' (4). Aggregate scores for the total emotional and instrumental support received and given ranges have a maximum of 36 (in the case of answering 'often' for the maximum of nine network members), with a higher score reflecting more support received and given.

### *Education*

Attained *educational level* was measured in nominal years that it takes to complete such a level ranging from 5 = elementary not completed to 18 = university education completed.

### *Independent variables*

*Functional capacity* is measured with six questions about activities of daily living; based on Katz *et al.* (1963), such as 'Can you walk up and down stairs?' The five possible answers were 1 = not at all, 2 = only with help, 3 = with a great deal of difficulty, 4 = with some difficulty and 5 = without difficulty. Item scores were summed to obtain a scale score ranging from 6 (poor) to 30 (good). *Number of chronic diseases* for seven major chronic conditions was counted from 0 to 7. The seven chronic conditions that were counted included the following: (a) chronic non-specific lung disease, (b) cardiac disease, (c) peripheral arterial disease, (d) diabetes mellitus, (e) cerebrovascular accident or stroke, (f) arthritis and (g) malignancies. *Cognitive functioning* was measured using the Mini-Mental State Examination (Folstein *et al.*, 1975), with scale scores ranging from 0 to 30. *Frequency of church attendance* (1 = never or not a member of a church, 6 = weekly or more) was included to measure religious participation. *Partner status* (yes/no) was also included as a predictor, as well as if a respondent does *volunteering* (yes/no). *Mastery*, the degree to which a person perceives themselves to be in control, was indicated by the Pearlin mastery scale (5–25), with a higher score reflecting higher mastery (Pearlin and Schooler, 1978). *Net income* was measured by information on net monthly household income, which is adjusted for inflation and whether or not the respondent shares a household with a partner (€378–4,039 per month). Finally, *age at interview*, *birth cohort* and *gender* (0 = male, 1 = female) are included.

### *Analyses*

In the current study, we investigate cohort differences in the educational gradient in network size, diversity, and received and given emotional and instrumental support in a series of multi-level linear regression models comparing respondents from different birth cohorts at different observations. Multi-level designs, as also structural equation modelling, are particularly suitable to study growth models in which

cohorts are followed over time (Grimm *et al.*, 2016). All independent variables are entered as fixed effects, which are similar to regression parameters in ordinary regression analysis. A random effect at the respondent level is included to control for the dependency between person-year observations from the same individuals. All independent variables were centred around the grand mean in order to ease interpretation of the coefficients. To disentangle ageing and cohort differences, the *age at interview* variable (linear and quadratic term) and the *birth cohort* variable, which is measured by birth date, are included as continuous variables. Tolerance of the age and cohort variable is acceptable at 0.41. The multi-level repeated-measures design was chosen over comparing parallel age groups at different points in historical time as it reflects that societal change is perceived as gradual rather than tied to a specific point in time. In order to test whether older adults that have a lower educational level are more disadvantaged socially in later-born cohorts, an interaction between cohort and educational level was fitted to the model for all of the personal network variables, whilst also adding age at interview, cohort, educational level and gender as linear terms in Model 1. In Model 2, functional capacity, number of chronic diseases, cognitive functioning, partner status, frequency of church attendance, volunteering, mastery and net income were added; all are well-known predictors of the structure and function of the personal network. These variables are included to shed more light on the mechanisms by which educational differences in personal network size, diversity, and received and given social support occur. The descriptive statistics for the 4,886 respondents in the five ten-year birth cohorts at baseline are presented in Table 1. These unadjusted values are not controlled for age at interview, and the birth cohorts had different ages at baseline (55–64 years, 1928–1957, 65–74 years, 1918–1927 and 75–84 years, 1908–1917).

## Results

### *Cohort differences in the educational gradient in network size and diversity*

Results of the multi-level regression analyses of network size and diversity are displayed in Table 2. The results of Model 1 on network size show that older adults with a higher educational level have a larger network size ( $B = 0.35$ , standard error (SE) = 0.04,  $p < 0.001$ ). Older adults from later-born cohorts also have a larger network size ( $B = 0.14$ , SE = 0.01,  $p < 0.001$ ). The insignificant interaction term between educational level and birth cohort ( $B = 0.003$ , SE = 0.002) shows that the positive relation between educational level and network size exists regardless of birth cohort. Females and younger older adults have a larger network. In Model 2, resources, skills and opportunities involving functional capacity, number of chronic diseases, cognitive functioning, partner status, frequency of church attendance, volunteering, mastery and net income are added. After controlling for these resources, higher-educated adults in later-born cohorts do gain more in network size compared to lower-educated adults in later-born cohorts ( $B = 0.006$ , SE = 0.002,  $p < 0.01$ ; see Figure 1). The other parameters of Model 1 do not change substantially after including the covariates, only the positive effect of being female on network size becomes larger. Those who have better cognitive functioning, have



**Table 1.** Description of means and percentages of the sample at baseline

	Total sample	Cohort				
		1908–1917	1918–1927	1928–1937	1938–1947	1948–1957
N	4,486	975	926	975	992	1,018
<i>Mean values or percentages</i>						
Network size (0–80)	15.71	12.48	13.79	15.40	15.30	21.23
Diversity (0–11)	5.03	4.15	4.62	5.17	5.33	5.83
Total emotional support received (0–36)	22.09	20.16	21.77	22.57	22.41	23.45
Total instrumental support received (0–36)	14.57	14.21	14.01	14.27	14.81	15.51
Total emotional support given (0–36)	22.01	19.36	20.61	21.28	23.72	24.87
Total instrumental support given (0–36)	14.99	10.67	13.67	15.65	16.91	17.82
Educational level attained (5–18 years)	9.75	8.40	8.73	9.46	10.38	11.64
Female (%)	52	49	53	52	53	52
Physical functioning (6–30)	28.11	25.66	28.07	29.16	28.69	28.91
Chronic diseases (0–7)	0.90	1.22	0.98	0.67	0.80	0.90
Cognitive functioning (0–30)	27.49	26.08	27.42	27.93	27.85	28.13
Having a partner (%)	74	53	72	81	84	81
Church attendance (1–6)	3.10	3.73	3.71	3.50	2.46	2.16
Volunteering (%)	34	15	28	38	43	43
Mastery (5–25)	17.43	16.80	17.31	17.99	17.52	17.51
Net income (€378–4,039)	1,525.20	1,395.79	1,437.88	1,610.44	1,586.69	1,586.99
Age at interview	66.05	80.07	70.12	60.34	59.94	60.34



**Table 2.** Linear multi-level regression of network size and diversity (N = 15,781)

	Network size				Network diversity			
	Model 1		Model 2		Model 1		Model 2	
	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>
Fixed effects:								
Constant	16.13***	0.13	15.96***	0.13	5.06***	0.03	5.00***	0.03
Cohort (years)	0.14***	0.01	0.16***	0.01	0.03***	0.002	0.03***	0.002
Age (years)	-0.03***	0.01	0.05***	0.01	-0.03***	0.002	-0.01**	0.003
Age <sup>2</sup>	-0.01***	0.00	-0.002**	0.0007	-0.001***	0.0001	-0.0002	0.0002
Female	1.29***	0.25	1.78***	0.24	0.28***	0.05	0.51***	0.05
Educational level attained (5–18 years)	0.35***	0.04	0.24***	0.04	-0.004	0.007	-0.03**	0.007
Cohort × Educational level attained	0.003	0.002	0.006**	0.002	-0.001	0.001	0.0002	0.001
Cohort × Educational level attained × Female	0.006	0.005	0.006	0.004	-0.000	0.001	-0.00	0.001
Physical functioning (6–30)			0.02	0.02			0.01	0.01
Chronic diseases (0–7)			-0.12	0.08			0.02	0.02
Cognitive functioning (6–30)			0.25***	0.03			0.05***	0.01
Having a partner			2.03***	0.19			0.90***	0.04
Church attendance (1–6)			0.64***	0.04			0.09***	0.01
Volunteering			0.94***	0.15			0.29***	0.03
Mastery (5–25)			0.12***	0.02			0.03***	0.01
Net income (€378–4,039)			0.0007***	0.0002			0.0001**	0.00

(Continued)

Table 2. (Continued.)

	Network size				Network diversity			
	Model 1		Model 2		Model 1		Model 2	
	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>
Random part respondent level:								
Intercept	48.416***	1.343	41.101***	1.208	1.889***	0.056	1.511***	0.048
Slope	-0.655***	0.063	-0.637***	0.058	-0.015***	0.003	-0.012***	0.002
Intercept-slope covariance	0.049***	0.007	0.050***	0.006	0.003***	0.0003	0.003***	0.0003
Random part observation level:								
Intercept	34.111***	0.494	34.347***	0.497	1.592***	0.023	1.594***	0.023
-2 log likelihood	109,451.6		108,959.9		60,389.1		59,628.7	

Note: SE: standard error.

Significance levels: \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

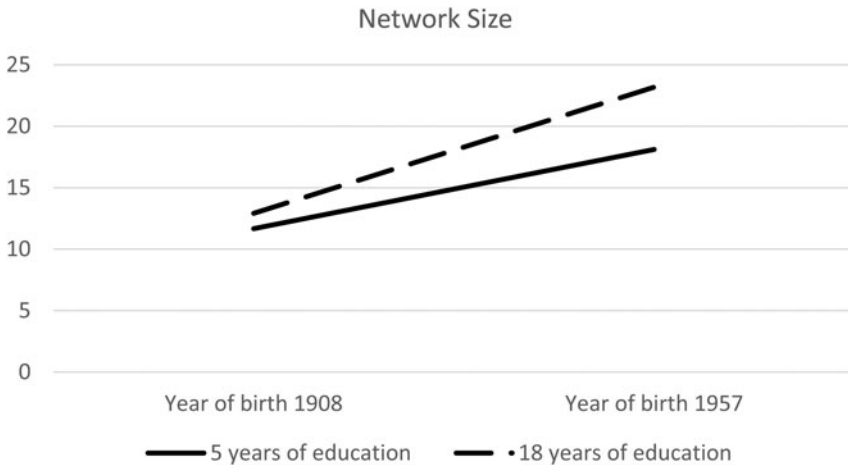


Figure 1. Educational gradient in network size.

a partner, have a higher frequency of church attendance, volunteer, have higher mastery and a higher income have a larger network.

For network diversity, the results of Model 1 show that there is no main effect of educational level on the diversity in social roles that are occupied within the network ( $B = -0.004$ ,  $SE = 0.007$ ), and the effect of educational level also does not differ by birth cohort ( $B = -0.001$ ,  $SE = 0.001$ ). Although higher-educated adults thus have a larger network size than lower-educated adults, and increasingly so across birth cohorts when controlling for resources, they do not have a greater number of different relationship types in their network. However, those in later-born cohorts do have a larger diversity in their personal network ( $B = 0.03$ ,  $SE = 0.002$ ,  $p < 0.001$ ) irrespective of their educational level, as do those who are younger and are female. When controlling for the covariates related to resources, skills and opportunities in Model 2, higher-educated adults actually have a less-diverse personal network ( $B = -0.03$ ,  $SE = 0.007$ ,  $p < 0.01$ ). Those who have better cognitive functioning, have a partner, have a higher frequency of church attendance, volunteer, have higher mastery and have a higher income have a larger diversity of social roles occupied in their network.

### **Cohort differences in the educational gradient in total given emotional and instrumental support**

The results of the multi-level regression analyses on total given emotional and instrumental support are in Table 3. Higher-educated adults give more emotional support than lower-educated adults ( $B = 0.38$ ,  $SE = 0.03$ ,  $p < 0.001$ ). Also, those in later-born cohorts give more emotional support to network members ( $B = 0.08$ ,  $SE = 0.01$ ,  $p < 0.001$ ). Although the difference in given emotional support between higher- and lower-educated adults becomes slightly smaller across birth cohorts, the interaction term fails to reach statistical significance by a small margin ( $B = -0.003$ ,  $SE = 0.002$ ). Females and those who are younger give emotional

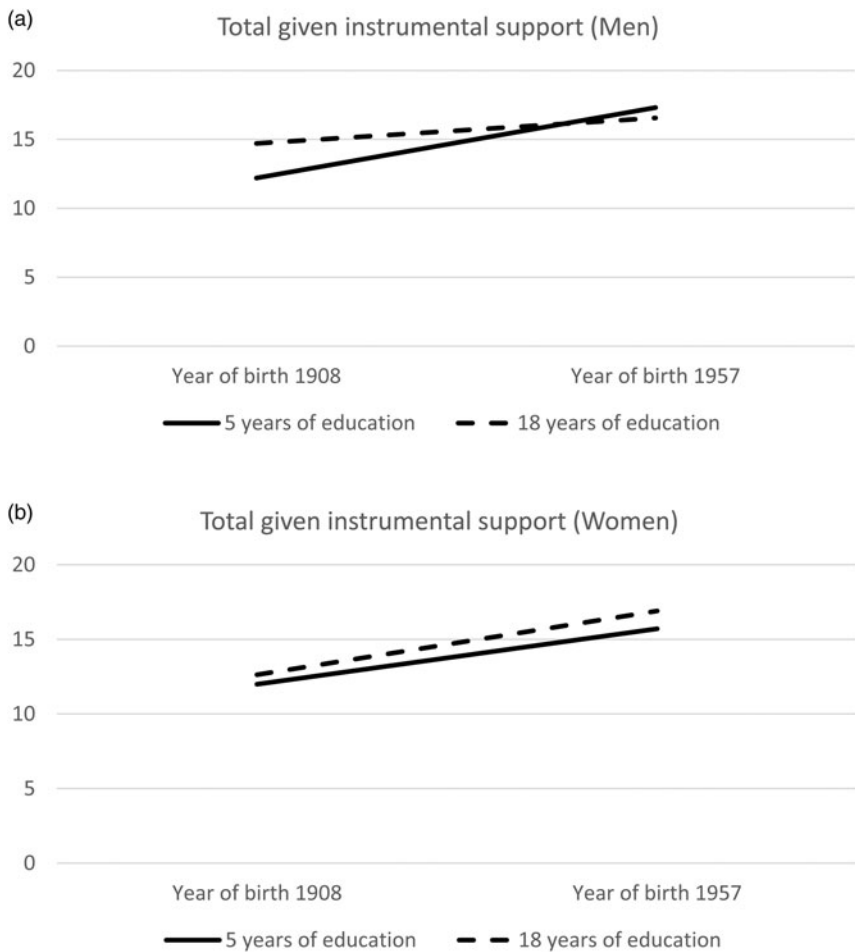
**Table 3.** Linear multi-level regression of total given emotional and instrumental support (N = 15,833 and N = 15,838, respectively)

	Total given emotional support				Total given instrumental support				
	Model 1		Model 2		Model 1		Model 2		
	<i>B</i>	<i>SE B</i>	<i>B</i>	<i>SE B</i>	<i>B</i>	<i>SE B</i>	<i>B</i>	<i>SE B</i>	
Fixed effects:									
Constant	22.64***	0.11	22.56***	0.10	14.69***	0.09	14.57***	0.08	
Cohort (years)	0.08***	0.01	0.09***	0.01	0.07***	0.01	0.08***	0.007	
Age (years)	-0.03**	0.01	0.001	0.01	-0.17***	0.01	-0.12***	0.01	
Age <sup>2</sup>	-0.004***	0.0007	-0.002**	0.001	-0.004***	0.001	-0.001*	0.0006	
Female	3.47***	0.19	3.45***	0.19	-1.25***	0.15	-0.89***	0.15	
Educational level attained (5–18 years)	0.38***	0.03	0.30***	0.03	0.13***	0.02	0.07***	0.02	
Cohort × Educational level attained	-0.003	0.002	-0.001	0.002	-0.003*	0.001	-0.002	0.002	
Cohort × Educational level attained × Female	0.003	0.004	0.003	0.004	0.005	0.003	0.006*	0.002	
Physical functioning (6–30)			0.006	0.02			0.12***	0.01	
Chronic diseases (0–7)			0.04	0.07			-0.13*	0.06	
Cognitive functioning (6–30)			0.23***	0.03			0.11***	0.02	
Having a partner			0.19	0.16			0.88***	0.14	
Church attendance (1–6)			0.29***	0.04			0.25***	0.03	
Volunteering			0.54***	0.13			0.81***	0.11	
Mastery (5–25)			0.04*	0.02			0.05**	0.02	
Net income (€378–4,039)			0.001***	0.0001			0.0001	0.0001	

Random part respondent level:								
Intercept	25.923***	0.830	24.016***	0.800	15.742***	0.519	13.960***	0.481
Slope	0.198***	0.043	0.175***	0.042	-0.302***	0.027	-0.291***	0.025
Intercept-slope covariance	0.042***	0.005	0.041***	0.005	0.016***	0.003	0.016***	0.003
Random part observation level:								
Intercept	26.721***	0.391	26.871***	0.394	22.024***	0.314	22.038***	0.313
-2 log likelihood	104,054.4		103,869.9		99,662.9		99,312.3	

Note: SE: standard error.

Significance levels: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .



**Figure 2.** Educational gradient in total given instrumental support, by gender: (a) men and (b) women.

support. These findings from Model 1 remain intact after including the covariates; the higher-educated and later-born cohorts give more emotional support, and the interaction term remains insignificant. Those with better cognitive functioning, higher frequency of church attendance, who volunteer, have higher mastery and a higher net income give more emotional support to their network; no differences are found with respect to functional capacity, chronic diseases and partner status.

Higher-educated adults also give more instrumental support ( $B = 0.13$ ,  $SE = 0.022$ ,  $p < 0.001$ ), just as those in later-born cohorts ( $B = 0.07$ ,  $SE = 0.01$ ,  $p < 0.001$ ). However, in contrast to the general proposition of widening educational gradients across birth cohorts, the difference between higher- and lower-educated adults actually becomes smaller over time ( $B = -0.003$ ,  $SE = 0.001$ ,  $p < 0.05$ ). After including the covariates in Model 2, higher-educated adults still give more

**Table 4.** Linear multi-level regression on total received emotional and instrumental support (N = 15,529 and N = 15,842, respectively)

	Total received emotional support				Total received instrumental support				
	Model 1		Model 2		Model 1		Model 2		
	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>	
Fixed effects:									
Constant	21.94***	0.11	21.86***	0.11	14.52***	0.09	14.59***	0.09	
Cohort (years)	0.01	0.01	0.03**	0.01	0.04***	0.01	0.04***	0.007	
Age (years)	-0.07***	0.01	-0.05***	0.01	0.05***	0.01	0.02*	0.009	
Age <sup>2</sup>	-0.002**	0.007	-0.001	0.001	0.003***	0.0006	0.002***	0.001	
Female	3.72***	0.19	3.58***	0.19	0.06	0.16	-0.33	0.16	
Educational level attained (5–18 years)	0.36***	0.03	0.29***	0.03	-0.03	0.02	-0.005	0.02	
Cohort × Educational level attained	-0.002	0.002	-0.0002	0.002	-0.001	0.002	-0.001	0.002	
Cohort × Educational level attained × Female	0.0002	0.004	0.0001	0.003	0.003	0.003	0.002	0.003	
Physical functioning (6–30)			0.01	0.01			-0.14***	0.02	
Chronic diseases (0–7)			0.10	0.06			0.09	0.05	
Cognitive functioning (6–30)			0.22***	0.02			0.09***	0.02	
Having a partner			-0.17	0.17			-0.73***	0.14	
Church attendance (1–6)			0.35***	0.04			0.30***	0.03	
Volunteering			0.40**	0.13			0.06	0.11	
Mastery (5–25)			0.009	0.02			-0.009	0.02	
Net income (€378–4,039)			0.0004***	0.0001			-0.0001	0.0001	

(Continued)



Table 4. (Continued.)

	Total received emotional support				Total received instrumental support			
	Model 1		Model 2		Model 1		Model 2	
	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>	<i>B</i>	SE <i>B</i>
Random part respondent level:								
Intercept	26.445***	0.853	24.639***	0.824	16.179***	0.573	15.442***	0.559
Slope	0.253***	0.044	0.220***	0.042	0.148***	0.031	0.129***	0.030
Intercept–slope covariance	0.038***	0.005	0.037***	0.005	0.031***	0.004	0.029***	0.004
Random part observation level:								
Intercept	28.395***	0.413	28.499***	0.415	23.327***	0.336	23.255***	0.335
–2 log likelihood	104,737.6		104,555.6		100,823.5		100,624.6	

Note: SE: standard error.

Significance levels: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

instrumental support, but the main effect of educational level is almost halved ( $B = 0.07$ ,  $SE = 0.02$ ,  $p < 0.001$ ). The interaction term between educational level and cohort becomes insignificant after including the covariates ( $B = -0.002$ ,  $SE = 0.002$ ). So, the closing gap between higher- and lower-educated adults in giving instrumental support can partly be understood from the increased resources, skills and opportunities available to lower-educated adults in later-born cohorts. Furthermore, there is a significant interaction effect of educational level and cohort by gender after including the covariates ( $B = 0.006$ ,  $SE = 0.002$ ,  $p < 0.05$ ). Among lower-educated men, the total instrumental support given increases more strongly than among higher-educated men (see Figure 2). In the cohort of 1908, higher-educated men by far gave the most instrumental support, whereas in the birth cohort 1958 lower-educated men actually give slightly more instrumental support than higher-educated men. Also, both lower- and higher-educated women give more instrumental support across birth cohorts, with higher-educated women giving more than lower-educated women. In the latest born cohorts, the instrumental support giving of both lower- and higher-educated women is similar to men's (see Figure 2). Those with better functional capacity, better cognitive functioning, who have a partner, a higher frequency of church attendance, volunteer, have higher mastery and a higher net income also give more instrumental support to their network.

### **Cohort differences in the educational gradient in total received emotional and instrumental support**

The results of the multi-level regression analyses on total received emotional and instrumental support are presented in Table 4. Higher-educated adults receive more emotional support than lower-educated adults ( $B = 0.36$ ,  $SE = 0.03$ ,  $p < 0.001$ ), and the effect of educational level does not differ by birth cohort ( $B = -0.002$ ,  $SE = 0.002$ ). Those who are younger and are female receive more emotional support, whereas there are no differences between birth cohorts. After including relevant covariates in Model 2, these findings remained intact; higher-educated adults receive more emotional support ( $B = 0.29$ ,  $SE = 0.03$ ,  $p < 0.001$ ). Those in later-born cohorts, who have better cognitive functioning, a higher frequency of church attendance, volunteer and have a higher net income also receive more emotional support.

There are no differences in receiving instrumental support by educational level ( $B = -0.03$ ,  $SE = 0.02$ ); higher- and lower-educated adults receive equal levels of instrumental support. However, irrespective of educational level, older adults in later-born cohorts do receive more instrumental support from their network ( $B = 0.04$ ,  $SE = 0.01$ ,  $p < 0.001$ ). Also, those who are older receive more instrumental support. After including the covariates in Model 2, those in later-born cohorts still receive more instrumental support from their network ( $B = 0.04$ ,  $SE = 0.007$ ,  $p < 0.001$ ), and the covariates do not explain this cohort difference. Those who have lower functional capacity, better cognitive functioning, that do not have a partner and have a higher frequency of church attendance receive more instrumental support from their network.

## Conclusion and discussion

In the present study, the aim was to investigate whether the educational gradient in personal network characteristics has widened across birth cohorts. Due to societal changes that demand more active involvement of individuals in gaining and maintaining network ties, the disadvantage faced by lower-educated older adults in their personal networks might be magnified across birth cohorts. The present study presents rather mixed evidence for this idea that lower-educated older adults are more disadvantaged in their personal network in today's society. Rather than showing a clearly marked increasing educational gradient disadvantaging lower-educated older adults in their networks over historical time, the findings in the present study hint at an improvement of the personal network across birth cohorts irrespective of educational level. Those in later-born cohorts were found to have larger networks, more diversity in the network, give more emotional and instrumental support, and receive more instrumental support. Also, the provision of social support is more equally distributed over gender and educational groups now than 25 years ago, as older women and lower-educated men provide more instrumental support to network members across birth cohorts. Overall, the findings cast doubt on the idea that the current societal context of individualisation disadvantages lower-educated older adults in social networks and social support.

For network size, a widening educational gradient across birth cohorts was found for network size. The disadvantage for those who are lower educated becomes slightly larger in later-born cohorts when controlling for resources, opportunities and skills. But a similar trend was not found for network diversity, which educational level does not impact on. Earlier studies on network composition have shown that the networks of lower-educated adults are traditionally often kin-centred, whereas the higher-educated networks are more often non-kin or wider community-centred (Ajrouch *et al.*, 2005; Suanet *et al.*, 2013). But once the more advantageous position of higher-educated older adults in resources, skills and opportunities are considered, lower-educated older adults actually have a slightly higher diversity of roles in their network, even though their networks are smaller. So lower- and higher-educated older adults do not differ in diversity in social roles as the result of initial differences in education, but due to resources, skills and opportunities that arise across the lifecourse. There is not much indication that the process of individualisation has radically altered the network size and composition of lower-educated older adults in a negative way. So, societal change does not seem to have eroded the networks of lower-educated older adults by creating friction between the generally more communal self-concepts and kin-based networks of lower-educated older adults, and the changing societal context demanding more individual agency in social ties.

Results on giving emotional and instrumental support suggest that differences between the higher- and lower-educated older adults in giving support decrease across cohorts, especially for instrumental support. Increased psychological resources (mastery) and social opportunities (partner status, church attendance, volunteering) explain why lower-educated adults in later-born cohorts tend to give more instrumental support. At the same time, older adults from later-born

cohorts provide more emotional and instrumental support. These observed cohort differences remain fully intact after controlling for a wide range of resources, skills and opportunities, although an interaction by gender is also found. The smaller increase in instrumental support given by higher-educated men and the simultaneous larger increase in instrumental support given by lower-educated men as well as lower- and higher-educated women hints at a democratisation of resources and opportunities to help others and most likely also perceptions about who is able to do so. The finding hints in the direction of a cultural shift in which older adults see themselves and are seen by others as active contributors to society and their networks, which is also reflected in the societal and policy discourse on active ageing (Foster and Walker, 2015). Concerning the closing gender gap in instrumental support provision over historical time, the process of emancipation is likely to have eroded traditional gender roles and has provided women with an enlarged set of social roles to fulfil (England, 2010), including more opportunities and resources to provide others in the network with instrumental support.

Concerning the receipt of emotional and instrumental support, higher-educated older adults do receive more emotional support from their network, but this does not become magnified across birth cohorts. As lower-educated adults have fewer resources than higher-educated adults on average, these findings exemplify that emotional support is not necessarily given to those who have a highest need for it. Instrumental support is mostly directed at older adults with low functional capacity and that do not have a partner. However, one could say that the receipt of emotional support is rather abundant in the sample and much more frequent than the receipt of instrumental support. Irrespective of educational level, older adults in later-born cohorts receive more emotional and instrumental support, also after taking all covariates into account. As it was also found that older adults give more support in later-born cohorts, it confirms that older adults more than before can maintain a high balance in their support exchange in old age in their social relationships, which is likely positive for the maintenance of their social relationships when they grow older (Suanet and Van Tilburg, 2019). This can be both a reflection of or a consequence of a societal context in which continuous fulfilment from relationships might be more important than before.

With regards to educational gradients in networks, these have not widened except for network size, and in some cases even become smaller. Across cohorts, larger and more diverse networks are found, in which more support is exchanged, irrespective of educational level. So, the societal context involving a larger need for individual's active management in building their social lives seems to benefit older adults with different educational levels in some way. Given the known differences between lower- and higher-educated adults in networks and self-concepts, these benefits might actually run via two distinct pathways. For higher-educated adults, the societal context of individual management of ties matches their self-concepts focusing on agency, which can help them create and maintain their networks. For lower-educated older adults, the persisting focus on others and community in self-concepts combined with the cultural shift emphasising older adults as active contributors could likely make them feel an incentive to provide more social support to others.

The degree to which these findings transfer to other societal contexts is open to debate. Large-scale societal changes like individualisation and de-traditionalisation are present within many Western and also non-Western countries and, therefore, similar findings can be expected as in the Dutch context. However, the Netherlands is also known for having a relatively low level of economic and social inequality when compared to other Western and non-Western countries (Organisation for Economic Co-operation and Development, 2020a, 2020b). The Netherlands has a relatively generous welfare state and schemes such as passes giving free or discounted activities for low-income people to enable social, cultural and sports participation. The findings here thus do not rule out that in contexts with larger socio-economic inequalities, lower-educated older adults in later-born cohorts might be (come) more disadvantaged in terms of their personal networks due to societal change. As such, studying the interrelation between socio-economic status and social outcomes remains of vital importance.

The present study has several methodological strengths and limitations. It was not possible to differentiate fully between resources, skills and opportunities for social contact as explanations of educational differences in personal networks. Nonetheless, to the extent possible, measures reflecting relevant skills, resources and opportunities have been included such as cognitive functioning, physical functioning, mastery and church attendance. We also had no suitable data to consider the changes in communication technology adequately, as most of these were not yet invented or diffused enough when the LASA study originated in 1992. A distinct advantage of the present study for answering questions on changing educational gradients in personal networks is the coverage of a large number of birth cohorts that were clearly subject to dissimilar societal conditions during the lifecourse. Data allowing for a comparison across a large number of cohorts at different ages over a timespan of almost 25 years on many aspects of older adults' functioning is exceptional.

To conclude, the current study investigated educational differences in social networks. Contrary to the notion that individualisation disadvantages lower-educated older adults, we find that networks are larger, more diverse and have more exchanged social support across birth cohorts, irrespective of educational level. Undeniably, we need to obtain a fine-grained understanding of how the current societal structure and culture give rise to social network outcomes for different categories of older adults.

**Financial support.** This work was supported by a Veni grant from the Netherlands Organisation for Scientific Research (NWO) (file number 451-14-019). The Longitudinal Aging Study Amsterdam is supported by a grant from the Netherlands Ministry of Health Welfare and Sports, Directorate of Long-Term Care. The data collection in 2012–2013 and 2013–2014 was financially supported by the NWO in the framework of the project 'New Cohorts of Young Old in the 21st Century' (file number 480-10-014).

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**Cite this article:** Suanet B (2024). Educational gradients in older adults' personal network size, diversity and social support: a widening gap between haves and have nots across birth cohorts? *Ageing & Society* 44, 1051–1072. <https://doi.org/10.1017/S0144686X22000654>