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Original Article

Cohort Difference in Age-Related Trajectories in Network Size in Old Age: Are Networks Expanding?

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Abstract

Objectives: Contemporary societal views on old age as well as a rise in retirement age raise the question whether patterns of stability and/or decline in network size as found in earlier studies similarly apply to later birth cohorts of older adults.
Methods: Change score models are estimated to determine cohort differences in age-related trajectories in network size. Two birth cohorts (1928–37 and 1938–47, 55–64 at baseline in 1992 and 2002) of the Longitudinal Aging Study Amsterdam are followed across 4 observations over a time span of 9 years.
Results: Age-related trajectories in network size differ between the early and late birth cohort. The late birth cohort makes large gains in network size around retirement age, but this increase does not hold over time. Increased educational level and larger diversity in social roles relate to the cohort difference. Nonetheless, cohort difference prevails even after adjusting for these factors.
Discussion: The peak level in the network size in the late birth cohort hints at stronger preference and more opportunities to gain and maintain social relationships around retirement age in the current societal structure and culture. The subsequent drop-off in network size suggests that these ties are mostly used to adapt to the retirement transition.

Keywords: Cohort analysis, Longitudinal methods, Social change, Social networks

Humans are a social species and, regardless of age, suffer if their need to feel socially attached is not fulfilled (Hawkley & Cacioppo, 2010; Maslow, 1943). The importance for social resources for individual well-being may increase with advancing age when declines in health and mobility lead to heightened demands for support and incentives for social engagement in an individual's social network (Antonucci, Ajrouch, & Birditt, 2014). Besides the quality of social relationships, the size of an individual's social network might play a crucial role. A longitudinal study of people 65 years and older has shown that personal network size determines to a degree not only the availability of social support but also the opportunities for social participation (Huxhold, Fiori, & Windsor, 2013). Thus, network size is highly relevant for the maintenance of health and well-being in older ages (see also Cornwell & Waite, 2009). Unfortunately, despite an increasing need for social resources at older ages, previous studies on older cohorts have shown stability or decrease in network size across old age, with a steeper decrease among the oldest old (Aartsen et al., 2004; Cornwell, Laumann & Schumm, 2008; Van Tilburg, 1998). These studies also documented increasing numbers of close relatives in the network at the expense of nonkin ties as people age.

Here, we argue that the pattern of stability and/or decline in network size is partly a consequence of specific sociohistorical conditions and does not necessarily apply to more recent cohorts of older adults. Emphasis on the opportunities and potential of older adults who are relatively healthy and young (Laslett, 1991; Martinson & Minkler, 2006), as well as a rise in retirement age (Holzmann, 2013), are likely to have implications for network size. Late birth cohorts of older adults have more resources, for example, higher educational levels, which could help to maintain and gain relationships throughout old age. In addition, nonkin ties are more numerous in networks of older adults nowadays (Suanet, Van Tilburg & Broese van Groenou, 2013), possibly increasing diversity in social roles in the network. This study, therefore, aims to understand the influence of sociohistorical change on longitudinal developments in network size. Moreover, we will explore whether sociohistorical change might affect the shape of development within a given time interval. To achieve this, we will use a method that allows the identification of nonlinear patterns. Finally, after identifying potential cohort differences, we aim to shed some light on the origins of these differences by linking cohort differences in network size to cohort differences in resources and social roles. We investigate cohort differences in network size by comparing two 10-year Dutch cohorts of older adults, born 1928–37 (early birth cohort) and 1938–47 (late birth cohort), aged 55–64 at baseline in 1992 and 2002, respectively, across four waves over a time span of 9 years.

Changes in Network Size Across Old Age

Social gerontology has long used a deficit model focusing on the loss of social ties in old age. The disengagement theory that states that older adults withdraw from social roles as a natural and unavoidable development to prepare for their death is a clear example (Cumming & Henry, 1961). In the socioemotional selectivity theory (Carstensen, 1992), networks are assumed to shrink as a result of selection processes. It is argued that more peripheral ties and roles are relinquished because they do not provide the emotional regulation that older adults prefer, resulting in smaller and emotionally closer networks. Though incomplete, a focus on loss in old age is not completely unfounded. Certain life course transitions and a deterioration in health make older adults vulnerable to a decline in network size. Death and incapacity of age-peers result in the loss of social ties. In addition, loss of roles due to retirement can reduce the size of the personal network further (Weiss, 2005). Older people have been found to be more likely to spend time alone than younger age groups (Marcum, 2013). In addition, age-related health problems have been associated with lower social integration in networks as these limit participation in social activities (Cornwell & Waite, 2009). Schafer (2015) found that health is as an important assortative mechanism: people were less likely to identify those in bad health as a close tie.

However, old age may also offer opportunities to maintain and gain social relationships. Participation in social activities and volunteering in old age might result in new network members (Cornwell, Laumann and Schumm, 2008). Additionally, physical health decline bring in (new) helpers (Aartsen, et al., 2004). Rather than solely focusing on loss, we propose that the personal network in old age can concurrently demonstrate gains, stability, and losses in ties. Moreover, all of these different developments depend on both the individual's characteristics and the social context of the individual.

Previous studies give mixed evidence concerning personal network size across old age. Cross-sectional studies generally hint at a decline in network size in old age. Cornwell, Laumann, and Schumm (2008) found age to be negatively related to network size between ages 57–85 (birth cohorts 1920–49). In addition, Smith and colleagues (2015) demonstrated decreasing quantities in six different relationship dimensions after the age of 60. Longitudinal studies on social network size change are rare. Van Tilburg (1998) found that network size remained stable over a time span of 4 years in a sample of Dutch older adults aged 55–85 years, born 1908–37. Shaw and colleagues (2007) showed that received tangible and informational social support increased over 10 years, whereas given social support and contact with friends declined. In a meta-analysis on social network change across the life course, Wrzus and colleagues (2013) showed that the average network size steadily declines over the life course from adolescence to older adulthood.

Cohort Differences in Age-Related Change in Network Size: Do Networks Expand?

Personal networks are influenced by the sociohistorical context in which they are embedded. During the last decades, large sociohistorical changes occurred that probably have had an impact on network size in old age. For example, novel views on old age may not only have affected the self-image of older adults but also attitudes of others towards them (Kotter-Grühn & Hess, 2012). Societal representations of younger older adults have dramatically shifted towards emphasizing their productive potential (Martinson & Minkler, 2006). Especially the postretirement phase (also termed "Third Age") has been associated with opportunities to gain and maintain social relationships as, for most people early on in retirement, employment and family obligations lessen and health problems are still far-off (Laslett, 1991). Images of groups are often shaped by the social roles we see them perform (Eagly & Wood, 2012). Retirees are seen as filling more diverse roles in contemporary society. Older adults in later birth cohorts are, for example, more involved in informal and formal social participation (Einolf, 2009; Broese van Groenou & Deeg, 2010). Although mandatory retirement age for the two Dutch cohorts studied was 65 years, generous early retirement policies allowed labor market exits at ages of 55–60 for our early cohort (Statistics Netherlands, 1995). From 2001 to 2006, the average retirement age was 61 years (late cohort entered study in 2002, also aged 55–64) (Statistics Netherlands, 2017). In addition, groundbreaking advances in information and communication technologies over the last two decades substantially lowered barriers to maintain contact with people across large geographical distances (Wang & Wellman, 2010). Finally, age homophily in networks is substantial (McPherson, Smith-Lovin & Cook, 2001). As life expectancy increased over the last decades (Mathers et al., 2015), more age-peers might be available in later life. From the aforementioned reasons, larger personal networks in later birth cohorts are expected.

Furthermore, resources such as education and health that are theoretically and empirically strongly linked to the size social networks in old age (e.g., Huxhold, Fiori, & Windsor, 2013) changed across birth cohorts. Higher educated people are more geographically mobile across the life course resulting in larger and less proximal networks (Ajrouch, Blandon, & Antonucci, 2005). Higher education is correlated with greater cognitive skills and resources necessary to develop and sustain personal relationships (Broese van Groenou & Van Tilburg, 2003). Finally, aging adults with a lower socio-economic status lose more confidants than higher educated adults and are less able compensate these losses by adding new network members (Cornwell, 2015). Thus, network sizes could be larger in later than in earlier birth cohorts, because the average attained level of education has increased strongly across birth cohorts (Liefbroer & Dykstra, 2000). In contrast, evidence on cohort differences in health has been less equivocal. In the compression of morbidity hypothesis, it has been argued that chronic diseases tend to be compacted in a more narrow time period near the end of life (Fries, Bruce, & Chakravarty, 2011). Evidence on cohort differences in (mild) disability and self-rated health is, however, more mixed (e.g., Galenkamp, et al., 2013; Martin & Schoeni, 2014). Better health has been linked to larger networks in old age (Cornwell & Waite, 2009).

As said before, societal views on old age affect self-image and behavior and vice versa. If network sizes of older adults are larger in the late cohort, this could be associated with an increasing diversity in social roles in the network. The social network of older adults in later birth cohorts displays a larger percentage of nonkin ties than earlier cohorts up into late adulthood (Ajrouch, Akiyama, & Antonucci, 2007; Suanet, Van Tilburg, & Broese van Groenou, 2013). This fact hints at the possibility of occupying a larger diversity in social roles in the personal network in later birth cohorts. Fertility, however, did decline over the last decades (Balbo, Billari, & Mills, 2013), resulting in a reduced number of family ties. Consequentially, specific familial roles (e.g., children, siblings, grandchildren) could be occupied less often in the personal network in late birth cohorts. In addition, Smith and colleagues (2015) showed that personal networks of older adults become less multiplex with time, thus having a smaller and more specialized network. Considering both lines of argumentation, it remains an open question whether or not a potentially larger network size in cohorts born later coincides with larger diversity in social roles in these cohorts.

Studying Cohort Differences

Cohort differences in age-related trajectories in network size can appear in three forms: (a) differential starting levels, (b) delay of onset of decline, and (c) differential age-related trajectories (Suanet, Van Tilburg, & Broese van Groenou, 2013). First, people could enter old age with different network sizes that persist throughout old age. Second, the onset of decline in network size could be postponed until later ages in the late birth cohort. Increased resources like better health could make it possible to retain a larger personal network longer than before. Third, birth cohorts can have different gradients of change in network size across old age. Societal changes are likely to have altered the process of social ageing through increased preferences, possibilities, and/or necessity to gain and maintain social relationships in old age, most likely making decline in network size decelerated in the late birth cohort. Age-related trajectories in network size can show any combination of these three types of cohort differences.

Taken together, in the present study, we aim to test the following hypotheses:

Hypothesis 1: Older adults in the late birth cohort have a larger network size during the 9-year time span that they are followed, than older adults in the early birth cohort.

Hypothesis 2: More resources (i.e., higher level of education and better health) in the late birth cohort can explain the larger network size in the late birth cohort.

Hypothesis 3: A greater diversity in social roles in the late birth cohort is associated with the larger network size in the late birth cohort.

Methods

Data

Data from the Longitudinal Aging Study Amsterdam (LASA), a cohort-sequential and multidisciplinary research program on physical, cognitive, social and emotional functioning of older adults, is employed (Hoogendijk et al., 2016; Huisman, 2011). The nationally representative sample was drawn from the population registers of 11 Dutch municipalities in three geographic regions that vary in religious climate and degree of urbanization. The sample is used in two studies: first, the NESTOR study on Living Arrangements and Social Networks (LSN); second, LASA. The oldest old, primarily the eldest men, were oversampled. The initial response rate (the number of complete and partial interviews, divided by the total number of eligible persons in the sample plus a fraction of those persons in the sample but of whom eligibility could not be determined) was 60% (N = 3,805). The cooperation rate (the number of completed interviews divided by the total number of contacted eligible persons) was 62%. Respondents (3,107) born 1908–1937 were included in the first LASA observation (1992–93), on average 11 months after the LSN interview, with a response rate of 85% and a cooperation rate of 89%. Follow-ups were conducted in 1995–96 (N = 2,545), 1998–99 (N = 2,076), 2001–02 (N =1,691), 2005–06 (N = 1,257), 2008–09 (N = 985), and 2011–12 (N = 614). A new cohort, age range 55–64, was recruited from the same sampling frame in 2002/03, exactly 10 years after the first cycle of the original LASA cohort. The new cohort consisted of 1,002 men and women born 1938–47 (initial response rate was 55% and cooperation rate was 62%). In subsequent observation cycles, respondents from this new cohort were combined with those from the original cohort. To test our hypotheses on age and cohort differences in the educational gradient of social network size and diversity, we use information from two 10-year birth cohorts, 1928–37 and 1938–1947, that were followed over a time span of 9 years. At baseline observation of the 1928–37 birth cohorts in 1992–93 and the 1938–47 cohorts in 2002/03, they were aged 55–64. We investigate the two birth cohorts only at overlapping age ranges to ensure comparability. As a result, we use four observation cycles for each 10-year cohort. At the fourth observation cycle (2002–03 and 2012–13, respectively), respondents were aged 67–76.

Of the 2,139 respondents (birth cohort 1928–37: N = 1,137, birth cohort 1938–47: N = 1,002) that were interviewed at some point, 1% (N = 163) was deceased before they were approached, 2% (N = 265) refused to be interviewed. Less than 1% (N = 54) was too ill, physically or cognitively, to be interviewed; less than 1% (N = 53) could not be contacted mostly due to residential relocation; and 0.1% (N = 8) was institutionalized making their networks incomparable to those living in the community. Reasons for not having valid data include an abridged or terminated interview at an observation (N = 158), a telephone interview for those too ill to partake in the entire face-to-face interview (in a telephone interview, questions on the personal network are not asked; N = 266) or item nonresponse on personal networks (N = 15). We included respondents having valid data on at minimum one wave. The final sample consisted of 1,962 respondents having 6,313 person-year observations (M = 3.2 observations). Of these 1,962 respondents, 971 respondents are from the cohort 1928–37 and 991 respondents from the cohort 1938–47.

Measurements

Personal network size and diversity

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, neighbors, contacts through work and school, members of associations, and other nonkin relationships. For each of these 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. The "network size" was measured by counting all identified contacts in the personal network (range = 0–88). In the analyses, network size was T-standardized (i.e., the mean was scaled to 50 and the standard deviation to 10). "Network diversity" was assessed using a slightly adapted version of the Social Network Index of Cohen and colleagues (1997). This is the number of social roles in which a respondent has regular contact, which is biweekly or more often, with at least one person. For each role that is covered by their regular contacts they receive one point (for analogous measurement, see also Ellwardt, Van Tilburg, and Aartsen, 2015). Contacts were classified into 13 social roles: spouse, child, child-in-law, sibling, sibling-in-law, parent, (other) relative, close friend, acquaintance, neighbor, (former) colleague, voluntary organization, and other group. A higher sum score reflects a greater diversity in roles in the personal network. As the categories above 10 roles had very low numbers, they were collapsed into a category of having 10 or more roles. Please note that because the network size and diversity are based on the same network delineation, we can only determine associations, not causality.

Resources

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. We measured "functional capacities" with six questions about activities of daily living, based on Katz, Ford, Moskowitz, Jackson, and Jaffe (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. We summed item scores to obtain a scale score ranging from 6 (poor) to 30 (good). The "Number of chronic diseases" for seven major chronic conditions was counted from 0 to 7. We included "self-perceived health" (1 = poor, 5 = very good).

Control variables

Finally, we adjusted for sample differences in "age at the interview" and controlled for "gender" (0 = male, 1 = female).

Procedure

To examine cohort differences in longitudinal change, a methodological model able to describe development in all cohorts with the same acuity is needed. Only then, it is possible to disentangle substantive cohort effects from differences arising due to differential model fit. To meet this requirement, we employed a number of different approaches. We focused on models based on multi-group structural equation modeling, since these (a) account for measurement error and selective drop-out, (b) take covariations between predictor variables into account, (c) explicitly model interindividual differences in changes, and (d) can directly contrast model parameters across groups (McArdle, 2009). All analyses were conducted with MPlus 8. Visual inspection of the network data revealed a distinct nonlinear shape of the longitudinal development in the younger cohort. Network size in the younger cohort increased from T1 to T2 when the majority of the sample reached the average retirement age, and decreased thereafter. Extrapolation techniques revealed that neither classic polynomial latent growth models (up to a polynomial of the third order) nor dual change score models could adequately capture the steep nonlinear change in the younger cohort. Thus, we adapted a latent change score modeling technique (see McArdle, 2009 for a general introduction) put forward by Mun, von Eye and White (2009) in the context of evaluation research, which is particularly feasible for designs consisting of a limited number of measurement points. Within this approach the overall development across the observation period is deconstructed into a latent (i.e., free of measurement error) level parameter and a number of latent change score parameters that are optimally easily interpretable. In our particular case, we set the latent intercept of our developmental curve to T2 (i.e., Intercept in Figure 1A), because this was the point of peak

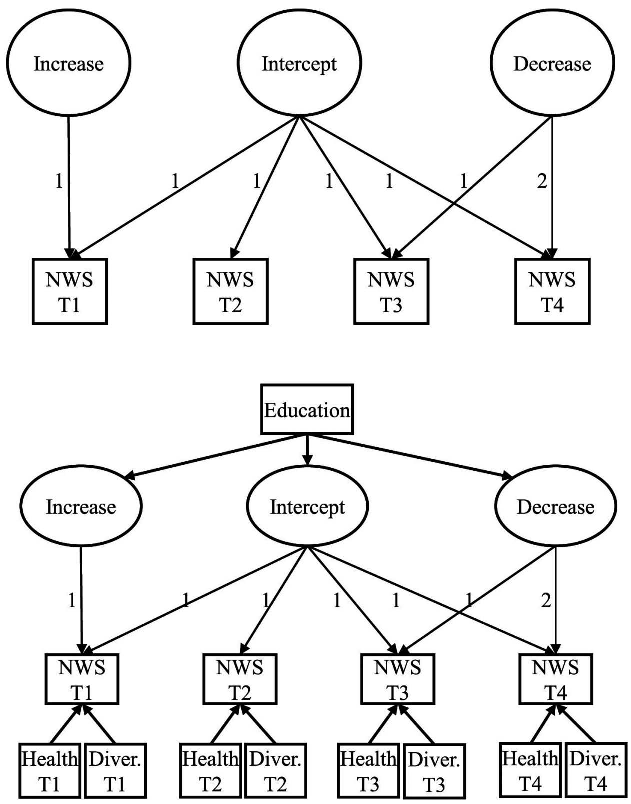

Figure 1. (A) Base analytical model for change in network size. (B) Full analytical model for change in network size.

performance in the younger cohort. Subsequently, we estimated a latent slope factor (i.e., Increase in Figure 1A) from T1 to T2 that depicts the increase in network size from the beginning of the assessment up to the point when most participants reached the retirement age. Finally, we introduced an additional linear slope factor describing the decrease from the peak performance at T2 through the subsequent assessments of T3 and T4 (i.e., Decrease in Figure 1A). We deviated from the method of Mun and colleagues (2009) by using a multi-group design. This means that the Intercept, Increase, and Decrease parameters were estimated in both groups separately and could have been compared with chi-square model contrasts in the usual way. We were, however, interested in obtaining an interpretable estimate of the effect size of the cohort effect, which was—as confirmed by visual inspection and preparatory analyses—a function of age. Thus, we specified the expected mean values of the network size at T1 (i.e., the starting level), at T2 (i.e., the peak level), and at T4 (i.e., the final level) as derived from the latent change score model in both cohorts as additional parameters in the multi-group SEM. The expected mean value of network size at T1 in the younger cohort was, for example, computed by subtracting the increase parameter of this group from the Intercept parameter of this cohort. Cohort effects were then tested by setting the average values of network size at T1, T2, and T4 consecutively equal in both groups. If these equality constraints resulted in a significant loss in model fit, it could be concluded that there was cohort effect at that specific time point. By subtracting the expected mean values of the network size of the younger cohort from the expected mean values of the older cohort and dividing this difference by their averaged standard deviation, we were able to obtain an approximate effect size of the cohort effect in terms of Cohen's d.

Our model addressed the problem of the selective attrition bias by employing a full information maximum likelihood approach (FIML). The FIML algorithm yields good parameter estimates and standard errors if patterns of missing data are related to variables in the statistical model (Graham, 2009). In all models, all available information on functional capacity, chronic diseases and self-rated health, network size, and role diversity as well as age, gender, and education were either included directly in the model or used as auxiliary variables in the FIML algorithm. We depict the effect of the influence of the FIML method in the Supplementary Figure 1.

There were only minor differences between the cohorts in terms of age and gender ratio. The younger cohort sample was on average 4.1-month younger and included 0.36% more females. Nevertheless, we adjusted for both variables in all of our analyses. The intercept, increase and decrease parameters were regressed on age and gender in every model reported in this study. Age was unrelated to developments in network size (ΔX^2 = 1.63; Δdf = 6; p = .950). In contrast, gender was significantly related to mean levels and changes in network size (ΔX^2 = 17.24; Δdf = 6; p = .008). Women demonstrated on average a more positive development in network size than men, particularly in the younger cohort. Differences between cohorts remained, however, essentially unchanged after the adjustment (Supplementary Figure 2).

To examine whether or not cohort differences in the development of the network size were potentially caused by increases in resources (i.e., education and health) and role diversity, we sequentially introduced covariates in our latent change score model. At first, education as a stable individual difference was introduced as predictor of the latent model factors (see Figure 1B for the full analytical model). Secondly, measures of health at the respective measurement points (i.e., T1 to T4) were included as predictors on the observed scores of network size at the corresponding time points. Finally, the measures of role diversity from T1 to T4 were included.

Results

Descriptive analyses

Descriptive statistics of the sample are displayed in Table 1. In the early birth cohort, network size becomes smaller across the four observations. In the late birth cohort, network size increases substantially from T1 to T2 and subsequently declines again. Network size is, therefore, larger in the late birth cohort at T2 and to a lesser extent at T3 than in the early birth cohort, but both cohorts display the same network size at the other two observations. Those in the late birth cohort are, on average, more highly educated. No cohort differences in functional capacity are observed. Self-rated health is slightly better in the late birth cohort. In both birth cohorts, functional capacity and self-rated health decline slightly from T1 to T4. Chronic diseases are more numerous in the late birth cohort at each observation, and in both cohorts chronic diseases increase after T2. Diversity in social roles in the network is larger in the late birth cohort, except at T4 when they are equal.

Age-Related Changes in Network Size

First, we estimated the base analytical model with no predictors (unadjusted model, Figure 2A and B). The network size did not differ between birth cohorts at T1 (ΔX^2 = 0.11; Δdf = 1; p = .738) and T4 (ΔX^2 = 0.37; Δdf = 1; p = .541). The late birth cohort demonstrated a higher network size at T2 (i.e., peak level) than the early birth cohort (ΔX^2 = 16.96; Δdf = 1; p = .000). Thus, hypothesis 1 is partly confirmed. However, the two birth cohorts did not differ at the starting point of their respective 9-year observation period but rather in terms of their longitudinal change. In contrast to the early cohort, the average network size of the late cohort increased from T1 to T2. The network size decreased

Table 1. Sample Characteristics (N = 1,962) by Birth Cohort According to Observation

	T1		T2		T3		T4		Time-invariant	
	1928–37 (N = 958)	1938–47 (N = 990)	1928–37 (N = 813)	1938–47 (N = 833)	1928–37 (N = 725)	1938–47 (N = 714)	1928–37 (N = 645)	1938–47 (N = 635)	1928–37 (N = 969)	1938–47 (N = 991)
Network size	15.42 (8.81)	15.30 (9.26)	16.10 (9.38)	18.03 (10.17)	16.46 (9.67)	17.36 (9.74)	16.39 (9.10)	16.81 (9.88)		
Educational level (5–18)[a]									9.46 (3.29)	10.39 (3.40)
Functional capacity (6–30)	29.18 (2.35)	28.69 (3.06)	28.86 (2.65)	28.68 (3.04)	28.61 (2.99)	28.53 (3.19)	28.28 (3.14)	28.44 (2.93)		
Chronic diseases (0–6)	0.66 (0.83)	0.80 (0.90)	0.88 (0.96)	0.94 (0.95)	1.04 (1.00)	1.07 (1.03)	1.18 (1.04)	1.28 (1.07)		
Self-rated health (1–5)	3.69 (.88)	3.66 (0.96)	3.72 (.88)	3.75 (.85)	3.71 (.80)	3.79 (.86)	3.63 (.90)	3.74 (.87)		
Network diversity (0–10)	5.17 (1.97)	5.33 (2.06)	5.26 (1.89)	5.67 (1.97)	5.22 (1.94)	5.45 (1.93)	5.25 (1.94)	5.26 (1.96)		

Note. [a]Educational level is a time-invariant predictor. The M and SD refer to respectively 969 and 991 respondents who have a valid value on the educational level, at their baseline observation.

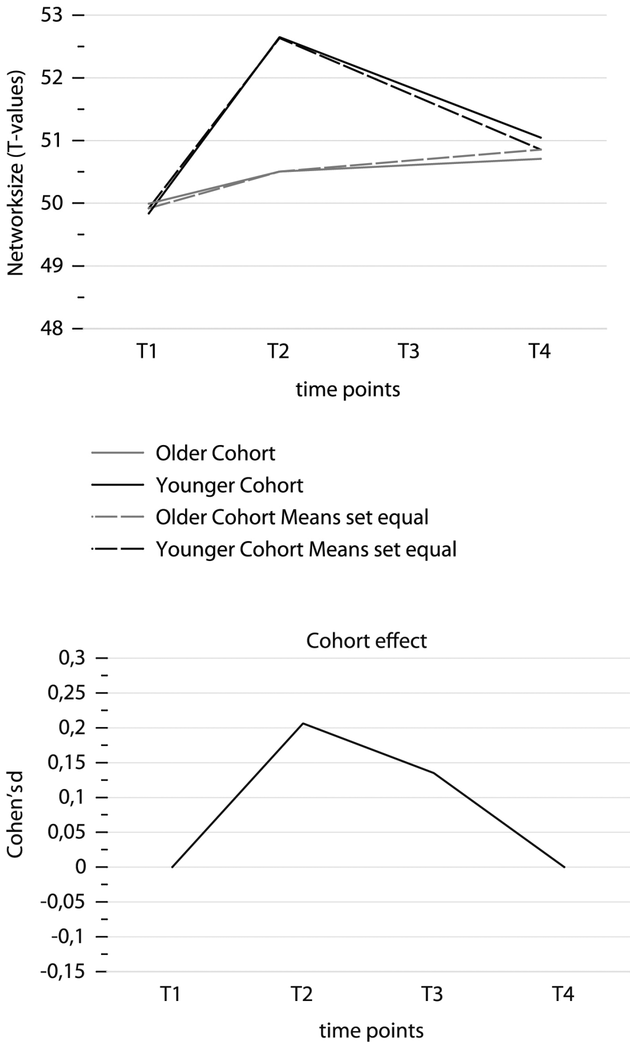

Figure 2. (A) Estimation of network size from T1 to T4: no predictors. (B) Cohort effect: no predictors.

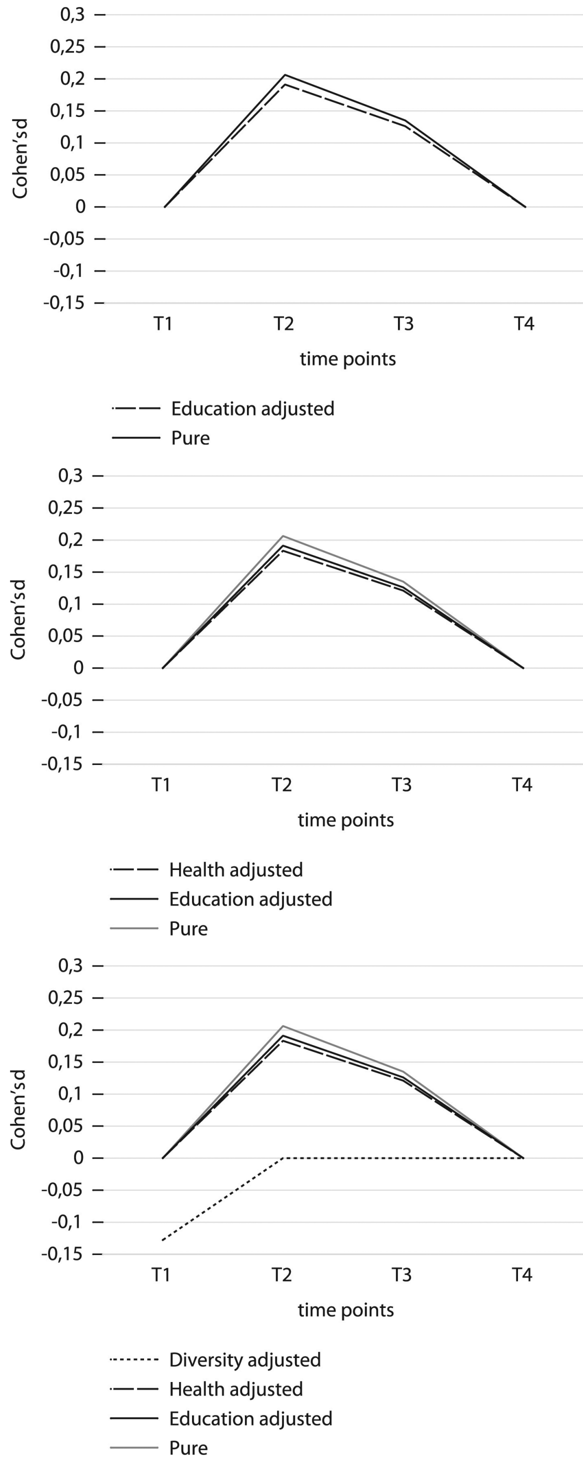

Figure 3. Cohort effect: (A) only education, (B) only education and health, and (C) education, health and diversity Adjusted.

afterwards until T4, at which point the network size of both cohorts were statistically indistinguishable.

Do Resources Explain Age-Related Changes in Network Size?

Second, we added education to the model. The late birth cohort sample experienced, on average, approximately one more year of education than the early birth cohort. Education was related to developments in network size ($\Delta X^2 = 50.02$; $\Delta df = 3$; $p = .000$) but the effect of education did not differ between birth cohorts ($\Delta X^2 = 2.99$; $\Delta df = 3$; $p = .394$). After controlling for birth cohort differences in education (Figure 3A), the network size still did not differ between birth cohorts at T1 ($\Delta X^2 = 1.183$; $\Delta df = 1$; $p = .277$) and T4 ($\Delta X^2 = 0.10$; $\Delta df = 1$; $p = .755$). The late birth cohort still demonstrated a higher network size at T2 (i.e., peak level) than the early birth cohort ($\Delta X^2 = 10.66$; $\Delta df = 1$; $p = .001$) but the effect size was slightly reduced. Thus, a higher level of education can partly explain the increase in network size at T2 and T3 for the late birth cohort.

Third, our health measures were added. The late birth cohort sample demonstrated on average slightly worse functional health and physical health but showed a minimal better self-rated health on average across all time points. Health was related to developments in the network size (ΔX^2 = 23.83; Δdf = 3; p = .000). The effect of health did not differ between birth cohorts (ΔX^2 = 2.71; Δdf = 3; p = .439). After controlling for birth cohort differences in health (Figure 3B), network size did not differ between birth cohorts at T1 (ΔX^2 = 0.74; Δdf = 1; p = .389) and T4 (ΔX^2 = 0.25; Δdf = 1; p = .616). The late birth cohort still demonstrated a higher network size at T2 (i.e., peak level) than the early birth cohort (ΔX^2 = 9.95; Δdf = 1; p = .002). Still, health cannot explain much of the peak level at T2 of the late birth cohort. In relation to Hypothesis 2, only a higher attained level of education and better self-rated health in the late birth cohort provide a minor explanation. Cohort differences in age-related trajectories in the network size remain sizeable after the inclusion of resources.

Does Diversity in Social Roles Explain Age-Related Changes in Network Size?

Finally, a diversity in social roles was entered. The late birth cohort sample demonstrated a slightly higher diversity on average across all time points. Diversity was strongly associated with developments in the network size (ΔX^2 = 1774.75; Δdf = 1; p = .000), confirming Hypothesis 3. The association with diversity did not differ between birth cohorts (ΔX^2 = 0.01; Δdf = 1; p = .929). After controlling for birth cohort differences in diversity (Figure 3C), the network size differed between birth cohorts at T1 (ΔX^2 = 4.41; Δdf = 1; p = .036). When birth cohort differences in diversity were accounted for, the late birth cohort actually showed a lower network size at T1 than the early birth cohort. However, network sizes at T2 (ΔX^2 = 1.71; Δdf = 1; p = .191) and T4 (ΔX^2 = 0.38; Δdf = 1; p = .539) did not differ across birth cohorts. The former cohort effect in the network size was absent after including differences in diversity. The analysis, however, also showed that the unadjusted model actually underestimates gains in the network size in the late cohort when the majority of the sample reached the average retirement age. When cohort difference in role diversity were taken into account, the late birth cohort started at a lower level of the network size. We have included a table listing the results of the final model in the Supplementary Material (Supplementary Table 1).

Discussion

In the present study, we examined age-related levels and trajectories in the network size in two birth cohorts of older adults aged 55–64 years at baseline in 1992 and 2002, respectively, over a time span of 9 years. Hypothesis 1 that later birth cohorts have larger networks across old age was partly confirmed. Although both cohorts did not differ in terms of network size at the beginning of their respective assessment, they demonstrated sizeable differences in terms of their longitudinal trajectories. Although the earlier cohort demonstrated almost stability in the network size across 9 years, the later cohort showed a marked increase in network size at the second observation when the majority of the sample reached the average retirement age (of about 61 years). The increase in network size was, however, followed by a rather steep decrease in later years. This nonlinear change has also been observed in cross-sectional studies (e.g., Marcum, 2013; Smith et al., 2015). Cohort differences were absent after 9 years of study when both samples reached an average age of 71.5 years. Newly gained social ties thus seem a crucial strategy to adapt to the retirement transition, but only a small part of these new ties are preserved over the long term.

We investigated whether cohort differences in age-related trajectories in the network size could be explained by cohort differences in resources. Overall, resources only provide a minor explanation for the differences in the network size observed in the current study, thereby refuting Hypothesis 2. Only the attained level of education and self-rated health explained a trivial part of the observed cohort differences.

Finally, we found that larger diversity in social roles in the network was associated with larger network size, thereby confirming Hypothesis 3. After inclusion of diversity, the late birth cohort had a smaller network size at T1, whereas at T2 the cohort difference was no longer significant. Thus, there are still large gains in network size after baseline for the late birth cohort around retirement age that are not related to diversity (nor resources). However, a decrease in the diversity in social roles was strongly related to the decline after T2, thus a decline in the network size after T2 goes hand in hand with a decline in the types of social roles in the network.

We interpret the observed cohort differences as “differential ageing,” rather than “baseline” or “delay” cohort differences. The peak in the network size in the late cohort might reflect the emphasis on the desirability of social participation in young old age (e.g., Laslett, 1991). People in early cohorts enter old age with the idea that a decline has been started, as described in the disengagement theory (Cumming & Henry, 1961) and socioemotional selectivity theory (Carstensen, 1992). The peak level in the network size in the late birth cohort indicates that the late cohort is more likely to act antithetical to disengagement and selectivity, particularly in young old age. Findings for the peak level in the network size are more in line with the activity theory (Havinghurst, 1961) and continuity theory (Atchley, 1999), both of which posit that to age successfully people remain socially active.

As the health of the late birth cohort does not strongly decline over the four waves, it is unlikely that decline after T2 is caused by a withdrawal from the society or selection of emotionally close ties. A more convincing explanation could be the wearing off of the so-called “honeymoon phase” of retirement (Gall, Evans, & Howard, 1997). Originally applied to well-being, well-being increased in the first years after retirement and, when the novelty faded, well-being again declined to earlier levels. It is plausible that the impetus to gain and maintain social relationships also wears off over time, causing a return to more regular levels of social integration among retirees over time.

Part of our interpretation of the cohort effects in the development of network size centers around the assumption that the younger cohort uses the time freed by retirement to engage more in social interactions. We were unable to directly test this claim, as the network size was only measured once every 3 years, and the retirement and time variable were acting largely collinear. Future studies could use the time to the retirement transition as a time scale to examine the exact shape of potential retirement related developments. These analyses could shed light on whether or not changes in the network size are due to preparatory adjustments occurring preretirement or due to short-term behavioral changes postretirement or due to long-term adjustments to the changed living conditions in retirement (for similar analyses on life satisfaction, see Wetzel, Huxhold, & Tesch-Römer, 2016).

Our study has several other limitations. First, we were unable to account for dependence within cohorts that stem from age homophily in social networks, like the health status of network members, which also shape the network. Second, the social role relations employed here might not have been exhausted enough to capture the nuanced interplay between network size and roles. There is growing acknowledgment that social relations can be multiplex (Bush, Walker, & Perry, 2017). Third, future studies could include exchanged social support, also studied for kin and nonkin ties separately. The socioemotional selectivity theory posits an increase in emotionally supportive ties in old age, whereas the "mobilization of helpers" perspective hints at an increase in the instrumentally supportive ties and a decrease in emotionally supportive ties. Fourth, future studies could investigate gender-differences, as the social lives of women have changed more dramatically, due to increased labor market participation. Finally, economic factors, such as income and wealth (controlled for purchasing power), could also add to our understanding of cohort differences in age-related change in the network size.

Generalizability of our findings to other societal contexts hangs largely on similarity in cultural and structural characteristics. Emphasis on productive potential in old age in public discourse characterizes most Western countries recently (e.g., Martinson & Minkler, 2006). Increased resources in later birth cohorts have also been documented widely (e.g., Einolf, 2009). Information and communication technologies were widespread in 2002 in most of the Western world, but clearly less so in 1992. Retirement regulations do vary substantially over time and between countries. Debates on the sustainability of pension systems in the face of rapid population ageing have resulted in large reforms in Western countries (Holzmann, 2013), such as rise of the retirement age. In the Netherlands, after 2006, the retirement age increased due to several legal measures (average retirement age in 2014 was 64 years). The current retirement age is set at 67, and from 2022 will be tied to life expectancy. Thus, the network size peak around the retirement age in the coming decades is likely to be at higher ages than that observed here, but only if societal views on young old people change accordingly.

To conclude, the present study shows that age-related trajectories in the network size differ between birth cohorts. Those in the late birth cohort (1938–47) experienced a peak level in network size around the retirement age. Resources only explain a minor part of the cohort differences. In addition, after including the larger diversity in social roles in the late birth cohort, the gain in the network size of the late cohort at retirement age persists. However, findings do not imply that policymakers can stop worrying about social isolation and loneliness in old age, since a decline in the network size at higher ages also happens in the late birth cohort.

Supplementary Material

Please visit the article online at https://academic.oup.com/gerontologist/ to view supplementary material.

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Conflicts of Interest

None.

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