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Research Article

Multigenerational Households During Childhood and Trajectories of Cognitive Functioning Among U.S. Older Adults

Haena Lee, PhD,[1,*] Lindsay H. Ryan, PhD,[1] Mary Beth Ofstedal, PhD,[1] and Jacqui Smith, PhD[1,2]

[1]Institute for Social Research, University of Michigan, Ann Arbor. [2]Department of Psychology, University of Michigan, Ann Arbor.

*Address correspondence to: Haena Lee, PhD, Leonard Davis School of Gerontology, University of Southern California, 3715 McClintock Avenue Room 221, Los Angeles, CA 90089-0191. E-mail: haenal@usc.edu

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Abstract

Objectives: Family structure in childhood influences early brain development and cognitive performance in adulthood. Much less is known about its long-term impact on later-life cognitive functioning. We extend the two-generation family structure approach to investigate the potential contribution of living with grandparents in multigenerational households to differences in cognitive functioning at older ages.

Methods: Data were drawn from 9 waves of the Health and Retirement Study (1998–2014) merged with newly collected childhood family history data. Five types of family structure were assessed: two-parent households, two-parent households with grandparents, single-parent households, single-parent households with grandparents, and grandparent-headed households. Growth curve models were used to estimate trajectories of cognitive functioning over time.

Results: Childhood family structure was significantly associated with level of cognitive functioning, but not to rate of cognitive decline. Relative to those from two-parent households, individuals who grew up in multigenerational households showed higher levels of cognitive functioning, including those living with a single parent and grandparents. Those who lived with a single parent alone were the most disadvantaged. The effects of these multigenerational households persisted net of childhood and adulthood socioeconomic status and health outcomes.

Discussion: Grandparent coresidence may cultivate a socially enriched home environment, providing resources and protection for early cognitive development that could persist throughout life. Multigenerational living arrangements are likely to increase as the contemporary population ages. More research needs to be done to understand the impact of these living arrangements on future generations' brain health and cognitive aging.

Keywords: Childhood family structure, Cognitive decline, Grandparent effects, HRS, Life course analysis

"Good health begins in early life" (Repetti et al., 2002). One of the most important factors affecting lifelong health is a child's family social context (C. A. McEwen & McEwen, 2017), especially around family structure. Family structure reflects material, psychosocial, and emotional resources of caregivers and quality of learning environment critical for early development that could continue throughout life (Bronfenbrenner, 1986). For example, growing up in two-parent households is found to be a strong predictor of health and well-being in old age, from health behavior to functioning to mortality, compared to other types of households including single-parent households (Gauffin et al., 2013; Hayward & Gorman, 2004; Lee, 2019; O'Rand & Hamil-Luker, 2005).

Despite prior work linking childhood family structure to various health outcomes, the effects of childhood family structure on cognitive functioning have been largely overlooked. Yet, there are theoretical reasons to believe early-life family social context matters for cognition in later life based on research in children and younger adults. Specifically, exposure to a socially enriched family environment in two-parent households appears to benefit cognitive development by stimulating learning through language and reasoning development and increasing opportunities for interactions and socialization processes (Lewis & Lamb, 2003). Given the effects of stress on the development of the brain structures and regions (B. S. McEwen, 2003), exposure to single-parent households in early life may compromise cognitive health if people growing up in these environments are more likely to experience perceived stress and emotional insecurity due to changes in family structure (Carlson & Corcoran, 2001).

The literature on the effects of family structure on cognitive health is, however, mostly limited to studies of two generations—parents and their offspring. Virtually no attention has been paid to multigenerational households (parent, grandparent, and child) although considerable work in child development shows the beneficial effects of growing up with grandparents, especially for cognition (Romeo et al., 2018) and academic performance (Deleire & Kalil, 2002; Monserud & Elder, 2011). Such cognitive differences in early life could have enduring health consequences throughout life or carry into old age via adult experiences (Richards & Deary, 2005). Yet, it is not known whether different types of childhood family structure shape cognition over time and to what extent adult experiences explain the early origins of cognitive aging.

Here, we extend prior work by examining the long-term impact of childhood family structure on the trajectories of cognitive functioning with nine waves of the Health and Retirement Study (HRS; 1998–2014). By using newly collected childhood family history data in the HRS, we distinguish two-parent households not only from single-parent, but also from multigenerational households. We further assess the extent to which different types of family structure contribute to cognitive decline, in part, through shaping adult socioeconomic status (SES) and health conditions.

Long-Term Effects of Family Structure on Cognitive Functioning Across the Life Span

Conceptually, there are two mechanisms that could explain how early-life family structure contributes to cognitive aging processes. One mechanism posits that childhood family structure may have a long-term impact on cognitive functioning in later life as a result of (under)development of the brain structure and regions (Lupien et al., 2009). The argument is that exposure to socially enriched environments particularly in early life can enhance the development of the brain structure, while exposure to stressful environments may permanently alter regulatory set points and compromise the development. For example, evidence based on the socialization perspective suggests that responsive parenting, verbal openness, and emotional support in two-parent households are associated with greater levels of cognitive development as such environments may cultivate stimulating learning and socialization processes (Carlson & Corcoran, 2001). In single-parent households, however, the residential parent becomes the primary provider of not only material but also social resources, entailing less investment in monitoring and interactions for children due to time demands of the residential parent (McLanahan & Sandefur, 1994). For example, individuals from single-parent households had poorer executive function in childhood relative to those from two-parent households with a similar low SES background (Sarsour et al., 2011). The stress theory emphasizes that changes in family structure may trigger stress in a child's life by disrupting his or her family relationships and emotional security, which may weaken the foundation of early-life brain to serve as a base for later-life brain health. Smaller brain regions involved in socioemotional and memory function were found among people who are exposed to stress in early life (Hanson et al., 2015; Malter Cohen et al., 2013).

Another mechanism posits that childhood family structure may influence cognitive health via adult experiences such as education, income, and health, often referred to as "chains of risks" (Ben-Shlomo & Kuh, 2002). Dannefer (2003) argues that, because early-life conditions set in motion adult social processes, early disadvantage can lead to further adversity in adulthood, whereas early advantage can put a premium on individual's lives which may benefit health over time. With regard to lifelong cognitive health, education can be a particularly important adult factor that shapes brain growth and enable more efficient brain networks. Older adults with higher levels of school performance may thus enter old age with higher levels of cognitive reserve and lower risk of cognitive decline (Dekhtyar et al., 2015). Higher levels of education often lead to occupations that involve high mental demands and stimulation, which could increase additional neuronal resources that are believed to preserve cognitive function (Fisher et al., 2014). Education correlates with socioeconomic position, and individuals with high levels of SES tend to have better cognitive performance than low SES individuals in late adulthood (Alley et al., 2007). Education also shapes health behaviors throughout the life course. Highly educated individuals are more likely to avoid smoking and drink socially, both of which are associated with better cognitive function in later life (Baumgart et al., 2015). They are also likely to have occupations that come with good health benefits, which could increase utilization of health services such as regular checkups. Regular health checkups are key for screening and preventing chronic conditions such as stroke and depression, which may increase risk of cognitive decline (Baumgart et al., 2015).

The Present Study: The Role of Grandparent Coresidence During Childhood

Studies on cognitive outcomes of those who have coresided with grandparents are less extensively examined, and the available findings are limited to younger populations. A few studies find that coresiding with grandparents can be advantageous for youth, especially for those from single-parent households (Deleire & Kalil, 2002; Dunifon & Kowaleski-Jones, 2007; Monserud & Elder, 2011). They posit that understanding the role of caregivers and "linked lives" is critical because they serve as a platform by which development occurs and where other elements related to individuals' well-being and life chances are channeled (Elder, 1998).

There are several pathways through which grandparent coresidence could influence cognitive function. Grandparent coresidence may influence brain and cognitive development by cultivating nurturing and engaging home environments and increasing opportunities for conversation and social interactions (Rogoff, 1990). Exposure to adult language and conversation can drive language skills and enhance cognitive development (Romeo et al., 2018). Coresident grandparents may offer their grandchildren emotional support and a sense of financial security that may serve as a buffer for family stress, alleviating negative outcomes that children would otherwise experience due to absence of a parent in single-parent households (Deleire & Kalil, 2002). Grandparents are also likely to provide assistance to the parent that may improve parenting behavior which may positively influence children's development and socialization (Monserud & Elder, 2011). Despite ready evidence of the positive influence of grandparents on a child's development (for a review, Sadruddin et al., 2019), it is unknown whether growing up with grandparents benefits cognitive health across the life span, and whether such individuals fare as well as those growing up with two parents or whether they are more similar to individuals of single-parent households.

Together with prior evidence showing the potential different effects of early-life family structure types, the current study expects the following: Older adults from two-parent households will have better cognitive trajectories (higher level of cognitive functioning and slower rate of cognitive decline) than other types of alternative households such as single-parent and grandparent-headed households (**Hypothesis 1**); and those from multigenerational households will have better trajectories (slower decline) than two-parent households since coresident grandparents may cultivate socially enriched home environments that provide additional resources and access to brain stimulation (**Hypothesis 2**). Because childhood family structure can set in motion adult social positions and health which may in turn affect cognitive functioning at older ages, we also hypothesize that relationships between childhood family structure and cognitive functioning will operate, in part, through educational attainment, income, and wealth (**Hypothesis 3**) and through unhealthy behaviors and chronic conditions in adulthood (**Hypothesis 4**).

Although the current study focuses on childhood family structure, we recognize that childhood SES is an important determinant of later-life cognitive functioning. Mounting evidence shows that low family SES matters for cognitive health (Brandt et al., 2012; Greenfield & Moorman, 2018), potentially through adult SES including educational attainment (Luo & Waite, 2005; Marden et al., 2017). This study is the first to empirically test whether childhood family structure contributes to later cognitive functioning above and beyond childhood and adult SES. Given that development is influenced by multiple proximal and distal contexts, this investigation will allow us to explore whether differences in cognitive functioning in later life are not merely the product of socioeconomic origins but also of broader aspects of childhood-family life experiences.

Data

Data are drawn from the HRS, a nationally representative, longitudinal survey of the U.S. population aged 51 and older (Sonnega et al., 2014). The first core interview took place in 1992, with subsequent waves fielded every 2 years. In addition to the core interview, HRS administers supplemental surveys in the off years to collect specialized topics of aging. HRS first asked respondents about their childhood SES and health in the 1998 core. In 2015 and 2017, the HRS collected information on respondents' family history and other childhood events through a Life History Mail Survey (LHMS). The HRS-LHMS consists of a random half-sample of the respondents who were still alive and had been interviewed in a previous year HRS core. We analyzed nine waves of HRS (1998–2014), merged with the 2015 and 2017 LHMS and the retrospective childhood variables from the core. We started with the 1998 core wave because it is the first time that the sampling represents the U.S. adults aged 51 and older. Restricting the data set to respondents aged 51 and older who participated in the LHMS and had at least one cognitive functioning score yielded a final estimation sample of 8,799 (54,535 person-year observations over nine waves).

Measures

Cognitive Function

The HRS administers a range of cognitive tests at each wave to measure and track cognitive function of respondents over time. We assessed global cognitive function based on the three cognitive tests available in the core: total word recall; counting backward from 20; and serial sevens. The summary score ranged from 0 (severely impaired) to 27 (highly functioning) (Langa et al., 2010). Total word recall is the sum of immediate and delayed 10-noun free word recall to measure memory (0–20 points). A counting backward test is to measure speed of mental processing (0–2 points). A serial sevens subtraction test is to measure working memory (0–5 points), amounting the number of times the respondents correctly subtract seven starting from 100. Although additional cognitive status variables are assessed in the HRS, they are only administered to respondents aged 65 and older (Crimmins et al., 2011). As such, we included these three measures administered to the full age range in the study (age ≥ 51). A small percentage of respondents in each wave refused to participate in the cognitive tests and, to reduce sample attrition, the HRS has imputed cognitive measures for missing data (Fisher et al., 2017). We used the imputed cognitive variables released by the HRS in our analysis.

Childhood Family Structure

Our key independent variable is childhood family structure. In the LHMS, respondents were asked to report family members they had lived with at age 10. Five mutually exclusive types of family structure were created: two-parent household (reference); two-parent with grandparent(s); single-parent household; single-parent with grandparent(s); and grandparent-headed households with no parent present.

Adult SES and Health

Adult SES was measured using years of education and household income and wealth. Both income and wealth were drawn from the RAND Income and Wealth Imputation data (Version P). Some respondents have zero income and negative wealth. We adjusted these nonpositive values by adding constants and taking neglog transformation (Whittaker et al., 2005). We examined smoking and drinking as unhealthy lifestyle behaviors. We coded smoking into three categories: never (reference); former; and current smoker. Drinking was coded into four categories: never (reference); former; light; and heavy drinker. Heavy drinker was assessed if respondents reported they had more than 3 drinks per day (+4 drinks for male respondents) when they drank, based on the national guidelines for older adult's excessive alcohol consumption (National Institute on Alcohol Abuse and Alcoholism, n.d.). Strokes and depression were controlled for as correlates of cognitive decline. All variables except education were time-varying.

Covariates

Demographic covariates include age, gender (1 = female), race/ethnicity, and adulthood living arrangement. Four race/ethnicity categories were measured: non-Hispanic White (reference), non-Hispanic Black, Hispanic, and other. Following the practice of other researchers (Chen et al., 2015; Hughes & Waite, 2002), we assess adulthood living arrangement by combining respondent's marital status (partnered vs single) with information on coresidents and their relationships to the respondent. Six categories were created for each wave: living with spouse/partner (reference); partnered and living with adult child; partnered and living with adult child and grandchild; single living alone; single living with adult child; and single living with adult child and grandchild.

We measured cumulative childhood adversity and childhood health as early-life covariates, the two factors that are consistently found to strongly predict poor health in later life (Montez & Hayward, 2014). Cumulative childhood adversity was assessed with an index that included five items from the core: father's education (1 = less than 8 years); mother's education (1 = less than 8 years); self-reported financial situation (1 = financially poor); moved due to financial difficulty (1 = yes); and received help from relatives due to financial difficulty (1 = yes). The Cronbach's alpha was 0.71 indicating good reliability among the items. Following previous work (Luo & Waite, 2005; Montez & Hayward, 2014), we imputed missing data for mother's and father's education as less than 8 years as respondents in the HRS missing data on parental education have economic and health variables similar to those whose parents had less than 8 years of education. Few respondents experienced three or more adversities, so we collapsed the index to range from zero to two or more. Childhood health was coded 1 if respondents reported in the core that they had "poor" or "fair" health. We also controlled for any experiences of mental/learning problems during childhood using the LHMS (1 = yes). Lastly, change in family structure was controlled for by assessing whether respondents experienced any alterations in childhood household composition due to parental death, divorce, or separation (1 = any).

Analytic Strategy

We used growth curve modeling approach to account for repeated observations of cognitive functioning per person. This analytical framework accounts for partially missing (or unbalanced) data using maximum likelihood and performs equally well or better than multiple imputation methods (Curran et al., 2010; Singer & Willett, 2003). The mean number of observations per respondent was 6.3. Time was modeled by age in the current study and was centered on its grand mean at age 65. Preliminary analyses showed a nonlinear relationship between age and the outcome, so we added age-squared to all models. All independent variables and covariates were interacted with age to test for differences in the rate of change in cognitive functioning. The model is expressed formally as:

$$Cognitive\ functioning_{ij} = \gamma_{00} + \gamma_{10}Age_{ij} + \gamma_{20}Age_{ij}^2 + \mathbf{X}_{ij}\beta + (\mathbf{X}_{ij} * Age_{ij})\lambda + \zeta_{0i} + \zeta_{1i}Age_{ij} + \epsilon_{ij}$$

where subscripts i and j index the individual and person-year observation, respectively. γ_{00} denotes the fixed intercept, γ_{10} and γ_{20} indicate fixed effects for the linear and quadratic terms of age, while β is the vector of coefficients associated with the vector of covariates X (e.g., X can be either time-invariant or time-varying. The coefficients for time-invariant childhood variables are the same at all $j = 1, 2, 3, \ldots, 9$). λ is the vector of coefficients associated with the vector of covariates and their interaction with age. The ζ_{0i} and ζ_{1i} terms represent normally distributed random effects for the intercept and linear term of age, respectively (these were allowed to covary in the model).

We fit a series of nested models and showed the estimates from growth curve models in Table 3. In Model 1, we first estimated the long-term effect of childhood family structure on trajectories of cognitive function. We then accounted for education in Model 2 since education is prior to income and wealth attainment. Income and wealth are added in Model 3. Model 4 further adjusted for adult health behaviors and conditions. Preliminary analyses added health behaviors and health conditions separately; however, the coefficients were largely the same. Accounting for adult SES and health indicators in this sequential manner allows us to investigate to what extent the link between childhood family structure and cognitive functioning observed in Model 1 is explained by the adult pathways. We control for gender, race/ethnicity, and childhood covariates in all models with adulthood living arrangement entered beginning in Model 2. All models were estimated using *mixed* in Stata 16.

Results

Descriptive Statistics

Table 1 presents descriptive statistics of variables used in the analysis. Two-parent household was most common form of household structure for the HRS respondents during their childhood (79.41%). A fair amount of respondents grew up in single-parent household (8.36%). Multigenerational households were not uncommon for this age group. About 10% of respondents grew up with grandparents (7.65% in two-parent household and 2.30% in single-parent household, respectively), while 2.27% grew up in grandparent-headed household with no parent present. About 35% of respondents reported that they experienced either parental death, divorce, or separation. Most respondents lived with spouses or partners in their adulthood, 30% lived with at least one child, and around 4% lived in multigenerational household.

Table 2 reports averages for the outcome variable and for childhood and adulthood SES and health characteristics by childhood family structure type. Important points illustrated in this table are, first, that older adults from two-parent households are more economically advantaged than respondents in most types of family structure, with one exception. Older adults from multigenerational households with two parents

Table 1. Mean/Percentages for Variables Used in the Analysis (N = 8,799)

Variables	Mean (*SD*)/%
Total cognitive function (range 0–27)	17.63 (3.86)
Childhood family structure (%)	
Two-parent household	79.41
Two-parent household with grandparent(s)	7.65
Single-parent household	8.36
Single-parent household with grandparent(s)	2.30
Grandparent-headed household with no parent present	2.27
Change in family structure (%)	35.44
Cumulative childhood adversity (%)	
0	42.94
1	21.96
2+	35.09
Childhood poor health (%)	6.04
Any mental/learning problems (%)	1.61
Years of education	13.04 (2.65)
Income (logged)	10.67 (1.10)
Wealth (logged)	11.52 (3.36)
Smoking (%)	
Never smoked	46.17
Former smoker	41.28
Current smoker	12.64
Drinking (%)	
Never drank	42.48
Former drinker	21.47
Light drinker	34.21
Heavy drinker	1.83
Ever had stroke (%)	2.03
Depressive symptoms (range 0–8)	1.21 (1.70)
Age	65 (8.85)
Female (%)	62.66
Race/ethnicity (%)	
Non-Hispanic White	83.64
Non-Hispanic Black	10.59
Hispanic	4.18
Other	1.59
Living arrangement (%)	
Partnered, couple alone	60.36
Partnered, child	18.66
Partnered, child and grandchild	2.57
Single, alone	12.35
Single, child	4.60
Single, child and grandchild	1.47

Notes: *SD* = standard deviation. Values for time-varying variables are measured at baseline.

Table 2. Childhood and Adulthood SES and Health Characteristics by Childhood Family Structure Type, Health and Retirement Study

	Two-parent	Two-parent, multigeneration	Single-parent	Single-parent, multigeneration	Grandparent-headed	Diff.[a]
Total cognitive function	17.72	18.06	16.71	18.16	15.70	<.001
Cumulative childhood adversity (%)						<.001
0	45.33	49.20	22.22	35.11	22.58	
1	22.45	23.96	14.62	22.34	24.73	
2+	32.21	26.84	63.16	42.55	52.69	
Childhood poor health (%)	5.36	9.27	8.19	7.45	9.68	<.001
Any mental/learning problems (%)	1.51	2.24	1.17	3.19	3.23	<.001
Years of education	13.11	13.46	12.32	12.88	11.86	<.001
Income (logged)	10.70	10.78	10.47	10.65	10.27	<.001
Wealth (logged)	11.65	11.97	10.38	11.09	10.34	<.001
Smoking (%)						<.001
Never smoked	46.66	46.65	39.77	46.81	50.54	
Former smoker	41.15	39.62	42.98	45.74	36.56	
Current smoker	12.20	13.74	17.25	7.45	12.90	
Drinking (%)						<.001
Never drank	42.01	37.06	46.49	41.49	63.44	
Former drinker	21.68	24.60	19.30	18.09	15.05	
Light drinker	34.46	36.42	32.75	38.30	19.35	
Heavy drinker	1.85	1.92	1.46	2.13	2.15	
Ever had stroke (%)	2.09	1.92	1.75	1.06	2.15	<.001
Depressive symptom	1.16	1.05	1.72	1.30	1.66	<.001

Notes: Diff. = group difference; SES = socioeconomic status. Estimates presented here are means or percentages at baseline.
[a]Significant group comparisons on the basis of chi-square test or ANOVA ($p < .001$).

had better childhood and adulthood SES than those from two-parent households. Second, those from multigenerational households have better cognitive functioning than others including two-parent households. Third, older adults from single-parent households and from grandparent-headed households were most disadvantaged. These two groups started in low SES families and remained socioeconomically disadvantaged.

Long-Term Effects of Childhood Family Structure on Trajectories of Cognitive Functioning

Table 3 shows estimates of growth curve models predicting trajectories of cognitive functioning by childhood family structure. Since we centered age at 65, the intercept could be interpreted as the mean of cognitive functioning at age 65 for an individual who is in the reference group for each of the categorical variables with mean values for all continuous variables.

Model 1 shows that childhood family structure is significantly associated with level of cognitive functioning, but not with the rate of cognitive decline. Older adults from multigenerational households had on average higher levels of cognitive functioning relative to those from two-parent households. This was the case regardless of whether they are from single- or two-parent households (b = 0.457, $p < .001$ and b = 0.528, $p < .05$, respectively). Growing up in single-parent households was particularly problematic for later-life cognitive functioning (b = −0.339; $p < .001$). The coefficient for those from skipped-generation households was in the expected direction but not statistically significant. This might be related to a power issue due to small cell size.

These differences by family structure types persisted with the inclusion of years of education in Model 2. The magnitude of the coefficients of the family structure variables was reduced but remained significant. The largest reduction occurred to those from two parents with coresident grandparents for which the coefficient declined from 0.457 to 0.264 ($p < .05$) with inclusion of education. Additional years of education were significantly associated with higher levels of cognitive functioning and a slower cognitive decline net of childhood and demographic covariates.

Introducing income and wealth in Model 3 slightly reduces the effects of childhood family structure but the coefficients remained statistically significant. While each adult SES indicator was associated with higher levels of cognitive functioning, only higher income was associated with a slower rate of cognitive decline over late adulthood. Additional adjustment for health behaviors and health conditions in Model 4 also did not explain away the beneficial grandparent effect in the multigenerational households (b = 0.247, $p < .05$ for two-parent, multigenerational

Table 3. Growth Curve Models Predicting Cognitive Function by Childhood Family Structure and Adulthood SES and Health Outcomes, Health and Retirement Study, 1998–2014 (*N* = 54,535 Person-Year Observations)

	Model 1		Model 2		Model 3		Model 4	
	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope
Fixed effects								
Intercept	17.338***		10.274***		9.100***		9.449***	
Age (centered)	−0.107***		−0.130***		−0.173***		−0.169***	
Age-squared	−0.004***		−0.004***		−0.004***		−0.004***	
Childhood family structure (two-parent = ref.)								
Two-parent with grandparent(s)	0.457***	−0.005	0.264*	−0.003	0.252*	−0.003	0.247*	−0.004
Single-parent	−0.339***	−0.004	−0.337**	−0.002	−0.309**	−0.002	−0.298**	−0.002
Single-parent with grandparent(s)	0.528*	0.002	0.422*	0.003	0.439*	0.001	0.421*	0.001
Grandparent-headed household	−0.073	−0.006	−0.069	−0.003	−0.067	−0.002	−0.084	−0.002
Years of education			0.490***	0.002*	0.468***	0.001	0.453***	0.001
Income					0.099***	0.004*	0.092***	0.004*
Wealth					0.033***	0.000	0.030***	0.000
Smoking (never = ref.)								
Former							−0.054	−0.007
Current							−0.258**	−0.011
Drinking (never = ref.)								
Former							0.154***	0.009*
Light							0.143***	0.010*
Heavy							0.108	0.011
Ever had stroke							−0.712***	0.013
Depressive symptoms							−0.083***	0.001
Variance components								
Variance of random intercept	6.430***		4.905***		4.745***		4.616***	
Variance of random slope	0.008***		0.008***		0.008***		0.007***	
Residual variance	6.301***		6.313***		6.322***		6.327***	
Goodness-of-fit								
AIC	273,609		271,882		271,714		271,545	
BIC	273,903		272,193		272,150		272,106	

Notes: AIC = Akaike information criterion; BIC = Bayesian information criterion; ref. = reference; SES = socioeconomic status. All models adjust for gender, race/ethnicity, change in family structure, cumulative childhood adversity, childhood health, and any mental/learning problems with adulthood living arrangement entered beginning in Model 2. Coefficients for these demographic and early-life covariates can be found in Supplementary Table 1.
$^*p < .05$. $^{**}p < .01$. $^{***}p < .001$.

households and $b = 0.421$, $p < .05$ for single-parent, multigenerational households). Those from single-parent households remained most disadvantaged net of all covariates ($b = -0.298$, $p < .01$).

In Figure 1, we illustrate the association between childhood family structure and cognitive functioning over time, based on the coefficients from Model 4. As we saw in estimates from growth curve models in Table 3, older adults who grew up in multigenerational households showed higher levels of cognitive functioning, including those growing up with a single parent and with grandparent(s), while individuals from single-parent households were the most disadvantaged compared with their reference group from two-parent household.

Among health behaviors, current smoking was associated with lower levels of cognitive functioning ($b = -0.258$; $p < .01$), while former and light drinking were associated with higher levels of cognitive functioning and a slower rate of cognitive decline. This is not an unreasonable result as light/mild drinking is considered a healthy lifestyle. Indeed, light/mild drinkers may be more socially active and healthier, beneficial characteristics for remaining healthy cognition. In parallel to prior evidence, stroke and depression were associated with lower levels of cognitive functioning ($b = -0.712$, $p < .001$ and $b = -0.083$, $p < .001$, respectively). Cumulative childhood adversity (2+), poor health and mental/learning problems in childhood, and single respondents living with at least one adult child were

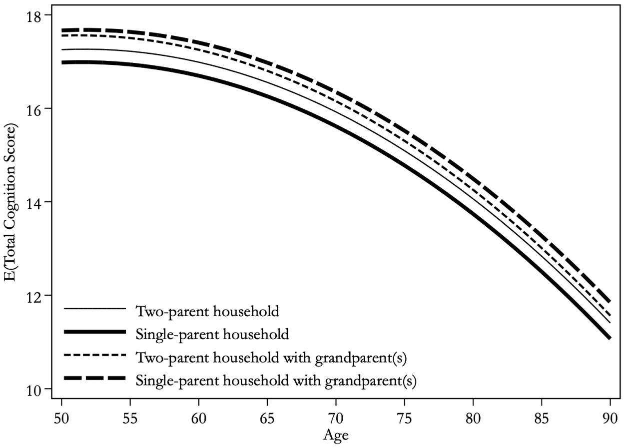

Figure 1. Trajectories of cognitive functioning by childhood family structure, estimates from Model 4 in Table 3, Health and Retirement Study, 1998–2014 (N = 54,535 person-year observations).

significantly associated with lower cognitive functioning across all models (see Supplementary Table 1).

Discussion

This is the first study to shed light on the role of childhood family structure in trajectories of cognitive functioning, looking specifically at coresident grandparent effects. While alternative households (other than two-parent households) have been typically considered undesirable for early development, an emerging literature in family demography documents that coresident grandparents may benefit child and adult outcomes and even compensate for not living with two parents (Deleire & Kalil, 2002; Monserud & Elder, 2011). Yet, little is known about their long-term implications for health throughout the life course. Using the newly collected family history data in the HRS, we investigate the long-term impact of different types of childhood family structures on older adult cognitive functioning, using nine waves of the HRS (1998–2014).

Taking advantage of longitudinal data collected over respondents' entire lifetimes, we extend prior research by carefully accounting for types of family structure to reflect the social, demographic, and historical contexts in which older adults grew up. We distinguish two-parent households not only from single-parent, but also from multigenerational households. A multigenerational living arrangement was historically quite common for many individuals born before 1950s. Recent analyses of historical U.S. Census data (1870–1950) show that 9% to 10% of children lived in a household with at least one grandparent present (Pilkauskas et al., 2020). Such a household tends to be socioeconomically advantaged, with higher levels of primary caregiver's education (Pilkauskas et al., 2020), unlike contemporary multigenerational households (Dunifon et al., 2014). This implies that growing up in multigenerational households may carry a different set of meanings and implications for one's adult health than would be the case today, especially for cognitive health; however, the empirical investigation on this topic was relatively ignored. We argue that consideration of these varied family structures within historical context provides a unique framework to examine the potential influence of childhood family life on cognition in late adulthood.

Consistent with prior research and our hypotheses (H1 and H2), we found that growing up in multigenerational households is beneficial for cognitive functioning relative to those raised in two-generational households. Single-parent households were the most disadvantaged in terms of later cognitive outcomes. However, contrary to the predictions derived from the "chains of risks" perspective (i.e., path-dependent model), we found little evidence for H3 and H4 that the influences of childhood family structure on later life outcomes operate through adulthood resources and achievement. Although the coefficients for multigenerational households, especially for those with two parents, substantially reduced after education is added, their positive effects on cognitive functioning persisted with inclusion of the rest of adult SES and health indicators. Education, income, wealth, smoking, drinking, depression, and stroke were all independently and significantly associated with cognitive functioning but accounted for little to no effects of family structure. Supplemental analyses reveal that childhood family structure is indeed weakly related or unrelated to most of the adult SES and health indicators (see Supplementary Table 2). Formal mediation tests using the Karlson, Holm, and Breen method and the Sobel test also show no statistically significant mediating effects of adult SES and health, confirming that the effects of childhood family structure may not operate through adult experiences but rather have an enduring influence on cognition over the life course. This finding is in line with those of several studies (Chopik & Edelstein, 2019; C. A. McEwen & McEwen, 2017; Repetti et al., 2002), highlighting that the childhood family social environment serves as a "critical" context that has long-term health consequences.

Note that not only two-parent but also single-parent households benefited from living with grandparents in terms of cognitive functioning. This result may be surprising but there is evidence in support of our finding in the literature of contemporary populations (Deleire & Kalil, 2002; Monserud & Elder, 2011). Using nationally representative samples of adolescents, both studies found that coresidence with grandparents is beneficial for the educational attainment of youth in single-parent households. The authors posit that the residential parent might have chosen to coreside with children's grandparents because he or she believes such a living arrangement will benefit their children by increasing resources available. Deleire & Kalil (2002) suggest that these "altruistic parents who are willing to accept the trade-offs" that come with coresidence such as lack of privacy and conflicts over parenting may have positive characteristics that can also positively influence child developments.

Furthermore, socioemotional support and warmth provided by coresident grandparents may buffer stress arising from parental separation or marital conflicts. Social interaction and involvement by grandparents may enhance mental stimulation, potentially benefiting early cognitive development, for which benefits may be critical for cognitive skills that last over time. For example, cognitive development may be positively affected by grandparent–grandchild relationships and connectedness (Kivett, 1991). However, information about grandparent involvement in respondents' childhood is not available in HRS, and we were unable to explicitly test if grandparent coresidence confers cognitive benefits through stimulating learning and cultivating socialization. Future research assessing intergenerational interactions and relationships could investigate this possibility.

Another possibility that we were unable to measure is whether the observed effects of family structure on older adults' cognitive decline are due to an unmeasured factor such as grandparents' health. For example, families choose to coreside with the children's grandparents not only because of their marital dissolution or financial strains but also because of their parents' health. Grandparents in poor health may be a burden to the family that may negatively affect the children's outcomes; however, information on grandparents' health was not available in the HRS. We call for future research that identifies possible sources of selection into multigenerational coresidence to explore who benefits in such living arrangements.

A major strength of the current study is that we clarify childhood family structure as another fundamental context that influences health over the life course. In fact, we find that childhood family structure is a stronger predictor than childhood SES of one's later cognitive function. These results raise questions about perspectives that view parental SES as fundamental causes of adult health. Our findings suggest that such traditional approach in life course research may have missed important socioemotional aspects of early life that are critical to life course health. We believe that our assessment of childhood family histories provides a richer substantive picture of the role of early experience on health processes that parental SES alone may not fully explain.

Another strength is that the present study is one of the first examples of life course research to empirically examine the role of multigenerational households during childhood in cognitive trajectories using population-based data of older adults in the United States. We should reiterate that this is in part due to limitations in available data sets. Investigating the effects of coresident grandparents on cognition over the life course requires longitudinal data on both older adults' cognition and their childhood family structure. However, existing surveys of older adults often lack information on childhood family structure—whereas studies on the effects of childhood family structure are primarily focused on outcomes for children and young adults. The social and health consequences of growing up in multigenerational households have been extensively discussed for younger populations (Deleire & Kalil, 2002; Dunifon & Kowaleski-Jones, 2007; Monserud & Elder, 2011; Song, 2016), yet very little work has been done for older adults. Brain changes underlying cognitive decline develop over years and begin decades before symptom onset (Alzheimer's Association, 2016). Future research integrating detailed information on childhood family social environment in studies of older adults will help identify early-life risk factors and advance our understanding of the early origins of cognitive aging.

Despite these strengths, the current study has limitations. First, the family structure measure used in this study is based on respondent's report on family configurations at one point in time (at age 10) and may not capture changes in family structure or time spent in a particular family type throughout childhood. Prior research in family studies suggests that individuals of never-married single parents tend to be more disadvantaged compared to those of divorced single parents (Monserud & Elder, 2011), but it is not feasible to distinguish never-married single-parent households from other single-parent households in the HRS. In addition, recent work has found that grandparent effects may differ by grandparent's SES and educational attainment (Song, 2016); however, information on grandparents' education and occupation status is not available in the HRS. Future work collecting detailed information on caregivers and household structure, perhaps, in longitudinal studies with multiple data points, could determine if adult cognition is dependent on longer exposure to alternative households, different configurations of family structure, and multigenerational social mobility.

Furthermore, the generalizability of our finding may be limited to those cognitively intact. HRS administered the 2015 and 2017 LHMS by selecting a random subsample of the respondents who were still alive and who had completed the 2014 and 2016 core interview. Due to the timing of the administration and its eligibility requirement, our analytic sample did not include those who had died and were lost to follow-up prior to 2015/2017—thus, it is likely healthier and more cognitively intact than the HRS overall sample. Lastly, the measures of childhood circumstances are retrospective, and, therefore, may be subject to recall bias, although Leyhe et al. (2009) find that older adults in population-based social survey seem to recall childhood circumstances quite well and early-life autobiographical memories may not be susceptible to declines in recall.

In sum, the present study reveals that childhood family structure is associated with level of cognitive functioning. We conclude that certain aspects of family functioning and experiences that occur early in life may set individuals on a different start point that influences cognitive functioning decades later, though more research is needed. These findings need to be replicated across different age cohorts to identify whether the benefit of multigenerations in the home is consistent regardless of changing coresidence norms over time. This is particularly an important query because multigenerational living arrangements are becoming more prevalent. As of 2016 about 10% of American families currently live in multigenerational households at least once before age 18 (Pilkauskas & Cross, 2018). As these multigenerational households and dementia prevalence both continue to grow, our results can point to the sites of early intervention to reduce further cognitive health disparities for our younger generations. Social interventions and public policy aiming at increasing family resources and intergenerational interactions could be beneficial for maintaining healthy cognition over the life course.

Supplementary Material

Supplementary data are available at *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* online.

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Conflict of Interest

None declared.

Author Contributions

H. Lee led the conceptualization of the study, analysis of the data, and writing of the manuscript. L. H. Ryan, M. B. Ofstedal, and J. Smith assisted in conceptualizing the study, interpretation of results, and editing of the manuscript.

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