

Research Article

The Long Shadow: Early-Life Adversity and Later-Life Loneliness in the United States

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Abstract

Objectives: This study assesses how early-life adversity (ELA) is associated with later-life loneliness among those aged 55 and older in the United States. We consider multiple domains of ELA to understand domain-specific associations between ELA and later-life loneliness.

Methods: Using data from the 2008 to 2016 rounds of Health and Retirement Study ($n = 29,661$ person-waves [weighted]), we evaluate whether and how different domains of ELA are associated with loneliness, and how their relationships are explained through adulthood conditions and are dependent on educational attainment.

Results: Our analyses demonstrate significant and distinctive relationships between various domains of ELA and later-life loneliness. Whereas adulthood conditions largely explain positive associations between loneliness with some domains of ELA (socioeconomic disadvantages and chronic diseases), disruptive home environment, risky adolescent behaviors, and impairment during childhood are still related to a higher level of loneliness after controlling for adulthood conditions. We also find empirical evidence supporting educational differences in relationships between some ELA domains and later-life loneliness. Our results also show that the associations between ELA and later-life loneliness differ between subdimensions of loneliness (emotional vs. social loneliness).

Discussion: This study underscores ELA as an important early-life risk factor contributing to later-life loneliness. Our findings suggest that policy interventions to reduce adverse childhood experiences may alleviate individuals' exposure to loneliness in later life.

Keywords: Childhood adversity, Life course, Loneliness, United States

Loneliness is now a pressing social issue in the United States. The high prevalence of loneliness in the United States as a “public health crisis” shows an increasing public concern toward loneliness (Murthy, 2017). The practice of social distancing during the coronavirus disease 2019 (COVID-19) pandemic has accelerated this trend (Krendl & Perry, 2021). Loneliness is an important dimension of psychosocial well-being, given its close (and often negative) associations with a range of mental and physical health outcomes, especially among middle-aged and older adults (for a review,

see Ong et al., 2016). To alleviate such negative implications of loneliness, scholars have emphasized the importance of developing social support, interpersonal relationships, and social skills as meaningful ways to improve individuals' psychosocial well-being (Cacioppo et al., 2015).

Although various contemporaneous factors can be associated with later-life loneliness, early-life experiences may also partially contribute to later-life loneliness. Yet, we know relatively little about relationships between early-life experiences and later-life loneliness. This is an unignorable

oversight from a life-course perspective because early-life conditions represent distinctive social forces that unfold and influence many later-life outcomes over time (Hayward & Gorman, 2004). Examining whether and how early-life conditions are associated with later loneliness also has important policy implications in implementing meaningful interventions to reduce loneliness among high-risk populations and improve the overall quality of life among middle-aged and older people.

To date, we are aware of only one study investigating the associations between early-life conditions and later-life loneliness (Kamiya et al., 2014). However, this study is limited in several ways. First, it missed important domains of early-life circumstances, such as family relationships and risky adolescent behaviors, that could have significant relationships with later-life loneliness. Furthermore, failure to reflect multiple aspects of early-life experiences may exaggerate domains studied due to correlations between different domains of early-life experiences (Ferraro et al., 2016). Second, it did not investigate how associations between early-life conditions and later-life loneliness might depend on important intermediate factors such as adulthood conditions (Ben-Shlomo & Kuh, 2002). Third, the study did not consider the multidimensional nature of loneliness (De Jong Gierveld & Van Tilburg, 2006; Weiss, 1973), an important limitation in light of the possibility that distinctive dimensions of loneliness can have different correlates (Dahlberg & McKee, 2014).

The current study is the first to adopt a life-course perspective to investigate loneliness for middle-aged and older people in the United States. To overcome the limitations mentioned previously, we seek to answer the following questions: (a) How are multiple domains of early-life adversity (ELA) associated with later-life loneliness among middle-aged and older people in the United States? (b) Whether and to what extent are these associations explained by adult conditions? (c) How does educational attainment moderate these associations? (4) How do these associations differ by dimensions of loneliness?

Loneliness in Midlife and Older Ages

Feeling lonely is a condition that an individual is not satisfied with the sufficiency or quality of relationships with others (Hawkley et al., 2008; Holt-Lunstad et al., 2015). Given that well-being indicates positive feelings and functioning well (Huppert, 2009), loneliness can be viewed as a dimension of psychosocial well-being. In recent years, loneliness has attracted growing public attention over the globe because a sizeable proportion of middle-aged and older people feel lonely. For example, in the United States, more than one-third of adults aged 45 and older report being lonely (National Academies of Sciences, Engineering, and Medicine, 2020).

Like other dimensions of well-being, loneliness is unequally distributed across the population. Prior studies

demonstrate that racial/ethnic minorities, those with lower socioeconomic status (SES), and older people are more likely to report higher levels of loneliness than Whites, those with higher SES, and younger people (Cohen-Mansfield et al., 2016; Hawkley et al., 2008, 2019; Pinguart & Sörensen, 2003; Raymo & Wang, 2022; von Soest et al., 2020). Additionally, measures of social isolation—such as small network size, spousal loss, and solo living—are also positively associated with loneliness (Chen & Short, 2008; De Jong Gierveld & Van Tilburg, 2006; De Jong Gierveld et al., 2012; Russell, 2009).

While feeling lonely is not a unique phenomenon in midlife or older ages, loneliness could be a severe problem for those at these ages, given its close links with physical and psychological issues that occur at higher risks as people age. Empirical evidence has shown close associations between loneliness and mortality (Luo et al., 2012), poor self-reported health (Hawkley et al., 2016), functional limitations (Luo et al., 2012; Warner & Kelley-Moore, 2012), cognitive decline (Wilson et al., 2007), and mental health problems (Cacioppo et al., 2006; Luo et al., 2012).

Although loneliness is often measured as unidimensional, it is a multidimensional concept. For example, Weiss (1973) classified loneliness into emotional and social loneliness. In his distinction, emotional loneliness reflects the lack of intimate relationships, whereas social loneliness indicates the perceived absence of an engaging social network. This distinction is crucial because multidimensional measures of loneliness enable scholars to examine differential correlates of emotional and social loneliness, thus providing deeper insights into why people feel lonely (De Jong Gierveld et al., 2009). In this regard, prior research found that some factors were only related to social but not emotional loneliness, such as contact with family and nonfamily members, perceived community integration, and poorer health (Dahlberg & McKee, 2014; Drennan et al., 2008).

Life-Course Perspectives

Social scientists have long recognized the importance of early-life experiences on later-life health and well-being (Elo, 2009; Hayward & Gorman, 2004; Montez & Hayward, 2011). However, implications of early-life experiences for loneliness over the life course have been largely neglected in prior research. We aim to fill this gap by investigating how adverse early-life conditions are associated with loneliness later in life. In particular, we expect a positive relationship between these two that could operate through various mechanisms, as illustrated in Figure 1.

The pathway framework posits that early-life conditions are associated with later-life outcomes through adulthood conditions (Montez & Hayward, 2011). Following this reasoning line, there may be multiple mechanisms for the associations between ELA and later-life loneliness. Two primary pathways are SES and health during adulthood. For

example, adulthood SES is an essential channel given its close association with SES during childhood (Sewell et al., 1969) and also being a strong predictor of loneliness for middle-aged and older people (Pinquart & Sörensen, 2003; Raymo & Wang, 2022; von Soest et al., 2020). Similarly, other domains of ELA—such as unfavorable parent–child relationships and risky behaviors—may also be associated with later-life loneliness partly because these domains are correlated with SES during adulthood (López Turley et al., 2010). Furthermore, adulthood health status might be another potential pathway as it reflects lasting influences from childhood health (Case et al., 2005) and is also related to feeling lonely later in life (Ong et al., 2016). Other domains of ELAs, such as childhood SES (Goosby, 2013), the quality of parent–child relationship (Morgan et al., 2012), and exposure to child abuse (Greenfield, 2010), are also likely to contribute to later-life loneliness given their links to adulthood health conditions.

There are alternative, but at least equally important, channels underlying the association between ELA and later-life loneliness, such as social skills (see Author Note¹) acquired in childhood and psychological stress sensitivity. Childhood is a sensitive period during which people develop and form social skills that exert strong influence over the life course (Luecken et al., 2013). Empirical evidence demonstrates that secure parent–child attachment improves social skills (Youngblade & Belsky, 1992). Early exposures to poor parent–child relationships, a disruptive home environment, or parental abuse would thus make it difficult to cultivate adequate skills in building cohesive family networks and developing stable social relationships during the later-life stage (Simpson et al., 2011), which are crucial for reducing loneliness in later life (Donaldson & Watson, 1996). Prior studies also report an increased psychological sensitivity to stressors among those who experienced ELA (Dougherty et al., 2004; Miller et al., 2011), which increases the likelihood of feeling lonely.

Research of the cumulative framework emphasizes the possibility that associations between early-life conditions and later-life health are contingent upon adulthood conditions (Halfon & Hochstein, 2002; Montez & Hayward, 2011). Relationships between ELA and later-life outcomes could be compensated for or amplified by conditions during adulthood. With the same adverse childhood SES, those who experienced upward mobility in adulthood tended to report better health than those who did not (Luo & Waite, 2005). These patterns suggest that improved adulthood

conditions could compensate for negative relationships between ELA and later-life health (Elo, 2009). Given the close link between loneliness and health in later life (Ong et al., 2016), we anticipate positive associations between ELA and later-life loneliness and the interactions between ELA and adulthood conditions in shaping later-life loneliness.

ELA as a Multidomain Concept in Predicting Loneliness

The abovementioned theories only discuss early-life conditions broadly without distinguishing between specific domains. However, empirical research demonstrates that a wide range of childhood factors exhibit independent associations with later-life outcomes (Hayward & Gorman, 2004; Palloni, 2006), calling for a more comprehensive conceptualization and understanding of early-life circumstances (Ferraro et al., 2016; Morton & Ferraro, 2020).

In this study, we incorporate multiple domains of ELA when predicting loneliness (see Figure 1). We first consider the most common early-life conditions used in prior research—childhood SES and health (including chronic diseases and impairment/disability). We also consider risky behaviors during childhood (externalizing and internalizing behaviors), given their associations with later-life well-being through adulthood conditions (Morton & Ferraro, 2020) and their close links with poor social skills during childhood (Berry & O'Connor, 2010).

Social dimensions of early childhood circumstances, such as interpersonal relationships at home, may also be essential for loneliness developed later in life. Relationships with parents (and other family members) lay the foundation for individuals' social interactions outside the home (Donaldson & Watson, 1996). Unfavorable family environment and parent–child relationships may therefore impede social skill cultivation, a critical factor in reducing feeling lonely later in life. Furthermore, a disruptive home environment may also increase psychosocial sensitivity, making people more vulnerable to stressors and feeling lonely later in life. Hence, we are also interested in how these social components of childhood conditions are associated with loneliness later in life.

The Moderating Role of Education

The cumulative framework suggests that adulthood conditions not only mediate but also moderate the relationship between ELA and later-life loneliness. The current study focuses on educational attainment, a fundamental marker of adulthood SES closely linked to many other adulthood conditions, including occupational status, personal and household income and wealth (Hout, 2012), and health (Elo, 2009). Furthermore, educational attainment is relatively stable over the life course (see Author Note²), which is quite different from adulthood income and wealth that could substantially vary across age.

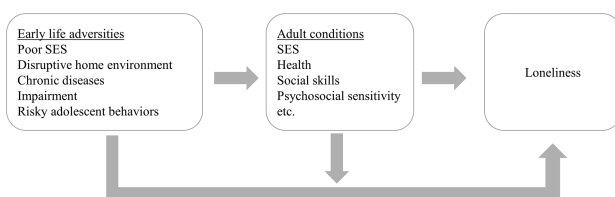


Figure 1. Conceptual frameworks. SES = socioeconomic status.

We expect two possible scenarios regarding the moderating role of educational attainment. First, consistent with higher education as a “great equalizer” in reducing family background influences (Hout, 1988), higher education may mitigate the negative implications of ELA for later-life loneliness. Prior research on middle-aged Americans reports that the health benefits of college degree completion were highest among those who are least likely to attain a degree due to childhood misfortune (Schafer et al., 2013). This suggests a general protective effect of college education on well-being (including loneliness), especially for those from disadvantaged backgrounds.

Alternatively, it is possible that the psychological toll of ELA persists or is even amplified among highly educated people relative to their less-educated counterparts. As noted above, experiences during childhood form attitudes and social skills (Luecken et al., 2013) that may not be altered by education obtained later. Additionally, individuals exposed to ELA are less likely to complete high school and enter college (Metzler et al., 2017). Because “birds of a feather flock together” (i.e., similarity forms connections and friendships; McPherson et al., 2001), those who have earlier exposure to ELA but successfully attend college may encounter substantial challenges in adapting to social life and forming meaningful networks in an environment surrounded by others with different early-life experiences (i.e., not exposed to ELA). These difficulties in forming close social relationships may have long-term implications for loneliness and psychological well-being in later life. Thus, higher education such as a college degree may not reduce, but could even amplify, the negative impacts of disadvantaged childhood in shaping loneliness later in life.

Key Hypotheses

A life-course perspective and empirical evidence summarized earlier lead us to posit the following hypothesis:

Hypothesis 1: Each domain of ELA is positively associated with later-life loneliness.

Additionally, the pathway and cumulative frameworks also lead us to hypothesize the followings:

Hypothesis 2: Positive relationships between ELA and later-life loneliness are explained by adulthood conditions (health and SES).

Hypothesis 3a: Positive relationships between ELA and later-life loneliness are less pronounced for those with higher educational attainment.

Hypothesis 3b: Positive relationships between ELA and later-life loneliness are more pronounced for those with higher educational attainment.

Because prior studies show that contact with family members and health are only correlated with social loneliness (Dahlberg & McKee, 2014; Drennan et al., 2008), we

expect that having an adverse home environment and poor health during childhood are associated with social but not emotional loneliness.

Data and Method

Data and Sample

We used data from the 2008–2016 rounds of the Health and Retirement Study (HRS; see Author Note³). The HRS is a nationally representative longitudinal study of approximately 20,000 people over 50 and their spouses in the United States. The HRS is administered biennially, and its response rates ranged from 81% (2010) to 89% (2012). We also used the HRS Tracker File and the RAND Longitudinal File to construct some variables (e.g., health behaviors). The 2008–2016 rounds of HRS are suitable for our purposes because they include a multidimensional loneliness measure in the Leave-Behind Psychosocial and Lifestyle Questionnaire (see Author Note⁴) and comprehensive information on early-life conditions. After restricting our analytical sample to respondents aged 55 and older (Author Note⁵) and excluding those with missing values on loneliness, our final analytical sample has 17,481 respondents and 29,661 person-waves (weighted).

Measurements

Loneliness

We used the UCLA 11-item loneliness scale to measure overall, emotional, and social loneliness. The UCLA 11-item loneliness scale is the revised version of the original 20-item UCLA loneliness scale (Russell et al., 1978), which allows us to distinguish between emotional and social loneliness (Lee & Cagle, 2017). An overall loneliness scale was first constructed by summing up all 11 items (Cronbach’s $\alpha = .881$), with higher values representing higher levels of loneliness. Following prior practice (Lee & Cagle, 2017; Lee et al., 2021), we then constructed measures of emotional (feeling isolated; Cronbach’s $\alpha = .849$) and social loneliness (lacking available social connections; Cronbach’s $\alpha = .875$; see [Supplementary Appendix A](#) for detailed items). To ease interpretation and comparison, we standardized all three measures with the mean of zero and the *SD* of one.

Early-life adversities

We constructed measures of ELA using self-reported, retrospective childhood experiences. Informed by earlier research using the same data (Kemp & Ferraro, 2021; Morton & Ferraro, 2020), we considered five domains of ELA: poor SES, disruptive home environment, chronic diseases, impairments, and risky adolescent behaviours (see Author Note⁶). Within each domain, we dichotomized each component and calculated a total score top-coded at 2, except for risky adolescent behaviors because

very few participants had a score of 2 or above (1.3%). For each domain, a higher value indicates more adversities. [Supplementary Appendix B](#) describes details about the operationalization of the five domains (Author Note⁷).

Adulthood conditions

We considered adulthood SES (including education) and health as pathways for the associations between ELA and later-life loneliness, and education specifically as a moderating factor. Educational attainment is a three-category measure based on the highest degree earned: (a) below high school, (b) high school or some college, and (c) college and above. We also considered the log-transformed equivalized household income and total wealth (including secondary residence) as additional measures for adulthood SES. The natural log of equivalized household income reflects income sharing and economies of scale after dividing household income by the square root of the household size. Given the close associations between loneliness and health, functional limitations, and health behaviors ([Cacioppo et al., 2006](#); [Canham et al., 2015](#); [Dyal & Valente, 2015](#); [Hawkey et al., 2009, 2016](#); [Luo et al., 2012](#)), we also incorporated a series of respondents' various health/health behavior measures: self-reported health (categorical), Center for Epidemiological Studies—Depression scale (CES-D) depression (excluding the loneliness item), activities of daily living and instrumental activities of daily living (higher values indicating more limitations), frequencies of vigorous, moderate, and mild activities, number of drinks per week, and number of packs smoked per day. Informed by previous research ([Morton & Ferraro, 2020](#)), we used lagged SES and health measures one wave before (wave $t - 1$) when loneliness was measured (wave t) to avoid reverse causality.

Control variables

We controlled for sociodemographic variables, including age, age squared, sex, race/ethnicity (Whites, Blacks, and others), and marital status (married, separated, divorced, widowed, never married, and others). Because social isolation is a distinct but closely related concept to loneliness ([Hawkey et al., 2008](#)), we also incorporated a social isolation index as a covariate (Author Note⁸). Birth cohort and survey year dummies were also included to account for potential cohort and periodic differences.

Finally, we imputed missing values in ELA, adulthood conditions, and control variables using multiple-imputation via chained equations ([Royston, 2004](#)). We created 20 multiply imputed data sets to tolerate a 1% statistical power falloff ([Graham et al., 2007](#); for missing cases, see [Supplementary Appendix D](#)).

Analytical strategy

To address our research questions, we first estimated an ordinary least squares (OLS) regression among all pooled waves to examine the association between ELA and

later-life loneliness (Model 1), including five domains of ELA and all control variables. We then added adult condition measures to evaluate how these measures would explain associations between ELA and loneliness (Model 2). Finally, we added an interaction between ELA and educational attainment to explore the moderating role of education (see Author Note⁹). We used sample weights for the Leave-Behind Psychosocial and Lifestyle questionnaire (XLBWGTR) in all analyses, with standard errors clustered at the individual level to account for intraindividual correlation (see Author Note¹⁰).

Results

Descriptive Statistics

[Table 1](#) presents descriptive statistics for all variables included in the analyses (Author Note¹¹). Results demonstrate that emotional and social loneliness are positively associated with overall loneliness with large magnitudes ($\beta = 0.80$ and 0.93 , $p < .001$). The association between emotional and social loneliness is also significant and positive, but with a moderate magnitude ($\beta = 0.49$, $p < .001$), suggesting these two represent distinctive dimensions of loneliness. There are also differences in the associations between ELA domains and later-life loneliness: risky adolescent behaviors exhibit the strongest relationships with overall, emotional, and social loneliness ($\beta = 0.34$ – 0.41 , $p < .001$), followed by disruptive home environment ($\beta = 0.18$ – 0.22 , $p < .001$) and impairment ($\beta = 0.15$ – 0.18 , $p < .001$), whereas weaker associations exist for poor SES ($\beta = 0.06$ – 0.10 , $p < .001$) and chronic diseases ($\beta = 0.03$ – 0.11 , $p < .01$) with loneliness.

Pairwise correlations (not shown) also indicate positive correlations between most domains of ELA. Although poor SES during childhood is negatively associated with chronic diseases, impairment, and risky adolescent behaviors, its negative associations with impairment and risky adolescent behaviors disappear after controlling for age, sex, and race/ethnicity. By contrast, we still observe a negative association between poor SES and chronic diseases during childhood after controlling these demographic variables, but with a small magnitude.

Consistent with prior findings, higher adult SES and better health conditions are associated with lower levels of loneliness. For example, people with more education, better economic situation, better self-rated health, and more frequent exercise report a lower level of loneliness than those with less education, worse economic situation, worse self-rated health, and less frequent exercise.

Multivariate Analyses

ELA and later-life loneliness

[Table 2](#) presents OLS regression results of overall loneliness as a function of five ELA domains and other covariates,

Table 1. Descriptive Statistics

Variables	Mean/proportion	SD (min., max.)	Association with loneliness		
			Overall	Emotional	Social
Dependent variable					
Overall loneliness	0.02	1.02 (-1.20, 3.42)	—	0.78***	0.91***
Emotional loneliness	0.03	1.02 (-0.91, 2.84)	0.80***	—	0.49***
Social loneliness	0.01	1.02 (-1.12, 3.03)	0.93***	0.49***	—
Early-life adversities					
Poor socioeconomic status	1.38	0.80 (0, 2)	0.10***	0.06***	0.10***
Disruptive home environment	0.85	0.88 (0, 2)	0.22***	0.20***	0.18***
Chronic diseases	0.49	0.72 (0, 2)	0.08***	0.11***	0.03**
Impairment	0.25	0.51 (0, 2)	0.18***	0.16***	0.15***
Risky adolescent behaviors	0.12	0.32 (0, 1)	0.41***	0.38***	0.34***
Adulthood conditions					
Education					
Below high school	0.13	—	—	—	—
High school or some college	0.59	—	-0.24***	-0.15***	-0.24***
College graduates	0.28	—	-0.45***	-0.28***	-0.46***
Self-reported health					
Poor	0.06	—	—	—	—
Fair	0.17	—	-0.22***	-0.25***	-0.15***
Good	0.31	—	-0.56***	-0.57***	-0.43***
Very good	0.34	—	-0.81***	-0.78***	-0.65***
Excellent	0.11	—	-0.98***	-0.89***	-0.82***
CES-D	1.03	1.49 (0, 6)	0.24***	0.25***	0.19***
ADL	0.26	0.89 (0, 23)	0.18***	0.19***	0.14***
IADL	0.60	1.99 (0, 28)	0.04***	0.04***	0.04***
Number of packs smoked per day	0.09	0.30 (0, 5)	0.30***	0.29***	0.24***
Number of days to drink per week	1.29	2.09 (0, 7)	-0.04***	-0.03***	-0.03***
Vigorous activities	1.20	1.36 (0, 4)	-0.10***	-0.08***	-0.08***
Moderate activities	2.18	1.26 (0, 4)	-0.14***	-0.12***	-0.12***
Mild activities	2.48	1.04 (0, 4)	-0.15***	-0.11***	-0.14***
Logged household income	10.34	1.45 (-1.15, 17.91)	-0.10***	-0.09***	-0.09***
Logged total wealth	10.66	5.44 (-14.83, 17.59)	-0.03***	-0.03***	-0.03***
Control variables					
Age	67.23	9.56 (55, 101)	-0.09***	-0.11***	-0.05***
Age squared	4611	1360 (3025, 10201)	0.00***	0.00***	0.00***
Birth cohort					
Before 1919	0.01	—	—	—	—
1920s	0.08	—	-0.14*	-0.26***	-0.04
1930s	0.18	—	-0.24***	-0.41***	-0.07
1940s	0.34	—	-0.22***	-0.38***	-0.07
1950s	0.36	—	-0.12	-0.26***	-0.00
1960s	0.02	—	-0.04	-0.27**	0.11
Sex					
Men	0.46	—	—	—	—
Women	0.54	—	-0.12***	0.10***	-0.23***
Marital status					
Married	0.64	—	—	—	—
Separated	0.02	—	0.53***	0.62***	0.36***
Divorced	0.14	—	0.33***	0.48***	0.17***
Widowed	0.14	—	0.20***	0.42***	0.02
Never married	0.06	—	0.40***	0.52***	0.24***
Others	0.00	—	0.24	0.23	0.20

Table 1. Continued

Variables	Mean/proportion	SD (min., max.)	Association with loneliness		
			Overall	Emotional	Social
Race/ethnicity					
Non-Hispanic Whites	0.80	—			
Non-Hispanic Blacks	0.10	—	0.22***	0.18***	0.19***
Others	0.11	—	0.20***	0.04	0.25***
Social Isolation Index	0.82	0.90 (0, 4)	0.29***	0.26***	0.24***
Survey year					
2008	0.18	—	—	—	—
2010	0.19	—	-0.01	-0.01	-0.00
2012	0.20	—	-0.02	0.00	-0.03
2014	0.21	—	0.04	-0.01	0.07**
2016	0.23	—	0.03	0.00	0.05*
Number of observations			17,481		
Number of person-waves			29,661		

Notes: ADL = activities of daily living; CES-D = Center for Epidemiological Studies—Depression scale; IADL = instrumental activities of daily living. All numbers were estimated with weights using multiplied imputed data sets ($n = 20$). Bivariate associations with loneliness were estimated using ordinary least squares regression with standard errors clustered at the individual level. Associations with loneliness for age and age squared came from the same regression. The first category of each categorical variable is the reference group. *** $p < .001$, ** $p < .01$, * $p < .05$ (two-tailed tests).

Table 2. Ordinary Least Squares Regression Estimations of Later Life Overall, Emotional, and Social Loneliness on Five Domains of Early-Life Adversities

Variables	Overall loneliness		Emotional loneliness		Social loneliness	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Early-life adversities						
Poor socioeconomic status	0.08*** (0.01)	-0.00 (0.01)	0.05*** (0.01)	-0.01 (0.01)	0.08*** (0.01)	-0.00 (0.01)
Disruptive home environment	0.16*** (0.01)	0.13*** (0.01)	0.14*** (0.01)	0.11*** (0.01)	0.14*** (0.01)	0.12*** (0.01)
Chronic diseases	0.04** (0.01)	-0.00 (0.01)	0.07*** (0.01)	0.02 (0.01)	0.01 (0.01)	-0.02 (0.01)
Impairment	0.09*** (0.02)	0.03* (0.02)	0.09*** (0.02)	0.04* (0.02)	0.07*** (0.02)	0.02 (0.02)
Risky adolescent behaviors	0.18*** (0.03)	0.09** (0.03)	0.20*** (0.03)	0.12*** (0.03)	0.13*** (0.03)	0.06 (0.03)
Constant	1.66** (0.62)	1.56** (0.59)	2.16*** (0.61)	1.56** (0.58)	0.97 (0.62)	1.22* (0.59)
Number of respondents	17,481	17,481	17,481	17,481	17,481	17,481
Number of person-waves	29,661	29,661	29,661	29,661	29,661	29,661
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Adulthood conditions	No	Yes	No	Yes	No	Yes

Notes: Clustered robust standard errors in parentheses. Estimated with probability weights and multiplied imputed data sets ($n = 20$). Additional controls are not shown. *** $p < .001$, ** $p < .01$, * $p < .05$ (two-tailed tests).

as well as separately by emotional and social loneliness. Regarding overall loneliness (Columns 1 and 2), Model 1 shows that net of control variables, all five domains of ELA are significantly associated with higher levels of overall loneliness in later life. Model 2 includes adulthood conditions to gauge to what extent these characteristics could account for observed associations in Model 1. Results across Models 1 and 2 reveal different patterns across ELA domains. Concerning poor childhood SES and having chronic

diseases during childhood, adulthood conditions fully account for their associations with loneliness, rendering coefficients of the above domains insignificant in Model 2. Postestimation tests using seemingly unrelated regressions indicate significant changes in the regression coefficients across models ($p < .001$).

Adulthood conditions account for half or even more of the associations between loneliness and other domains of ELA, such as impairment and risky adolescent behaviors.

Postestimation tests based on seemingly unrelated regressions again indicate that reductions in the regression coefficients across models for these domains are statistically significant ($p < .001$). However, coefficients of impairment and risky adolescent behaviors in Model 2 remain statistically significant, demonstrating lingering associations with later-life loneliness beyond measured adulthood circumstances. For the relationship between risky adolescent behaviors and loneliness, additional analysis indicates that loneliness is associated more with internalizing (i.e., depression and other psychological problems) than externalizing behaviors (i.e., youth–police contact and substance use; see [Supplementary Appendix E](#)).

Unlike other domains, adulthood conditions could only account for a much smaller part (about one-fifth) of the association between disruptive home environment and later-life loneliness. In Model 2, early experience of living in a disruptive home environment is still related to significantly higher levels of loneliness, though the reduction in the coefficients of disruptive home environments between Models 1 and 2 is statistically significant ($p < .001$).

Columns 3–6 of [Table 2](#) present results separately for emotional and social loneliness. Consistent with results for overall loneliness, Model 1 shows that poor SES, disruptive home environment, impairment, and risky adolescent behaviors are positively associated with later emotional (Column 3) and social loneliness (Column 5). However, having chronic diseases during childhood is only related to emotional loneliness, and such association disappears after accounting for adulthood conditions. On the other hand, having chronic diseases during childhood is not significantly associated with social loneliness, regardless of controlling for adult conditions. Furthermore, although adulthood conditions fully account for the association

between childhood impairment and social loneliness, they explain a smaller proportion of the association between childhood impairment and emotional loneliness. Similarly, adulthood SES and health/health behaviors partially explain the association between risky adolescent behaviors and emotional loneliness but fully account for the association between risky behaviors and social loneliness.

By contrast, results of poor SES and disruptive home environment are similar across the subdimension of loneliness. Low SES during childhood is not significantly related to emotional and social loneliness after conditioning on adulthood conditions. On the other hand, living in a disruptive home environment in early life is significantly associated with higher levels of emotional and social loneliness, regardless of controlling for adulthood conditions. These results are consistent with the patterns for overall loneliness.

Differences by education

We then evaluate the moderating role of educational attainment in the relationship between ELA and later-life loneliness. [Figure 2](#) visualizes results from the OLS regressions for overall loneliness with interactions between ELA and educational attainment. Among all domains, the disruptive home environment is significantly related to higher loneliness with similar magnitudes regardless of the level of education, whereas neither poor childhood SES nor impairment has significant associations with loneliness across education groups.

By contrast, we find some evidence supporting a moderating role of educational attainment in the relationships between loneliness and other domains of ELA. For example, risky adolescent behaviors are significantly associated with a higher level of loneliness among college graduates only ($\beta = 0.20, p < .001$). This positive association among college-educated individuals is significantly different from that among those with a high school degree or some college ($p < .05$). Although not statistically significant, the positive association between risky adolescent behaviors and loneliness among college graduates is larger than that among those with less than high school education. Additional analysis suggests that the pronounced positive relationship between risky behaviors and later-life loneliness among college graduates primarily reflects the influence of internalizing behaviors (see [Supplementary Appendix E](#)). A similar pattern also exists for having chronic diseases in childhood, but the positive association between childhood chronic diseases and overall loneliness do not reach a conventional significance level across the educational groups.

We then examined the moderating role of education by subdimensions of loneliness (see [Supplementary Appendix F](#)). Similar to the results for overall loneliness, the association between risky adolescent behaviors and emotional loneliness is significantly different between high school graduates and college graduates. We do not observe a significant moderating role of education for social loneliness, despite a

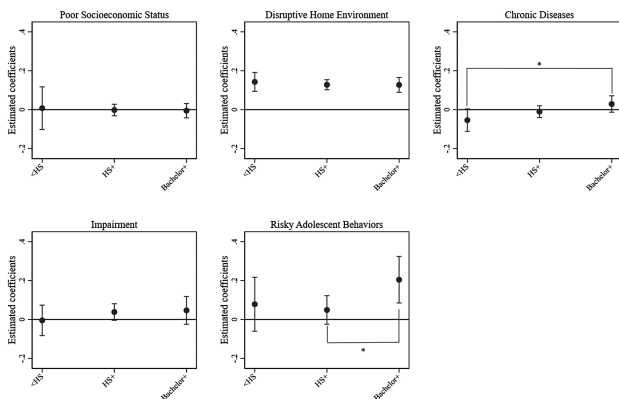


Figure 2. Visualized regression coefficients of five domains of early-life adversities on overall loneliness, by educational attainment. Dots indicate estimated regression coefficients, and error bars indicate 95% confidence intervals. Coefficients and confidence intervals were obtained from the main effect of the regression equation (3), by changing the reference group of educational attainment. <HS, HS+, and Bachelor+ denote respondents with less than high school education, high school graduates or some college, and college graduates. Estimated with probability weights and multiplied imputed data sets ($n = 20$). * $p < .05$ (two-tailed tests).

larger positive association between risky adolescent behaviors and social loneliness among college graduates relative to other groups. On the other hand, significant educational variation in the association between childhood chronic diseases and loneliness only exists for social loneliness, where increased social loneliness associated with chronic diseases during childhood appears to exist among college graduates but not the other two less-educated groups.

Discussion

Drawing on well-established life-course theories and empirical evidence (Elo, 2009; Hayward & Gorman, 2004; Montez & Hayward, 2011), the current study evaluates whether and how ELA is related to loneliness later in life. In doing so, we provide novel evidence of multidomain ELA as an additional source contributing to unequal loneliness among middle-aged and older people in the United States, what factors account for their associations, and how such associations vary by education. We also distinguish between social and emotional loneliness that may have different correlates over the life course.

We found that all five domains of ELA were significantly related to later-life loneliness without accounting for adulthood conditions. These results are consistent with empirical evidence that various childhood conditions are related to later-life health (Hayward & Gorman, 2004; Palloni, 2006) and support Hypothesis 1. In addition, the positive intercorrelations between domains of ELA suggest that failure to consider multiple aspects of early-life conditions may exaggerate the relationship between a specific type of early-life condition and later-life outcomes (Ferraro et al., 2016; Kemp & Ferraro, 2021).

We also found that the relationships between ELA and overall loneliness were domain specific. Consistent with the pathway framework and Hypothesis 2, our results showed that low SES during childhood was related to later loneliness through adulthood conditions. SES and health during adulthood are also important pathways via which impairment and risky adolescent behaviors relate to loneliness. However, the relationships between the above domains and later-life loneliness remain statistically significant after adjusting for these variables. These results partially support Hypothesis 2.

By contrast, relationships between disruptive home environment and later-life loneliness are statistically significant and change little net of adulthood SES and health/health behaviors. One potential reason for these persisting relationships is that our models do not capture all intermediating factors. For example, a disruptive home environment during childhood may impede social skills development (Donaldson & Watson, 1996; Luecken et al., 2013) and increase psychological sensitivity to stressors (Dougherty et al., 2004; Miller et al., 2011) that could exert a long-lasting effect over the life course on social support and loneliness.

Educational variation in the relationships between ELA and later-life loneliness is not consistent with the accumulated wisdom of education as a great equalizer (Hout, 1988). One important finding is the persistent relationship between early disruptive home environment and later-life loneliness across all education groups. Furthermore, the stronger association between risky adolescent behaviors (particularly internalizing behaviors) and loneliness among college-educated people (relative to those without a college degree) demonstrates the role of higher education in augmenting the negative association between specific dimensions of ELA and loneliness. Because similarity begets connections and friendships (McPherson et al., 2001), unfavorable childhood and adolescent behaviors may make it difficult for those exposed to ELA to form networks and friendships with highly educated individuals without such experiences. This finding provides support for Hypothesis 3b.

We also find that having chronic diseases during childhood is associated with emotional loneliness via adulthood SES and health, but not with social loneliness. Given that emotional loneliness reflects a feeling of the lack of intimate relationships, whereas social loneliness represents a perceived deficiency of available social networks (Weiss, 1973), those who had health issues during childhood were more likely to be dissatisfied with intimate relationships later in life, but less likely to be disappointed with available social ties. Our results differ from prior studies regarding distinctive correlates between emotional and social loneliness. We found that poor health during childhood was positively associated with emotional loneliness, whereas a European study showed a stronger correlation between poor health and social loneliness (Drennan et al., 2008). This discrepancy in the relationships between childhood health and two subdimensions of loneliness may reflect differences in specific measures of loneliness and health, survival selection in older adults, and/or other contextual differences between the United States and Europe.

There are several limitations in the current study, pointing to possible directions for subsequent research. First, we relied on retrospective childhood data. Although prior studies highlight the reliability and validity of the HRS retrospective childhood data regarding health (Smith, 2009) and SES (Vable et al., 2017), the retrospective nature of the data may introduce recall biases in ELA measures. Using prospective data with multiple domains of early-life conditions is an important extension to overcome such limitations. Second, although we took advantage of the longitudinal nature of the HRS study and conducted several robustness checks, our results could not be interpreted as causal because there might still be unobserved confounders. Third, we could not test the mediating role of social skills and psychological sensitivity due to data limitation, despite their theoretical importance underpinning the relationship between ELA and

loneliness. Finally, multiple domains of ELA could be related to each other in complex but important ways, which we did not consider in this study. For example, low SES may lead to disruptive parent–child relationships, which in turn leads to risky adolescent behaviors. Subsequent research could evaluate these potential interrelationships between subdomains using more appropriate data.

Despite these limitations, this study advances our understanding of loneliness for middle-aged and older people in the United States and its correlates over the life course. Loneliness has attracted increasing public, policy, and research attention, especially during the practice of social distancing during the COVID-19 pandemic. Our findings also provide important policy implications. Policy interventions to alleviate childhood adversity are necessary to reduce its long-term negative implications for the long run for middle-aged and older people's psychosocial well-being. Policy efforts to improve adulthood conditions, especially health conditions, would also help reduce the vulnerability to feeling lonely among those exposed to childhood adversity.

Author Notes

1. According to the American Psychological Association, social skills can be defined as abilities to interact with others competently and appropriately (<https://dictionary.apa.org/social-skills>).
2. Although recent work suggests continuing educational changes and transitions during midlife (Grodsky et al., 2021), changes in educational attainment are still relatively limited compared with volatility in income or wealth over the life course.
3. We did not use the 2018 round of the HRS because the sample weight for the Leave-Behind Psychosocial and Lifestyle Questionnaire in this wave was not available when we began this project.
4. Although the HRS collected data biennially, the Leave-Behind Psychosocial and Lifestyle Questionnaire were implemented among two rotating (random) 50% subsamples from the core panel participants. For example, respondents who completed the Leave-Behind Psychosocial and Lifestyle Questionnaire in 2008 were not reinterviewed until 2012.
5. The HRS uses a longitudinal sample cohort design, and some waves do not include people aged 51–54. We thus chose age 55 as the cutpoint to make sure that each wave in our sample is representative of the same-age population of middle-aged and older adults in the United States.
6. The strong correlations among the ELA domains may introduce multicollinearity. Variance inflation factors indicated little concern for multicollinearity in our regression analyses.
7. Sensitivity checks using alternative operationalization of ELA yielded largely consistent results as presented here (see [Supplementary Appendix C](#)).
8. The social isolation index has a total score of 0 (the least isolated) to 4 (the most isolated). Respondents were scored one if their situations satisfied any of the following scenarios at the time of the interview: (a) living alone, (b) had rare contact (i.e., met with, talked with, or wrote a mail/email less than once per month) with children, (c) had rare contact (defined above) with other family members, and (d) had rare contact (defined above) with friends.
9. This approach allows us to investigate how educational attainment moderates the relationships between ELA and later-life loneliness net of other adult conditions. However, the relationships between ELA and later-life loneliness that are explained by adult conditions may be moderated by educational attainment. We assessed this possibility by adding an interaction between ELA and educational attainment in Model 1. Results were largely consistent with our findings presented here.
10. We did not examine individual trajectories of loneliness due to (a) the long interval (4 year) between waves of the Leave-Behind Psychosocial and Lifestyle Questionnaire and (b) limited time points (two or three times) of loneliness measures in the period we examine. We also did not detect any meaningful differences in trends of loneliness by ELA over time.
11. Means and *SD* of loneliness measures reported in [Table 1](#) are not exactly 0 and 1 because these numbers are weighted.

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

We declare no conflict of interest.

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Author Contributions

S. Furuya and J. Wang jointly conceptualized the study. S. Furuya conducted the statistical analysis, drafted the manuscript, and revised the manuscript. J. Wang helped write and revise the manuscript. S. Furuya and J. Wang contributed to the interpretation of the findings and approved the final version of the paper.

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