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Original Article

Depression in Later Life: The Role of Adult Children's College Education for Older Parents' Mental Health in the United States

Jenjira J. Yahirun, PhD,[1,*] Connor M. Sheehan, PhD,[2] and Krysia N. Mossakowski, PhD[3]

[1]Center on the Family, University of Hawai'i at Mānoa, Honolulu, Hawaii. [2]School of Social and Family Dynamics, Arizona State University, Tempe, Arizona. [3]Department of Sociology, University of Hawai'i at Mānoa, Honolulu, Hawaii.

*Address correspondence to: Jenjira J. Yahirun, PhD, Center on the Family, University of Hawai'i at Manoa, Miller Hall 103, 2515 Campus Road, Honolulu, HI 96822. E-mail: jyahirun@hawaii.edu

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Abstract

Objectives: Research on the socioeconomic gradient in mental health links disadvantaged family background with subsequent symptoms of depression, demonstrating the "downstream" effect of parental resources on children's mental health. This study takes a different approach by evaluating the "upstream" influence of adult children's educational attainment on parents' depressive symptoms.

Methods: Using longitudinal data from the U.S. Health and Retirement Study (N = 106,517 person-years), we examine whether children's college attainment influences their parents' mental health in later life and whether this association increases with parental age. We also assess whether the link between children's college completion and parents' depression differs by parents' own education.

Results: Parents with children who completed college have significantly lower levels of depressive symptoms than parents without college-educated children, although the gap between parents narrows with age. In addition, at baseline, parents with less than a high school education were more positively affected by their children's college completion than parents who themselves had a college education, a finding which lends support to theories of resource substitution.

Discussion: Offspring education is an overlooked resource that can contribute to mental health disparities among older adults in a country with unequal access to college educations.

Key words: Depression, Intergenerational relations, Life course analysis

Mental health research demonstrates that a disadvantaged family background has a lasting influence on symptoms of depression (McLeod & Shanahan, 1996; Mossakowski, 2015). This finding illustrates the "downstream" effect of parents' socioeconomic status on children's subsequent mental health problems. Research across several social contexts, however, also suggests that children's socioeconomic status, and specifically their educational attainment, affects parents' physical health outcomes and mortality later in life (Friedman & Mare, 2014; Torssander, 2013; Yahirun, Sheehan, & Hayward, 2017). This work highlights the importance of considering the "upstream" flow of adult children's resources that shape older parents' health.

Yet mounting evidence of the association between children's resources and parents' physical health suggests that children's education may influence parents' health in other domains as well. A recent study by Lee, Glei, Goldman, and Weinstein (2017) used Taiwanese data to examine family

resources and found that children's education was inversely associated with parents' levels of depressive symptoms, over and above parents' socioeconomic status. Moreover, they found that the association between children's education and parental mental health weakened at older ages, which may be due to selective mortality and attrition among those with low educational attainment (Friedman & Mare, 2014; Lee et al., 2017).

It remains unclear whether these patterns also exist in the United States, where the lifetime prevalence of experiencing a major depressive episode is substantially higher (16.9 per cent) than in Taiwan (1.5 per cent; Kessler et al., 2013). The present study is the first to investigate whether children's educational attainment is associated with depression trajectories among older adult parents in the United States and extends prior research (Lee et al., 2017) by examining potential mechanisms through which children's education affects parents' depressive symptoms. Furthermore, guided by resource substitution theory (Mirowsky & Ross, 2003; Ross & Mirowsky, 2011), we assess whether the benefits of children's college completion are greater among less advantaged parents compared with more advantaged parents, and whether these advantages shift with age.

Background

Education has cumulative advantages for physical health and well-being (O'Rand, 1996; Ross & Wu, 1996). Compared with the poorly educated, well-educated individuals are more likely to be employed in subjectively rewarding jobs with higher incomes, have greater levels of social support, engage in healthier behaviors, and experience better psychological well-being (Eaton et al., 2010; O'Rand, 1996; Ross & Wu, 1996). Unlike other dimensions of socioeconomic status such as income or wealth, education fluctuates less after certain life stages.

In the United States, a college education in particular is associated with a number of advantages. At the minimum, many Americans consider college completion to be an essential component to achieving middle-class status (Brown, 2015). Cultural theorists argue that higher education signals access to a specific form of cultural capital (Bourdieu, 1974) and a college degree is increasingly considered "a sign of lifestyle, class of social origin, or 'attitude'" (Eaton et al., 2010: 229). Whether higher education is the answer to large-scale intergenerational mobility remains debatable (Hout, 2012), but the disparities in income, employment, poverty levels, and job satisfaction between individuals with and without a college degree are well documented and have increased substantially over time (Hout, 2012). In general, education is an attained status or resource that belongs to an individual, which provides advantages that can leave an imprint on mental health (Ross & Mirowsky, 2006).

Achieving a college education may not only benefit an individual's psychological well-being, but could also ultimately affect her/his parents' mental health later in life. The life-course perspective emphasizes the "linked lives" or the interdependence of family members such that events in one family member's life also shape the outcomes of other members (Elder, Johnson, & Crosnoe, 2003). There are multiple pathways through which a child's college education could affect parents' mental health. One explanation is that better-educated children experience fewer financial problems and are more likely to be employed, to have a stable income, and to accrue wealth as a result of their college credentials. This in turn reduces stress for parents, in part because parents shoulder the burden of supporting adult children who are not economically secure (Milkie, Bierman, & Schieman, 2008; Ryff , Lee, Essex, & Schmutte, 1994). That children's successes and failures are so intimately tied to parental well-being is not surprising; parents are often called upon to act as a safety net for younger generations, stepping in to provide financial assistance when needed (Seltzer & Bianchi, 2013). If parental stress and anxiety increase when children experience financial insecurity (Milkie et al., 2008), then the effect of children not completing college could simply be an antecedent to other socioeconomic disadvantages that could explain parental depression.

Some parents may see their children's college completion as a direct contribution to their own well-being in later life. Whereas parents are more likely to provide support to children who are struggling (Swartz, Kim, Uno, Mortimer, & O'Brien, 2011), successful children are more likely to be called upon than their less successful siblings to provide care for older parents (Pillemer & Suitor, 2006). Better-educated children may be a source of financial support to mothers and fathers (Fingerman, Cheng, Birditt, & Zarit, 2012), and this may be especially important in familial contexts where offspring are expected to provide for parents in later life (Park, 2017). In addition to financial or instrumental support, informational support may further reduce stress and protect mental health among parents of highly educated children (Thoits, 2011).

Less tangible, but equally important, are the emotions that having "successful" children evoke. Parents may feel proud of successful children, which could enhance their psychological well-being. Because parents often view children as an extension of themselves, children's accomplishments may be felt as parental achievements as well (Levitzki, 2009). Alternatively, children with more setbacks may experience worse mental health, which in turn affects parents' mental health through the "shared fate" of parents who are exposed to children's challenges (Greenfield & Marks, 2006).

Furthermore, compositional factors that are tied to children's education may also be linked to parents' mental health. College-educated individuals are more likely to be married and stay married (Goldstein & Kenney, 2001), and parents derive a sense of accomplishment when children "master" markers of adulthood, such as marriage (Hagestad, 1986). Yet better-educated children tend to live farther away from parents (Compton & Pollak, 2013), and

parents may feel isolated if they have small social networks to rely on (Cornwell & Waite, 2009). Thus, factors such as children's partnership status and geographic proximity to parents also shape parents' mental health and are likely tied to children's educational attainment as well.

Cumulative advantage theory suggests that achieving a college education can lead to other socioeconomic advantages increasingly benefiting mental health over time such that the mental health inequality between those with higher or lower levels of education diverges or strengthens with age (O'Rand, 1996; Ross & Wu, 1996). Previous research on whether the relationship between education and depression varies by age has focused on intragenerational pathways. Using cross-sectional data and a test of interaction effects, Miech & Shanahan (2000) found that the association between one's own educational attainment and symptoms of depression strengthens with age in the United States, which supports cumulative advantage theory. Kim & Durden (2007) used U.S. longitudinal and also found evidence of cumulative advantage.

When examining intergenerational pathways, Lee and colleagues' (2017) study using Taiwanese data did not find evidence of divergence, but rather that the effect of children's schooling on lowering parents' levels of depressive symptoms diminished in later life. As the gap between advantaged and disadvantaged parents converged with age, their study cited an age-as-leveler explanation (Lee et al., 2017). The age-as-leveler principle predicts that educational disparities in health narrow across the life course due to selective mortality and attrition among individuals with less education (Beckett, 2000) and children with less education (Friedman & Mare, 2014). That is, through selective mortality, parents whose children have lower levels of educational attainment die earlier than peers with more educated children, thus the remaining parents whose children did not complete college are increasingly robust in terms of their physical and mental health. Aging is correlated with depression (Mirowsky & Ross, 1992; Yang, 2007), and highly educated individuals or individuals with highly educated children live longer, and thus are more susceptible to becoming depressed later in life. Consequently, the health gap between the most and least advantaged parents converges or weakens with age. In addition, specific age-targeted polices such as social security (Dupre, 2007) may serve to narrow mental health disparities in later life that override the effects of family resources, such as children's education. Finally, the age-as-leveler or convergence effect could be due to an increased immunity among parents whose children failed to complete college, when education-related stressors stemming from children may have declined over time as parents eventually learn to cope better (Miech & Shanahan, 2000). Also, educational attainment is generally static after young adulthood, so older parents may no longer worry about their older children needing to return to school after a certain age.

In addition, the benefits of having highly educated children may also differ by parents' own education. Resource substitution theory argues that education is a more important resource among individuals who are otherwise disadvantaged (Mirowsky & Ross, 2003). Individuals with fewer social or economic resources can use education, as an attained resource, to substitute for social or economic resources that they may lack. For example, those from poor- or working-class family origins may experience the health benefits of education more acutely than those from advantaged family origins. In contrast to resource substitution theory, individuals with more social advantages may derive greater benefits from education, leading to resource multiplication, rather than resource substitution (Ross & Mirowsky, 2011). Individuals raised with more socioeconomic resources, for example, may more readily use their own education to modify health behaviors that positively influence health outcomes.

Extending this theory to the family context, prior research has examined how an individual's social origins (e.g., parental education) interacts with one's own education to shape individual health outcomes (Ross & Mirowsky, 2011). In the United States, a study of physical impairment found that parental education significantly affected the baseline and aging trajectories of individuals with low levels of education, but had no significant effect on the aging vectors of individuals who completed college (Ross & Mirowsky, 2011: 597). In a context where children's educational resources may also shape parents' health, it is possible that the least advantaged parents, individuals who themselves have less education, benefit more from the education of their adult children compared with their college-educated peers. However, research examining the moderating effect of one's own education on the relationship between offspring resources and own health has produced mix results. In the United States, Friedman & Mare (2014) found no moderating effects of parent education. Yet in Taiwan, evidence for resource multiplication was found such that highly educated children increased the longevity among parents who themselves had more years of schooling, compared with parents with less (Zimmer, Martin, Ofstedal, & Chuang, 2007).

The Current Study

This study examines whether children's education influences parents' mental health trajectories in the United States. We predict that a child's college education will have positive effects on parents' mental health by reducing the risk of parental depression compared with parents whose children did not complete college (Hypothesis 1). Similar to prior research, we foresee a weakening of the association between offspring education and parents' depression over their life course (Hypothesis 2). Notably, we extend Lee and collegues (2017) analysis to address potential mechanisms through which children's education could shape parents' mental

health. If parental stress and anxiety increase when children experience economic insecurity, then the effect of children not completing college could simply be an antecedent to other socioeconomic disadvantages that could explain parental depression. We hypothesize that accounting for children's income and wealth will attenuate the relationship between offspring education and parental health (Hypothesis 3). For similar reasons, we predict that the effect of children's education will also weaken after adjusting for financial transfers from children to parents (Hypothesis 4). Finally, framed by theories of resource substitution and resource multiplication, our study assesses whether the association between having children who complete college and parents' symptoms of depression differs among the most and least educated parents. We hypothesize that the link between children's education and parents' symptoms of depression will be stronger for parents with less education compared with parents with more education (Hypothesis 5).

Data and Methods

Sample

To test our hypotheses, we used data from the U.S. Health and Retirement Study (HRS), a biennial panel survey that began in 1992 (Wave 1) and is nationally representative of individuals aged 50 and older. We used the publicly available RAND HRS file—Version "O" (Bugliari et al., 2016) and the RAND HRS Family File—Version D (Bugliari et al., 2017). The HRS Family File included respondent reports of each of their children between 1992 (Wave 1) and 2012 (Wave 11). Basic demographic information on children was updated by a designated family respondent periodically, but questions about children's education were not asked at every wave. Children's education was provided by a designated "family respondent" in 1992 and 1994, and of new respondents only in 1996. The data collection on children's education was skipped in 1998, although values were carried forward from previous waves. Because of our focus on college attainment, we were concerned that a potential 6 year gap for certain respondents (i.e., those who were surveyed in 1992) could be problematic. However, a complete "census" of the schooling for all of the respondents' children was taken in 2000 (Wave 5), which is why we begin our analysis with that year. In addition, we note that a recent data alert was issued for the RAND Family File, where RAND states that approximately 3 per cent of the parent–child cases are duplicates (RAND Data Alert, 2018). Unfortunately, RAND has not released who the duplicates are, inhibiting us from simply excluding these records from our sample. We discuss the supplemental analyses conducted to ensure that our results are robust to this error in the *Discussion*.

We constructed our sample from all respondent–years in the RAND HRS "O" file that fell within our observation window of 2000–2012 (N = 261,219 person-years). To maximize observations, drops were wave-specific so that respondents and their children could "age into" our sample. We excluded those respondents who were born after 1959 because they are only observed for a year in the study and thus do no contribute to the growth curve trajectories (n = 9,674 person-years). We also dropped those observations when respondents were not yet ages 51 and older (n = 2,661 person-years). Next we merged together the file with the RAND HRS Family File—Version D, which led to an exclusion of person-years where a respondent did not report having any children and any persons with "bad links" to offspring, defined as those in which the parent–child relationship is evaluated by RAND as inconsistent across survey years (Bugliari et al., 2017) (n = 21,028 person-years). Please note that the exclusion of "bad links" likely removed most of the parent-child duplicates from the analytical sample (see RAND Data Alert, 2018). We further dropped person-years where the respondent was not present in the HRS (n = 106,083). Person-years where the respondent was missing information on marital status, education, or race were also dropped (n = 152). Consistent with prior research (Friedman & Mare, 2014), we only included information on children who were age 25 or older with the assumption that at that age, most offspring will have completed their formal education (n = 5,434 person-years).

We also excluded respondents without valid depressive symptom scores (our main outcome variable of interest) in any given year (n = 9,660 person-years). There was generally little missing data on other parental or children's characteristics, but to address this, we used multiple imputation then deletion (MID), where we calculated imputation models for the entire sample and then dropped those with missing Center for Epidemiologic Studies-Depression (CES-D) scores (Von Hippel, 2007). We evaluated the sensitivity of our findings to our imputation strategy by comparing results from models that used the multiple imputed data with results from models that used list-wise deletion and models based on data where those with missing CES-D scores were kept in the data. These results (available upon request) showed little substantive difference. Thus, we used the MID procedure that parallels prior work in this area (Lee et al., 2017). Our sample was comprised of older adults ages 51 and older who were alive and report having at least one child age 25 between 2000 (Wave 5) and 2012 (Wave 11). The final analytic sample had 25,058 respondents ages 51 and older comprising 106,517 person-years.

Measures

Depressive symptoms

We measured parents' mental health using a 7-item subset of the 20-item CES-D scale (Radloff, 1977). The negative indicators measured whether the respondent experienced the following sentiments all or most of the time: depression, everything is an effort, sleep is restless, felt alone, felt sad, and could not get going. The positive indicators measured whether the respondent felt happy and enjoyed life, all or

most of the time (Bugliari et al., 2016). This scale was coded so that higher scores signified more depressive symptoms. Abbreviated CES-D scales have comparable internal consistency and accuracy in assessing depressive symptoms among older adults compared with the complete CES-D (Andresen, Malmgren, Carter, & Patrick, 1994). The depressive symptoms scale used in our analysis had high internal consistency (Cronbach's alpha across the waves ranged from α =.72 to α = .78). CES-D scales are often skewed, so in preliminary analyses we fit models using the untransformed depressive symptoms scale against other transformations, including (a) the square root of depressive symptoms and (b) the logged (abbreviated CES-D + 1) scale. These transformations demonstrated substantively consistent results. Thus, we present results from models using the untransformed depressive symptoms scores for interpretability.

Children's educational attainment

Our main variable of interest was offspring education, reported as years of schooling. There are several ways to assess the education of respondents' children. Previous studies used the education of the oldest child (Torssander, 2013), the mean education of all children (Lee et al., 2017), or the share of children with a college education (Yahirun et al., 2017). We used the share of children with a college education. Specifically, we coded children's education as the following categorical variable: "0" no children with college education, "1" some children with a college education, and "2" all children with a college education. However, we also fit models using the mean years of offspring education, the maximum years of offspring education, and the proportion of children who completed college. These three additional specifications provided substantively consistent results, and the tests of this sensitivity analysis are provided in Supplementary Table A1.

Parental characteristics

We also controlled for parental characteristics. Specifically, we accounted for a respondent's gender with men coded "1" and women coded "0." Race/ethnicity is measured using the following categorical variable: non-Hispanic White (0 = Referent), non-Hispanic Black (1), Hispanic (2), and non-Hispanic Other (3). Foreign-born status was included with those born outside the United States coded "1" and those born in the United States coded "0." We coded marital status as the following categorical variable: married/partnered (0 = Referent), separated/divorced (1), widowed (2), and never married (3). The total number of living children was included as a continuous variable. We controlled for respondent income and wealth and categorized these measures into quartiles. Parents' age, marital status, income, and wealth were all time-varying variables in our models. We included the respondent's own educational attainment: less than high school (0 = Referent), high school or GED (1), some college (2), or college or more (3) in the models, and also included it as a moderator in our test of resource substitution theory.

Mediating variables

Potential mediators and controls for children's characteristics were included. Because offspring financial well-being may explain the association between children's education and parental depression, we controlled for the income of offspring as no children earned more than US$35,000 annually (0 = Referent), some children earned more than US$35,000 annually (1), and all children earned more than US$35,000 annually (2). The cutoff of US$35,000 was an artifact of how children's income was asked in the HRS itself (Bugliari et al., 2017). In addition, we included children's wealth measured by homeownership. We measure this as no children are homeowners (0 = Referent), some children are homeowners (1), and all children are homeowners (2). Children's transfers to parents were coded as no transfers of more than US$500 from any child in the past 2 years (0), or at least one child transferred US$500 or more in the past 2 years (1).

Children's characteristics

We accounted for the gender composition of children in the following categorical variables: no daughters (0 = Referent), some daughters (1), and all daughters (2). We included children's marital/partnership status as no children partnered (0 = Referent), some children partnered (1), and all children partnered (2). We also accounted for the proximity of children: no coresident child or child who lived within 10 miles (0 = Referent), at least one coresident child (1), and no coresident child but at least one child lived within 10 miles (2).

Methods

The first analysis employed ordinary least squares (OLS) regression using data to assess how children's education, parent characteristics, and children's characteristics affect levels of parental depression at baseline (t = 1). Next, we used multilevel growth curve models, which are similar to previous studies that used these models to measure changes in depression over time (Lee et al., 2017; Yang, 2007). The growth curve models build on the cross-sectional analysis at baseline and allowed us to model the trajectories of depressive symptoms as individuals in our sample age. In the growth curve analysis, person-years were clustered within individual respondents. We used age as the time scale, centering age at 68 (the mean age for the person-year sample). As such the intercept indicated the average depressive symptom score at age 68 for the sample while the age variable indicated the linear association between age and symptoms of depression. We coded age linearly, but in preliminary analysis (not shown here), a quadratic term (age squared) was also included. Although the quadratic term was statistically significant, the interaction with children's education was not statistically significant and did not alter the substantive results. Thus, we did not include the quadratic variable in our results. By interacting the distribution

of children's education with age, we were able to examine how the depressive symptoms—age intercepts and age slopes—differ by children's educational attainment. In addition, we examined whether our results differed when we allowed all other covariates to affect the slope, that is, by allowing all other variables in a fully adjusted model to also affect the age trajectory of children's education. We found that the substantive results remained the same (results not shown), and thus, we did not interact the covariates with age in the models presented.

We employed the following progressive adjustment strategy in both the cross-sectional and growth curve analyses. First, we documented the basic association between age, children's education, and parental depressive symptoms. In the growth curve models, this means that we interacted the age slope with children's college education to assess how the association between education and depressive symptoms changed over time. The second model included parents' other characteristics, such as their own education, income, and wealth. The third model added the potential mediators of children's income and homeownership and the fourth model included financial transfers from offspring to parents. The fifth model then added children's gender, partnership status, and proximity to parents. Finally, we interacted parent education and children's education using the same variables in the final model to test whether there was support for the idea of resource substitution—that the least educated parents gain more from the education of their offspring than the most educated parents.

Results

Table 1 presents descriptive statistics at the parent's year of entry into the sample. On average, depressive symptoms were low. The average parent was approximately aged 63–64 upon entry into our sample. Women and non-Hispanic Whites make up the majority of persons in the sample. At baseline, the sample consisted of predominantly married/partnered persons with respondents reporting an average of 3–4 children. Nearly 50 per cent of the

Table 1. Descriptive Statistics of Sample at Baseline (*N* = 25,058 persons)

Parent characteristics	Mean/percentage	*SE*	Children's characteristics	
Depressive symptoms	1.6	0.0	Education	
Age	63.7	0.2	No children with college	51.1%
Male	42.4%		Some with college	31.7%
Race/ethnicity			All with college	17.2%
NH White	68.5%		Gender	
NH Black	17.5%		No daughters	21.1%
Hispanic	11.4%		Some daughters	58.5%
NH Other	2.6%		All daughters	20.4%
Foreign-born	12.0%		Marital/partner status	
Marital status			No children partnered	17.3%
Married/partnered	69.4%		Some children partnered	48.7%
Separated/divorced	13.3%		All children partnered	34.0%
Widowed	15.5%		Transfers to parents, US$500+	4.6%
Never married	1.8%		Homeownership	
Number of children	3.80	0.02	No children homeowners	34.3%
Education			Some children homeowners	39.9%
< H.S.	23.6%		All children homeowners	25.8%
H.S./GED	52.9%		Income	
Some College	4.9%		No children earn 35k+	45.3%
College +	18.6%		Some children earn 35k+	32.0%
Income			All children earn 35k+	22.7%
1st quartile	23.0%		Child proximity	
2nd quartile	23.4%		No child lives w/in 10 miles	36.8%
3rd quartile	25.4%		1+ child coreside(s)	20.0%
4th quartile	28.1%		1+ child within 10 miles	43.2%
Wealth				
1st quartile	27.0%			
2nd quartile	25.8%			
3rd quartile	24.3%			
4th quartile	22.9%			

Source: HRS, 2000–2012.

respondents at baseline reported having some or all children who had completed college. A substantial share of parents had at least one daughter, at least one child who was married or partnered, and someone who lived close (within 10 miles) to the respondent at baseline. Less than 5 per cent of respondents reported receiving US$500 or more in the past year, even though over 25 per cent of respondents reported that all their children were homeowners and over 20 per cent reported having a child who earned at least US$35,000 or more per year. Descriptive statistics for the full person-year sample are provided in Supplementary Table A2.

In Table 2, abbreviated results from the OLS regression models predicting parental depressive symptoms at baseline are shown. In the first model, parents with no children who completed college had an average symptoms score of 1.68, when age is held constant. Age was significantly and positively correlated with depression, although the effect size was negligible (b = .00, p < .001). Importantly, having more college-educated children decreased depressive symptoms: parents with some children who completed college had average symptom scores of 1.14 and among those whose children all completed college, symptoms scores were even lower at 0.88 (p < .001).

Table 2: OLS model for depressive symptom scores at baseline (N= 25,058 persons)

	M1		M2		M3		M4		M5	
	b		b		b		b		b	
Constant	1.68	***	3.24	***	3.24	***	2.83	***	2.77	***
Age	0.00	**	-0.01	***	-0.01	***	-0.01	***	-0.01	***
Children's education[a]										
Some with college	-0.54	***	-0.18	***	-0.15	***	-0.15	***	-0.16	***
All with college	-0.80	***	-0.21	***	-0.18	***	-0.18	***	-0.16	***
Parent Characteristics										
Education[f]										
High School			-0.29	***	-0.28	***	-0.28	***	-0.28	***
Some College			-0.32	***	-0.31	***	-0.31	***	-0.31	***
College+			-0.53	***	-0.54	***	-0.54	***	-0.53	***
Income Quartile[g]										
2nd quartile			-0.38	***	-0.37	***	-0.37	***	-0.36	***
3rd quartile			-0.60	***	-0.58	***	-0.58	***	-0.57	***
4th quartile			-0.73	***	-0.71	***	-0.70	***	-0.70	***
Wealth Quartile[g]										
2nd quartile			-0.41	***	-0.40	***	-0.39	***	-0.39	***
3rd quartile			-0.56	***	-0.54	***	-0.53	***	-0.53	***
4th quartile			-0.60	***	-0.57	***	-0.57	***	-0.56	***
Children's Characteristics										
Homeownership[h]										
Some children homeowners					-0.12	***	-0.12	***	-0.18	***
All children homeowners					-0.11	**	-0.11	**	-0.16	***
Income[i]										
Some children earn 35k+					-0.03		-0.04		-0.06	
All children earn 35k+					-0.14	***	-0.15	***	-0.16	***
Transfers to parents, $500+[j]							0.17	**	0.19	**
Gender[k]										
Some daughters									0.04	
All daughters									-0.03	
Marital/partner status[l]										
Some children partnered									0.13	**
All children partnered									0.06	
Child proximity[m]										
1+ child coreside(s)									-0.07	
1+ child w/in 10 miles									0.04	

Note: Models 2–5 also control for gender, race/ethnicity, foreign born status, marital status. Full model results shown in Appendix Table A2. Reference categories are: [a]No children with a college education; [f]Less than high school; [g]1st Quartile; [h]No children homeowners; [i]No children earn 35k+; [j]No transfers; [k]No daughters; [l]No children partnered; [m]No child lives within 10 miles/coreside. Source: *HRS, 2000–2012*

* p < .05, ** p < .01, ***p < .001

Parent education, income, and wealth could be considered serious confounders in our analysis. In Model 2, all of these characteristics were statistically significant and associated with parents' depressive symptoms. In separate analyses (not shown in Table 2), we conducted Sobel–Goodman tests to assess what share of the association between children's college completion and parental depression could be explained by these confounders. We found that approximately 41 per cent of the total effect (of children's education on parental depression trajectories) was confounded by parents' education ($p < .001$), whereas a much smaller proportion (between 10 and 16 per cent) of the total effect was confounded by parental income or wealth ($p < .001$). These results are not surprising given the strong intergenerational transmission of educational attainment. However, controlling for these variables, as well as parent gender, race/ethnicity, foreign-born status, marital status, and number of children (not shown here, but full model results are presented in Supplementary Table A3), did not make the association between children's education and parental depression nonsignificant. Models 3, 4, and 5 include children's characteristics as mediators and controls. However, the substantive results remain the same as before.

Table 3 depicts results from the multilevel models for changes in parents' levels of depressive symptoms. Model 1 shows the age trajectory of depressive symptoms scores for our sample. At age 68, parents on average had a symptoms score of 1.58. Age was not significantly associated with more symptoms of depression ($p > 0.05$). In Model 2, we interacted the age slopes with children's college education. We found that parents with some or all children who completed college had significantly lower initial levels of depressive symptoms than parents with no children who completed college. Specifically, the intercept for parents with no children who completed college (1.84) was higher than the intercept for parents with some children who completed college (1.40, $p < .001$) and parents with all children who completed college (1.20, $p < .001$). Additional tests also indicated that having children who *all* attained a college degree was a greater benefit than having only *some* children with college education (results not shown here, $p < .001$).

Consistent with previous research (Lee et al., 2017), the slopes provided evidence for an age-as-a-leveler effect, whereby the gap between the least and most advantaged parents with respect to children's education decreased with age. Indeed, the age-related slope of depressive symptoms was negative, although not significant, for parents with no children who completed college ($b = -.001$, $p > 0.05$), but is positive, and stronger, for parents with some children who completed college ($b = .01$, $p < .01$) or parents with all children who completed college ($b = .01$, $p < .001$). In summary, results from Model 2 indicated that parents of more highly educated children entered the sample with significantly lower levels of depressive symptoms, but gradually converge with parents with no college-educated children.

Model 3 included all parental controls, although only parent education, income, and wealth are shown here (parent gender, race/ethnicity, foreign-born status, marital status, and number of children are also included but not shown here). Full model results are presented in Supplementary Table A4. Despite these controls, the results for children's education remained substantively the same. Parents of all college-educated offspring still had significantly lower intercepts (2.16) than parents with no children who finished college (2.37, $p < .001$), as do those for whom some of their children finished college (2.19, $p < .001$). That the magnitude of the difference in intercepts between those parents with no children who finished college and all parents who finished college was smaller in Model 3 (0.21) compared with Model 2 (0.64) suggests that at least some of the variation in parents' depressive symptoms was explained by parents' own characteristics. Similarly, the slopes were positive for parents with some children who completed college ($b = .01$, $p < .001$) and parents with all children who completed college ($b = .02$, $p < .001$), whereas the slope was negative for parents with no children with a college education ($b = -.01$, $p < .001$).

In addition to parental characteristics, Model 4 included potential mediators that can explain the link between children's college completion and parents' depression. Children's financial status measured by wealth and income was strongly tied to parents' initial levels of depressive symptoms. But, despite these controls, the relationship between children's education and parental mental health trajectories remained statistically significant and consistent with previous models. Model 5 additionally accounted for financial transfers between children and parents. We found that transfers increased a parent's levels of depressive symptoms, likely because children transfer money to parents when parents' mental health is already declining, but the main results for children's education remained robust. Model 6 included controls for other offspring characteristics, including gender, marital status, and geographic proximity to parents and the differences in slopes and intercepts remained statistically significant. We note that the magnitude of the difference in intercepts for those whose children all completed college and those with no children who completed college in Model 6 (0.18) was fairly similar to Model 3 (0.21) suggesting that children's income, wealth, transfers, and proximity did little to close the gap that their education created for parents' depression.

The results for children's education from our fully adjusted model (Model 6) are graphically displayed in Figure 1A. Whereas parents with at least one child who completed college scored approximately half a point lower on initial levels of depressive symptoms, their levels increased at a faster rate than parents with no children who completed college. Still, the benefit of having a college-educated child was substantial. For parents whose children all completed college, it took nearly 20 years

Table 3. Multilevel Model for Depressive Symptom Trajectories (*N* = 106,517 person-years)

	M1		M2		M3		M4		M5		M6	
	b		*b*		*b*		*b*		*b*		*b*	
Intercept	1.58	***	1.84	***	2.37	***	2.46	***	2.46	***	2.44	***
Age	0.00		−0.001		−0.01	***	−0.01	***	−0.01	***	−0.01	***
Children's education[a]												
Some with college			−0.44	***	−0.18	***	−0.15	***	−0.15	***	−0.15	***
All with college			−0.64	***	−0.21	***	−0.18	***	−0.18	***	−0.18	***
Age X children's education												
Age X some with college			0.01	**	0.01	***	0.01	***	0.01	***	0.01	***
Age X all with college			0.01	***	0.02	***	0.02	***	0.02	***	0.02	***
Parent characteristics												
Education[b]												
High School					−0.45	***	−0.44	***	−0.44	***	−0.44	***
Some College					−0.52	***	−0.50	***	−0.50	***	−0.50	***
College+					−0.74	***	−0.72	***	−0.72	***	−0.72	***
Income Quartile[c]												
2nd quartile					−0.14	***	−0.14	***	−0.14	***	−0.14	***
3rd quartile					−0.23	***	−0.23	***	−0.23	***	−0.22	***
4th quartile					−0.29	***	−0.29	***	−0.28	***	−0.28	***
Wealth Quartile[c]												
2nd quartile					−0.22	***	−0.21	***	−0.21	***	−0.21	***
3rd quartile					−0.35	***	−0.34	***	−0.33	***	−0.33	***
4th quartile					−0.42	***	−0.40	***	−0.40	***	−0.40	***
Children's characteristics												
Homeownership[d]												
Some children homeowners							−0.07	***	−0.07	***	−0.08	***
All children homeowners							−0.09	***	−0.09	***	−0.10	***
Income[e]												
Some children earn 35k+							−0.07	***	−0.08	***	−0.08	***
All children earn 35k+							−0.12	***	−0.12	***	−0.13	***
Transfers to parents, $500+[f]									0.13	***	0.13	***
Gender[g]												
Some daughters											−0.03	
All daughters											0.00	
Marital/partner status[h]												
Some children partnered											0.05	*
All children partnered											0.03	
Child proximity[i]												
1+ child coreside(s)											−0.01	
1+ child with/in 10 miles											0.00	

Note: Models 3–6 also control for gender, race/ethnicity, foreign born status, marital status. Full model results shown in Supplementary Table A3. Reference categories are: [a]No children with a college education; [b]Less than high school; [c]1st Quartile; [d]No children homeowners; [e]No children earn 35k+; [f]No transfers; [g]No daughters; [h]No children partnered; [i]No child lives within 10 miles/coreside.

Source: HRS, 2000–2012

*$p < .05$; **$p < .01$; ***$p < .001$.

from age 51 to reach the higher depressive symptom levels of those parents with some children who completed college. At the same time, it took these advantaged parents nearly 30 years to reach the same higher levels of depressive symptoms as parents with no children who completed college. Although the overall trend for parents in our sample suggested an age-as-leveler effect, the time needed to reach the point where parents of college-educated children experienced the same levels of depression as parents of noncollege educated children was two to three decades.

Our last set of results examined how parent education affected the association between children's college completion and parental depressive symptoms. Full model results are presented in Supplementary Table A5. We found that similar to the main growth curve models, high levels of parent and children's schooling reduced parental depression. Although the interaction between parents' and children's

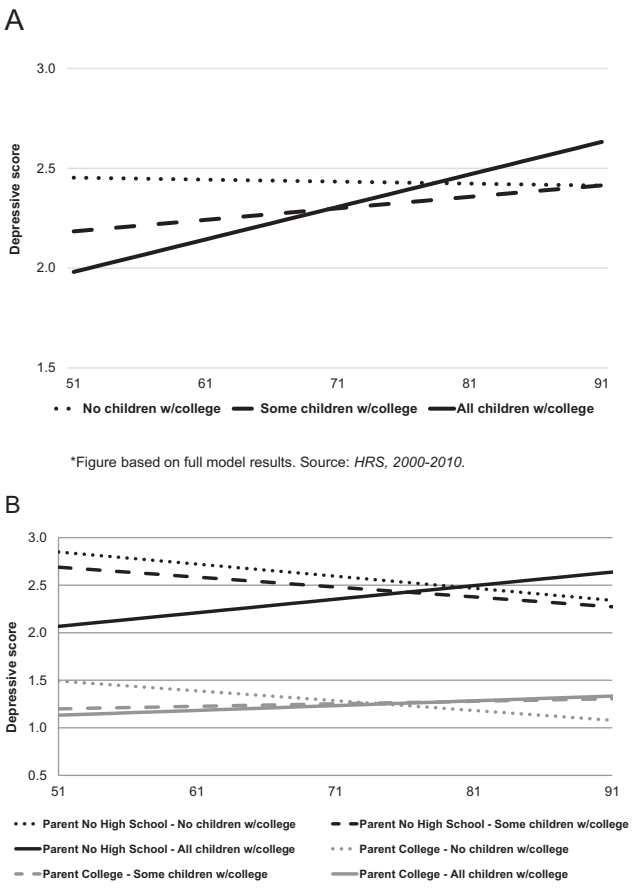

Figure 1. (A) Parents' depressive symptom trajectories by parental age and offspring college education, 2010–2012. (B) Parents' depressive symptom trajectories by parental age and parents' and offspring education, 2010–2012

education showed a significant difference, the interaction between the age slope of children's education and parents' education was not significant. The impact of having all children complete college was not as strong when parents' had already completed college themselves, compared with parents with less than a high school education ($b = .32$, $p < .01$). To ease the interpretation, and to assess how intercepts and aging vectors varied across parents with different levels of education, we presented our model results stratified by parent education in Table 4. We highlighted the contrast in intercepts for parents with less than a high school education versus those with a college education. Among parents who did not complete high school, those with no children who completed college have initial predicted depression scores of 2.63, compared with 2.31 among those parents whose children all completed college: a difference of 0.32 or nearly one-third of a point on the depressive symptoms scale. Among parents who themselves were college graduates, the difference between the most (1.22) and least advantaged (1.32) parents with respect to children's college completion was much smaller: 0.10 or one-tenth of a point on the abbreviated CES-D scale. Thus, we see that there is a stronger advantage of having all of one's children complete college among the least advantaged parents, compared with the most advantaged parents, for initial levels of depressive symptoms.

These points are also shown in Figure 1B, which presents the intercept and age slope of depressive symptoms by parent and children's education. The larger disparity between those with no children who completed college and those whose children all completed college was apparent for parents with less than a high school education, compared with parents with a college education. In addition, the aging vector for parents whose children all completed college appeared to be steeper among less-educated parents compared with parents with a college education themselves and the gap between the two groups with children who all completed college increased as individuals age.

Discussion

The extent to which children's educational achievements may prevent symptoms of depression among their parents is relatively uncharted territory in the mental health literature. Building on a recent study that used Taiwanese data (Lee et al., 2017), we found that a child's college education was also associated with lower levels of parental depressive symptoms in the United States, lending support for Hypothesis 1. Moreover, we found that having only some children who complete college was still beneficial to parents' mental health, although the association was significantly stronger when all offspring obtained a college education.

However, differences in the association between children's college education narrowed as parents grew older, supporting Hypothesis 2, such that age acts as a leveler for the older adults in our sample. Attrition or differential mortality selection among individuals based on their own education (House & Williams, 2003) as well as their children's education (Friedman & Mare, 2014) likely contributed to this finding (Beckett, 2000). Even so, our results demonstrated that at age 51, it takes nearly 30 years for parents whose children all completed college to reach the average depressive symptom score of parents for whom none of their children completed college. Given that the average remaining life expectancy for Americans at age 50 is approximately 32 years (Arias, Heron, & Xu, 2017), this suggests that for the majority of older adults, the mental health benefits of having highly educated children remained in place for most of their lives, even if that advantage may weaken with age.

Our results also suggested that the advantages of children's college education were robust to parents' own educational attainment, income, and wealth, as well as parents' demographic characteristics (gender, race/ethnicity, and nativity status). Adult children's education could affect parents' mental health by reducing their stress and concern given that a college education leads to economic security such as higher incomes and wealth. However, our results suggested that even after accounting for children's income

Table 4. Multilevel Model for Depressive Symptom Trajectories by Parents' Education

	Parents' education							
	<HS		HS/GED		Some college		College +	
	b		*b*		*b*		*b*	
Intercept	2.63	***	2.03	***	2.07	***	1.32	***
Age	−0.01	***	−0.01	***	−0.01		−0.01	**
Children's education[a]								
Some with college	−0.12	*	−0.18	***	−0.03		**−0.07**	
All with college	−0.32	**	−0.20	***	−0.11		**−0.10**	*
Age X children's education								
Age X some with college	0.00		0.01	*	0.00		0.01	**
Age X all with college	0.03	**	0.02	***	0.02		0.02	***
N (person–years)	23,393		57,772		4,790		20,562	

Note: Models include controls per Table 3, Model 6. Bold indicates significantly ($p < .05$) different from parents with <HS education. [a]Reference category = Less than high school.
Source: HRS, 2000–2012
*$p < .05$; **$p < .01$; ***$p < .001$.

and wealth, children's college education remained statistically significant, which did not lend support to Hypothesis 3. Another contribution of our study was that we controlled for financial transfers from children to their parents, and discovered that they did not explain the significant association between children's education and parents' mental health, which challenges Hypothesis 4.

The financial support provided by college-educated and wealthy children did not explain why their education seems to improve or protect their parents' mental health, suggesting that children's college education acts in less tangible ways to shape their parents' mental health, such as via informational support. Alternatively, perhaps parental pride in having children achieve a college education, or the confidence that college-educated children are not only currently financially and economically secure, but have futures that are at least better protected against economic downturns, are possible explanations for our results. These "shared fate" arguments (Greenfield & Marks, 2006) are not readily testable using the HRS data, and our results underscore the need to examine such arguments using richer data or different methods in the future.

Finally, we found evidence for resource substitution in that the mental health of parents with less than a high school education was more strongly affected by their children's college completion than parents who themselves had a college education. This finding supports prior research underscoring how the resources of family members matter especially for those individuals with fewer social advantages themselves (Ross & Mirowsky, 2011; Mirowsky & Ross, 2003). Although previous work cites how family of origin interacts with one's own resources, our work adds to a growing body of evidence suggesting that the resources of latter generations also matter for older adults, and that these resources may be especially important for the least advantaged elderly. In our study, less-educated parents with college-educated offspring may feel especially proud or may simply experience greater security knowing that their children achieved middle-class status and were upwardly mobile, compared with highly educated parents who had their children maintain their social class status.

Although our study adds to mounting evidence of the relationship between children's education and parents' health, we note limitations. First, the duplicate records for offspring in the RAND Family File (RAND Data Alert, 2018) present a challenge to using these data when we are not able to simply delete the duplicates from our sample. Although we deleted parent-child cases that RAND categorized as "bad links" from our analytical sample, we conducted supplemental analyses to support our findings. Using KonFoundit (Frank, Maroulis, Duong, & Kelcey, 2013) and confirmed that to invalidate our major findings (significant differences in intercepts of CES-D), a substantially greater number of cases than the 3 per cent of parent-child records would need to be duplicates. In addition, the fact that we specified educational attainment of children in numerous ways and still found similar substantive results (including the maximum level of education attained by a child, a specification that could not be biased by duplicates) suggests that the duplicates are not driving the major findings of our study.

As with previous studies that examine the "upstream" influence of children's education on parental health, our results are also subject to problems of endogeneity and omitted variable bias. Whereas research on the physical health of parents has attempted to account for these problems through the use of fixed effects models (Torssander, 2013) or quasi-experimental data (De Neve & Fink, 2018), future work on mental health could also address these concerns more directly by using such methods. Although our longitudinal study can address temporal ordering to a certain extent, it is also possible that our upstream effect may still be partially explained by reverse causality such

that some parents may have become depressed before their children completed their schooling, which may have limited their children's educational achievements. Also, we find evidence that age acts as a leveler in reducing children's educational disparities in health as parents grow older. However, attrition and selective mortality leave longitudinal samples open to bias such that in later life, only the healthiest survive (Beckett, 2000). This necessarily narrows the gap between parents of college-educated and noncollege-educated children and calls into question whether the effect of children's college education is truly weakening over the life course.

Furthermore, our paper only assessed the moderating effect of parent education, even though resource substitution theory suggests that there may be differential returns by parent race/ethnicity and gender. Indeed, preliminary analyses (not shown here) found that the baseline association between children's education and parental health varies by a parent's gender and race/ethnicity, although we did not find evidence that the aging vectors for children's education varied by those demographic traits. In addition, our study did not examine how children's other characteristics, such as their own gender or proximity to parents, might influence the link between offspring college completion and parents' mental health. Part of the difficulty is finding a way to assess meaningful moderating effects when the measures of children are aggregated at the parent level. Although we believe that using information on all of the respondent's adult children is a strength of our paper, focusing on only one child (the eldest, e.g.) could allow us to examine how a child's characteristics moderate the relationship between their education and parental health. We believe this to be an area that is ripe for future research.

Finally, understanding the causes and correlates of depression among older adults is especially important given that the likelihood of developing symptoms of depression increases with age (Mirowsky & Ross, 1992; Yang, 2007). Given that our findings suggest that the educational attainment of adult offspring is associated with parents' depression, public policy initiatives to increase access to education in the United States will have implications across generations not only for socioeconomic attainment, but health and well-being. As the cost of college tuition continues to escalate, highlighting the connection between children's resources and parental health underscores how the opportunity structure for social mobility fundamentally shapes the well-being of both offspring and their parents, whose lives are intertwined. Parents who are most in need of resources are the least likely to have children who complete college, and thus parents who are already underprivileged are further disadvantaged by the inability of younger generations to improve their own health and well-being. Thus, a lack of access to socioeconomic resources—across generations—compounds existing mental health disparities for older adults in the United States.

Supplementary Material

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

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Author Contributions

Yahirun designed the study and wrote the initial drafts of the manuscript. Sheehan conducted statistical analyses. Mossakowski contributed to the writing and theoretical framing of the manuscript. All authors edited and reviewed the final version of the paper.

Conflict of Interest

None declared.

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