



First-generation college graduates have similar depressive symptoms in midlife as multi-generational college graduates

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ABSTRACT

Purpose: Higher education may protect an individual against depressive symptoms, yet, disadvantaged socioeconomic status (SES) during childhood, often measured by lower parental education, may put them at higher risk for depressive symptoms later in life. This study evaluates if midlife depression is similar for first-generation and multi-generation college graduates.

Methods: For US Health and Retirement Study (HRS) participants ages 55–63 (N = 16,752), we defined a 4-category exposure from parents' (highest of mother or father's) and participant's own years of education, with 16 years indicating college completion: multi-gen (both ≥ 16 years: reference); first-gen (parents <16; own ≥ 16); only parent(s) (parents ≥ 16; own <16); and neither (both <16) college graduates across three birth cohorts. We used linear regressions to evaluate relationships between college completion and depressive symptoms measured by an 8-item Center for Epidemiologic Studies – Depression (CES-D) scale. Models pooled over time evaluated differences by sex, race/ethnicity, and birthplace.

Results: First-gen and multi-gen college graduates averaged similar depressive symptoms in midlife (β : 0.01; 95% CI: 0.15, 0.13). Results were similar by sex and race/ethnicity.

Conclusion: Consistent with resource substitution theory, college completion may offset the deleterious effects of lower parental education on midlife depressive symptoms for first-generation graduates.

1. Introduction

Depression is a leading cause of disability and premature mortality in the United States (Pratt et al., 2016; The US Burden of Disease Collaborators et al., 2018; Zhang et al., 2023). Prior research has established a clear link between educational attainment and depression, with studies showing a beneficial association between high levels of education and depression and an adverse association between low levels of parental education and depression (Adler & Newman, 2002; Link & Phelan, 1995; Lorant, 2003; Mirowsky & Ross, 2017; Phelan et al., 2010; Zajacova & Lawrence, 2018). Given rapid intergenerational increases in educational attainment in the United States and globally, it is important to understand how changes in educational attainment from parents' to one's own education impact depression. While *resource multiplication*

theory suggests that individuals whose parents have high education benefit more from added resources that help them achieve better health benefits, *resource substitution theory* suggests that individuals whose parents have lower education may see more health benefits from additional resources because they have fewer alternatives (Ross & Mirowsky, 2006).

Recent studies evaluating the association between intergenerational educational attainment and depressive symptoms in the United States have focused on primary or secondary school completion and depressive symptoms in early adulthood (Gugushvili et al., 2019; Tooth & Mishra, 2013; Ward et al., 2016, 2018). Additionally, prior studies have largely focused on comparisons to the least advantaged education groups (i.e., low levels of own and parental education) and on Black-White or within racial and ethnic group comparisons (Assari, 2018; Ward et al., 2016,

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2018). To our knowledge, no studies have considered the association between intergenerational college completion and midlife depressive symptoms across an older and more diverse population in the US. Depressive symptoms during midlife can adversely affect an individual's work performance, career advancement, and overall quality of life, leading to broader social implications (Steger & Kashdan, 2009). Prior studies have also linked depressive symptoms in midlife to poor late-life health outcomes, including functional limitations, an increased risk of stroke, cognitive impairment, or dementia (Barnes et al., 2006, 2012; Covinsky et al., 2010). Therefore, understanding the association between educational mobility and midlife depressive symptoms and how this changes over time can provide important insight into the long-term health consequences of increased educational attainment in both midlife and older adulthood.

College completion is becoming increasingly important in the US and some studies suggest that a college education is a better predictor of health than primary or secondary school completion (Backlund et al., 1999). In 1940, only 4.6% of the US adult population 25 and older had completed a 4-year college degree or higher (Bureau, 1940). By 1970, this number had more than doubled, driven partly by increased availability and support for college completion, although it varied by sex, race, and ethnicity. (Boulton) While higher education may protect an individual against depressive symptoms, a disadvantaged socioeconomic status (SES) origin, often measured by lower parental education, may put them at higher risk for depressive symptoms later in life (Adler, Boyce, & Chesney, 1994; Lorant, 2003; Ross & Van Willigen, 1997). First-generation (henceforth first-gen) college students (i.e., those whose parents did not graduate college) often face more academic and financial challenges than their peers; for instance, many often delay college enrollment for years after high school (Warburton et al., 2001). In comparison, multi-generation (henceforth multi-gen) college students (i.e. with at least one parent that graduated from college) are nearly twice as likely as first-gen students to have enrolled in college immediately after completing high school (Warburton et al., 2001). First-gen college students do not benefit from their parents' college experience, a source of cultural capital and informational support, and encounter varying levels of academic and financial support for achieving a college education (Collier & Morgan, 2008). Once graduated, first-gen college graduates are also less likely to receive family financial assistance to repay loans or accumulate wealth (Walsemann et al., 2015). Racial and ethnic minorities are more likely to be first-gen and more likely to experience interpersonal, institutional, and structural racism in the labor market, impacting job opportunities, earnings, and accumulated wealth over the life course (Black et al., 2006; Barrow et al.; Fuller-Rowell & Doan, 2010; Fuller-Rowell et al., 2015; Vines et al., 2006; Smith et al.). These additional challenges during and following a college education could lead to differential depressive symptoms later in life among first-gen compared to multi-gen college graduates.

This study aims to test the competing hypotheses of resource multiplication theory and resource substitution theory. We do this by examining the association between intergenerational college completion and midlife depressive symptoms for first-gen college graduates compared to multi-gen college graduates in the US. If multi-gen students have fewer depressive symptoms than first-gen students, it would provide evidence for resource multiplication; conversely, finding that multi-gen and first-gen students have similar depressive symptoms would provide evidence of resource substitution. In secondary analysis, we also evaluate if the association between first-gen (vs. multi-gen) college completion and depressive symptoms differs by sex, race and ethnicity, or birthplace (Ross & Mirowsky, 2006; Vable et al., 2018).

2. Materials and methods

2.1. Study population

We used data from the US Health and Retirement Study (HRS), an

ongoing population-based cohort of non-institutionalized adults 51 years and older that began in 1992. Study participants undergo detailed in-person or telephone interviews approximately every two years from cohort entry until death or dropout; new enrollment cohorts are added every six years to maintain representation of the US older adult population.

To ensure adequate variation in our primary exposure of interest and to evaluate if the relationship between intergenerational education and midlife depressive symptoms changed over time, we included participants from three different birth cohorts: 1) participants born 1933–1941; 2) participants born 1943–1951; and 3) participants born 1953–1961. This restricted our analysis to participants who were 55–63 years old during survey waves 1996, 2006, and 2016, respectively (N = 16,768). Depressive symptoms questions were consistent with subsequent waves starting in 1996 and looking across the decades allowed us to evaluate changes across non-overlapping birth cohorts (e.g. a participant who was 55 in 1996 would be 65 in the 2006 analysis). This excluded participants whose questionnaires were completed by proxy informants in 1996, 2006, or 2016 because proxy informants were not asked questions about participants' depressive symptoms. Our study focused on identifying depressive symptoms during midlife since this period is often associated with high career responsibilities, and such symptoms can have an impact on work performance, career advancement, and overall quality of life (Steger & Kashdan, 2009). We specifically examined individuals in pre-retirement age, as retirement can be a significant life transition, affecting depressive symptoms in ways we cannot account for in our analysis. For example, increased social isolation due to the absence of daily interactions with colleagues, financial concerns arising from changes in income and financial stability, or other personal challenges adapting to a new daily routine may all adversely impact depressive symptoms. We excluded participants with missing depressive symptoms (n = 7) and those with missing data on potential confounders (n = 9), yielding a final analytic sample of 16,752.

2.2. Intergenerational educational attainment

Our exposure of interest was intergenerational college education, which we defined as the combination of HRS participants' parental education (highest of mother or father's education) and the participant's own self-reported years of education. We consider college completion 16+ years of education (12 years of high school + 4 years of college) and classified participants into one of 4 categories: multi-gen college graduates (Reference group: at least one parent ≥ 16 years of education; own ≥ 16); first-gen college graduates (both parents <16 ; own ≥ 16); only parent(s) college graduates (at least one parent ≥ 16 ; own <16); and neither college graduates (both parents <16 ; own <16).

If education data was missing for the participant's father (n = 1585) or mother (n = 394), we used the educational attainment of the parent that was not missing. We consider it reasonable that the participant did not benefit from their missing parent's education as prior work in a subset of HRS participants found that the most common reason HRS participants did not know their father's education is that they did not know their father (Glymour et al., 2008). If education data was missing for both participants' parents (n = 1065), they were assigned <16 years of education. If education data was missing for the participant (n = 71), they were assigned <16 years of education as prior work in the HRS cohort indicates that excluding those with missing education data disproportionately excludes the most vulnerable, potentially biasing estimates (Vable et al., 2017).

2.3. Depressive symptoms

Depressive symptoms were assessed using a modified, eight-item version of the Center for Epidemiologic Studies – Depression (CES-D) scale (Turvey et al., 1999). The CES-D scale has good psychometric properties and the short, eight-item version of the scale was designed for

interviews with older participants. Each item on the scale asked participants how they felt all or most of the time in the past week: I felt depressed; I felt everything I did was an effort; my sleep was restless; I felt lonely; I felt sad; I could not “get going”; I was happy (reverse coded); I enjoyed life (reverse coded). The total number of yes/no responses were summed to arrive at a total depressive symptom score ranging from 0 to 8 (alpha reliability: 0.78) with higher scores indicating more depressive symptoms.

2.4. Covariates and potential effect modifiers

We adjusted our models for factors known to be associated with intergenerational educational attainment and depressive symptoms, including age at baseline (linear), birth cohort, sex, race and ethnicity (non-Hispanic (NH) White, NH Black, Hispanic and Other), self-reported birthplace based on US Census region (US non-South; US South; Outside the US), and self-reported childhood rurality (whether participants lived in a rural area most of the time when they were a child). Participants reporting “other” race and ethnicity were included in our analysis for overall sample size and precision, but results are not presented due to sample size limitations and ambiguous interpretation for stratified results. Since 8% of participants were missing childhood rurality, a missing indicator was created for the covariate ($n = 1397$).

Previous studies have suggested differences in the association between educational attainment and mental health by sex, (Gugushvili et al., 2019; Morrissey & Kinderman, 2020; Tooth & Mishra, 2013) race and ethnicity, (Gavin et al., 2010; Vable et al., 2018) and differences in the education gradient in health by birthplace (Nicklett & Burgard, 2009). Therefore, we considered whether the association differed by sex, race, and ethnicity (henceforth White, Black, and Hispanic) or by birthplace.

2.5. Statistical analysis

Given secular increases in education over time, we first wanted to evaluate the association between first-gen (vs. multi-gen) college graduates and midlife depressive symptoms across time. We started with three separate linear regression models (one for each birth cohort: 1933–1941, 1943–1951, and 1953–1961). Then, we pooled participants across birth cohorts and included an *education by cohort* interaction term to assess for a secular trend over time. However, since there were no differences by cohort in our primary groups of interest (i.e., multi-gen and first-gen college graduates), we ran our primary analysis models using linear regression in the pooled, overall sample to increase statistical power. In our secondary analysis to assess for effect modification by sociodemographic subgroups, we ran separate linear regression models in the pooled sample with *education by sex*, *education by racial/ethnic identity group*, and *education by birthplace* multiplicative interactions. We also examined combined race-sex categories as prior work suggests intersectional effects (Bauer, 2014). Finally, we also ran the primary analysis with first-gen as the reference group (rather than multi-gen) to understand differences compared to the non-college education groups.

2.6. Robustness checks

We performed a series of robustness checks. First, to assess if our results were robust to different exposure specifications, we repeated the analysis, excluding participants with missing education data for the participant or their parents. Second, we repeated primary analyses using a nine-category exposure variable with a subcategory for individuals with more than 12 but less than 16 years of education. This was done to evaluate if results differed among the subgroup of individuals who began but did not complete college, as their trajectory may have been affected by unmeasured confounding. Finally, to assess if our results were robust to different outcome specifications, we estimated results with a binary outcome of elevated depressive symptoms ($CES-D \geq 4$)

using logistic regression (Steffick, 2000). Statistical analyses were performed using STATA v.17.

3. Results

The average age of our sample at outcome assessment was 58.8 years (sd: 2.6; Table 1). Our sample was majority White (64%) and female (57%) participants. Multi-generation college graduates were 82% White, 7% Black, and 4% Hispanic. First-generation college graduates were 72% White, 17% Black, and 6% Hispanic. Average CES-D scores were similar for multi-gen and first-gen college graduates (mean: 1.0; sd: 1.6 for both groups).

We found no evidence of heterogeneity in the association between education and depressive symptoms for first-gen and multi-gen college grads across the three specified birth cohorts; therefore, we present results pooled across cohorts for our interaction analysis to increase sample size and our ability to detect other subgroup differences. In pooled models, first-gen and multi-gen college graduates had similar depressive symptoms in midlife ($\beta = -0.01$ [95% CI: 0.15, 0.13]; Fig. 1; complete model estimates available in Supplemental Table S2). We found no evidence that the association between first-gen (vs. multi-gen) college graduates and midlife depressive symptoms varied by sex, racial/ethnic identity, or birthplace (Table 2).

Compared to multi-gen graduates, we found higher depressive symptoms among the non-college education groups: $\beta = 0.34$ [0.17, 0.51] among participants for whom only their parents were college graduate(s) and $\beta = 0.65$ [0.53, 0.77] among participants who reported that neither they nor their parents were college graduates. While these were not our primary groups of interest, our findings also showed that compared to the White multi-gen reference group, depressive symptoms were greatest among Hispanic participants in the only parent college graduate group ($\beta = 1.09$ [95% CI: 0.36, 1.83]) and in the neither college graduate group ($\beta = 0.58$ [95% CI: 0.02, 1.14]); the magnitude of these estimates was significantly larger than those generated for their White counterparts (Table 2). Results showed similar effect estimates among the non-college education groups when we used the first-gen graduates as the reference group (Supplemental Table S3).

Robustness checks.

Results were substantively similar when participants with missing education data were excluded (Supplemental Table S4). Results were also similar when we used a nine-category variable to model intergenerational education (Supplemental Table S5) and when we evaluated a binary indicator for elevated depressive symptoms (Supplemental Table S6).

4. Discussion

The present study evaluates the association between a college education and midlife depressive symptoms for first-gen compared to multi-gen college graduates in the US. Our study results provide evidence for resource substitution. Specifically, our findings suggest a college degree may offset the deleterious relationship between parental non-college education and midlife depressive symptoms for first-gen students. In secondary analysis evaluating differences in the association by sex, race/ethnicity, and birthplace, we found the mental health benefits of a college education for first-gen students, our primary group of interest, were similar regardless of sex, race/ethnicity or birthplace.

There are several potential explanations for the importance of college completion for adult mental health. A college education can lead to better employment opportunities with higher salaries that reduce financial stress (Melchior et al., 2018). A college education may also shape social and behavioral norms that promote health (e.g. diet and exercise, access to medical and behavioral health resources) (Cutler & Lleras-Muney, 2010). In this case, it is possible that one’s own college completion might substitute for parental non-college completion. Among the other intergenerational groups, we found that parental

Table 1

Characteristics of Health and Retirement Study (HRS) participants (ages 55–63 in 1996, 2006, or 2016), stratified by a 4-category intergenerational education exposure variable, pooled across birth cohorts.

	TOTAL	POOLED BIRTH COHORTS				p-value
	(n = 16,752)	Multi-gen college grad (n = 1229)	First-gen college grad (n = 2632)	Only parent college grad (n = 927)	Neither college grad (n = 11,964)	
Mean age (SD)	58.8 ± 2.6	58.6 ± 2.5	58.7 ± 2.6	58.6 ± 2.5	58.9 ± 2.6	0.001
Female	57%	54%	50%	59%	59%	<0.001
Race/Ethnicity						<0.001
White	64%	82%	72%	72%	59%	
Black	20%	7%	17%	15%	22%	
Hispanic	13%	4%	6%	8%	16%	
Other/Missing	4%	7%	5%	5%	3%	
Birthplace						<0.001
US non-South	53%	61%	58%	60%	50%	
US South ^a	35%	26%	31%	28%	37%	
Outside the US	13%	12%	11%	12%	13%	
Childhood Rurality						<0.001
Rural childhood ^b	42%	22%	32%	31%	46%	
Missing	8%	10%	9%	12%	8%	
Depressive Symptoms						
Mean CESD (SD)	1.5 ± 2.1	1.0 ± 1.6	1.0 ± 1.6	1.4 ± 1.9	1.7 ± 2.1	<0.001
CESD (>4)	16%	8%	8%	14%	18%	<0.001

[^]p-values show differences across education groups using chi-square statistic for categorical covariates and analysis of variance (ANOVA) for continuous covariates.

^a States included: DE, MD, DC, VA, WV, NC, SC, GA, FL, KY, TN, MS, AL, OK, TX, AR, LA.

^b Based on self-report question on whether participants lived in a rural area most of the time when they were a child.

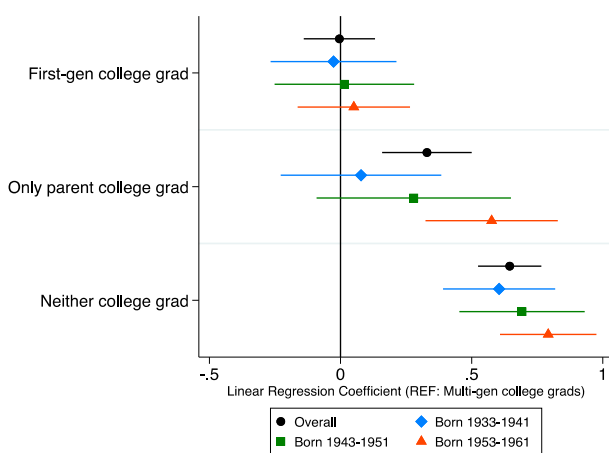


Fig. 1. Association between intergenerational education groups and midlife depressive symptoms, overall and stratified by birth cohort; Reference is the multi-generational group.

The models were adjusted for age at baseline, birth cohort, sex, race and ethnicity, birthplace, and childhood rurality.

college completion was associated with better mental health among individuals who did not complete college. This also supports resource substitution theory in that parental education could be a partial substitute for one's non-college education.

Our findings are comparable to a broader literature in the US suggesting that, at primary and secondary school levels, upward education mobility and consistently high education from one generation to the next reduce an individual's risk of developing midlife depressive symptoms (Assari, 2018; Tooth & Mishra, 2013; Ward et al., 2016, 2018). Our study expands on previous research by comparing the association between intergenerational college education and midlife depressive symptoms directly among these two groups of *first-gen* and *multi-gen* college graduates. Intergenerational studies in populations outside of the US comparing upwardly mobile and consistently high-education groups have been inconclusive (Cermakova et al., 2020; Gugushvili et al., 2019; Melchior et al., 2018). While studies from France

and the Czech Republic found higher levels of depressive symptoms among upwardly mobile individuals, other multi-country studies have found an association with lower depressive symptoms among upwardly mobile individuals compared to the consistently high education group (Cermakova et al., 2018, 2020). Cross-national differences in these associations merit greater scrutiny as college completion becomes increasingly common worldwide. Such comparisons may offer theoretical insight into mechanisms or heterogeneity in the education experience of older adults in diverse settings, which could be additionally driven by differences in cost and support for a college education through initiatives such as the GI Bill and Pell Grant in the US.

Our findings suggest that a college degree could be protective of midlife depressive symptoms for first-gen college graduates whose parents did not complete college. An alternative interpretation could be that for multi-gen college graduates whose parent(s) completed college, their own college completion may not be as significant of a resource. As noted above, this is consistent with resource substitution theory in that first-gen college graduates may see more health benefits from additional resources because they have fewer alternatives. One study evaluating changes in depressive symptoms in a single generation of college students found that while depressive symptoms decreased significantly from adolescence to college for first-gen college students, they remained the same for multi-gen college students (Wilbur, 2021). A college education could reduce exposure to family stressors that differentially affect parents without college degrees, such as financial strain. A college environment may also provide first-gen students with additional social support structures and mental health resources or coping mechanisms that they would not otherwise have access to.

Also, contrary to studies suggesting differential returns of education on mental health outcomes for women compared to men and for Black compared to White individuals, (Assari, 2018; Vable et al., 2018) our study finds no evidence of differential returns of education for first-gen (vs. multi-gen) graduates by sex, race/ethnicity, or birthplace. While it is possible that these relationships did not differ by racial and ethnic group in this population, it is also possible that the racial and ethnic minority groups in our study were small and we were underpowered to detect significant differences. Differences in the estimated returns of education by sex, or race and ethnicity in other studies could also be due to differences in the opportunities that higher education offers to men compared to women and for White individuals compared to minoritized

Table 2

Association between intergenerational education and depressive symptoms compared to the multi-generational reference group; main effects and demographic interactions, pooled across birth cohorts (N = 16,752).

	Pooled Base Model			Female Interaction			Race Interaction			Birthplace Interaction		
	β	(95% CI)	p-val	β	(95% CI)	p-val	β	(95% CI)	p-val	β	(95% CI)	p-val
Intercept	1.36	(0.62, 2.10)	<0.001	1.42	(0.66, 2.17)	<0.001	1.43	(0.69, 2.18)	<0.001	1.38	(0.63, 2.13)	<0.001
Education												
Multi-gen	REF			REF			REF			REF		
First-gen	-0.01	(-0.15, 0.13)	0.883	0.02	(-0.17, 0.22)	0.81	0.03	(-0.13, 0.18)	0.735	0.05	(-0.13, 0.22)	0.610
Only parent	0.34	(0.17, 0.51)	<0.001	0.41	(0.15, 0.67)	0.002	0.23	(0.03, 0.42)	0.024	0.25	(0.04, 0.47)	0.023
Neither college	0.65	(0.53, 0.77)	<0.001	0.56	(0.38, 0.74)	<0.001	0.55	(0.42, 0.69)	<0.001	0.62	(0.47, 0.78)	<0.001
Birth Cohort												
Born 1933–1941	-0.01	(-0.15, 0.13)	0.883	0.02	(-0.17, 0.22)	0.81	0.03	(-0.13, 0.18)	0.735	0.05	(-0.13, 0.22)	0.610
Born 1943–1951	0.33	(0.25, 0.41)	<0.001	0.33	(0.26, 0.41)		0.33	(0.25, 0.41)	<0.001	0.33	(0.25, 0.41)	<0.001
Born 1953–1961	0.23	(0.16, 0.31)	<0.001	0.24	(0.16, 0.32)		0.23	(0.16, 0.31)	<0.001	0.23	(0.16, 0.31)	<0.001
Female	0.29	(0.23, 0.35)	<0.001	0.20	(-0.02, 0.42)	0.081	0.29	(0.23, 0.35)	<0.001	0.29	(0.23, 0.35)	<0.001
Race												
White	REF			REF			REF			REF		
Black	0.41	(0.33, 0.50)	<0.001	0.41	(0.33, 0.50)	<0.001	0.23	(-0.20, 0.67)	0.297	0.41	(0.31, 0.48)	<0.001
Hispanic	0.66	(0.54, 0.77)	<0.001	0.66	(0.55, 0.78)	<0.001	0.12	(-0.43, 0.68)	0.666	0.65	(0.53, 0.76)	<0.001
Birthplace												
US Non-South	REF			REF			REF			REF		
US South	0.13	(0.06, 0.20)	<0.001	0.13	(0.06, 0.20)	<0.001	0.13	(0.06, 0.20)	<0.001	0.19	(-0.07, 0.45)	0.161
Outside the US	-0.02	(-0.13, 0.10)	0.768	-0.02	(-0.13, 0.10)	0.738	-0.01	(-0.12, 0.11)	0.890	-0.25	(-0.60, 0.11)	0.168
Female x Education (global F-test)												
female x first-gen				-0.08	(-0.35, 0.19)	0.582						
female x only parent				-0.11	(-0.46, 0.23)	0.527						
female x neither				0.15	(-0.08, 0.39)	0.200						
Race x Education (global F-test)												
Black x first-gen							-0.15	(-0.63, 0.34)	0.548			
Hispanic x first-gen							0.11	(-0.53, 0.75)	0.731			
Black x only parent							0.14	(-0.43, 0.71)	0.635			
Hispanic x only parent							1.09	(0.36, 1.83)	0.003			
Black x neither							0.26	(-0.19, 0.70)	0.26			
Hispanic x neither							0.58	(0.02, 1.14)	0.042			
Birthplace x Education (global F-test)												0.107
US South x first-gen										-0.23	(-0.54, 0.08)	0.153
Outside US x first-gen										0.08	(-0.35, 0.51)	0.711
US South x only parent										0.05	(-0.34, 0.44)	0.795
Outside US x only parent										0.61	(0.07, 1.15)	0.026
US South x neither										-0.03	(-0.31, 0.24)	0.808
Outside US x neither										0.27	(-0.11, 0.64)	0.161

REF group: Multi-gen, White males born in the US non-South, who lived in a nonrural area at age 14.

Interaction term coefficients indicate the additional difference in CES-D score associated with each education group; positive interaction terms indicate higher CES-D scores, while negative interaction terms indicate lower CES-D scores for the specified demographic group.

To calculate the change in CES-D score for each education group in a specific demographic group, sum the coefficient for the main effect with the coefficient for the interaction term.

Italicized p-values show the global test of interaction with each modifier variable x education group.

racial and ethnic groups, such as wage gaps, employment benefits, and experiences of discrimination. Future work should continue to evaluate this in larger studies and among Hispanic and Latino older adults more broadly as the composition of first-gen and multi-gen college graduates continues to change in the US.

4.1. Limitations

This study has some limitations. First, the cross-sectional design of our study prevents us from establishing temporality and ruling out reverse causality. While it is reasonable to assume that individuals have completed their education by age 55, there is the possibility of confounding by early-life mental health such that individuals with early-life depression do not achieve higher education because of their mental status. Similarly, strong, untestable assumptions, including unmeasured confounding, prevent us from making causal inferences, and our results must be interpreted as associational (Matthay et al., 2019). For example, it is possible that unmeasured factors like quality of education or social engagement earlier in life (e.g., having a non-parent college graduate mentor) could have impacted educational attainment and midlife depressive symptoms. Next, we define college graduates as those with 16 or more years of education without further characterizing their

educational experience (e.g., degree completed, area of study, institutional reputation, etc.). Future research should consider natural experiments or longitudinal data with different educational experiences among first-gen and multi-gen college graduates. Finally, another limitation of this study is its moderate sample size for Black and Hispanic participants. To increase statistical power, we grouped Mexican and other Hispanic participants which may obscure heterogeneity across Hispanic subethnic groups. Future work should disaggregate data on older Hispanic and Latino adults more fully.

Despite these limitations, our study contributes to the literature on intergenerational education and depressive symptoms in the US in significant ways. First, while prior studies have focused on primary or secondary educational attainment with a 12-year education threshold, we conceptualized intergenerational education in a college context. Understanding college effects is critical as college attainment becomes increasingly common. Second, our study evaluated the association between intergenerational education and depressive symptoms across sex, race and ethnicity identity, and birthplace. This is the first study, to our knowledge, to evaluate this association among White, Black, and Hispanic midlife adults ages 55 to 63 in the US. College completion remains less common among Black and Hispanic adults than White adults in the US. (Merolla, 2018) Our findings have important implications for how

college access may serve as a potential equalizer for mental health across racial and ethnic groups. If causal, our findings suggest programs and policies to facilitate college completion among first-generation students could be increasingly important population-level interventions to reduce disparities in depressive symptomatology. Finally, our study focus on midlife depressive symptoms offers valuable insight into the long-term mental health benefits of increased educational attainment from one generation to the next. While prior studies have connected depression to the development of acute or chronic health conditions in late life, (Barnes et al., 2006; Covinsky et al., 2010) it is important to note that depression in midlife can also affect other significant social determinants of health that pave the way for successful aging or accelerated health decline including social engagement, interpersonal relationships, work performance, and lost earnings (Adler et al., 2006; Steger & Kashdan, 2009). Future studies could elaborate on the present study to include the transition from middle age to older age or assess other downstream consequences of depressive symptoms.

5. Conclusion

Our study finds that midlife depressive symptoms are not significantly different for first-generation college graduates compared to multi-generation college graduates among a population-based cohort in the US. These findings suggest that a college education can positively affect midlife depressive symptoms regardless of parental education and that a college degree may counteract some of the adverse effects of a disadvantaged socioeconomic childhood for first-generation students. As the US population ages, midlife depressive symptoms may be a greater indicator of overall quality of life and the well-being of older adults. Our findings could also have important implications for reducing late-life racial and ethnic health disparities as historically marginalized groups comprise a larger proportion of college graduates over time. Our findings are encouraging evidence of the broad potential for the long-term benefits of college completion on adult mental health, regardless of parental education.

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Ethics statement

The authors of this study report no conflict of interest.

CRediT authorship contribution statement

Erika Meza: Writing – original draft, Visualization, Formal analysis, Data curation, Conceptualization. **Jillian Hebert:** Writing – review & editing, Validation. **Maria E. Garcia:** Writing – review & editing, Conceptualization. **Jacqueline M. Torres:** Writing – review & editing, Methodology, Conceptualization. **M. Maria Glymour:** Writing – review & editing, Supervision, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

The authors have no competing interests to report.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmph.2024.101633>.

References

- Adler, D. A., McLaughlin, T. J., Rogers, W. H., Chang, H., Lapitsky, L., & Lerner, D. (2006). Job performance deficits due to depression. *American Journal of Psychiatry*, 163(9), 1569–1576. <https://doi.org/10.1176/ajp.2006.163.9.1569>. PMID: 16946182; PMCID: PMC4269259.
- Adler, N. E., Boyce, T., Chesney, M. A., et al. (1994). Socioeconomic status and health: The challenge of the gradient. *American Psychologist*, 49(1), 15–24. <https://doi.org/10.1037/0003-066X.49.1.15>.
- Adler, N. E., & Newman, K. (2002). Socioeconomic disparities in health: Pathways and policies. *Health Affairs*, 21(2), 60–76. <https://doi.org/10.1377/hlthaff.21.2.60>
- Assari, S. (2018). Parental educational attainment and mental well-being of college students: Diminished returns of blacks. *Brain Sciences*, 8(11). <https://doi.org/10.3390/brainsci8110193>
- Backlund, E., Sorlie, P. D., & Johnson, N. J. (1999). A comparison of the relationships of education and income with mortality: The national longitudinal mortality study. *Social Science & Medicine*, 49(10), 1373–1384. [https://doi.org/10.1016/S0277-9536\(99\)00209-9](https://doi.org/10.1016/S0277-9536(99)00209-9)
- Barnes, D. E., Alexopoulos, G. S., Lopez, O. L., Williamson, J. D., & Yaffe, K. (2006). Depressive symptoms, vascular disease, and mild cognitive impairment: Findings from the cardiovascular health study. *Archives of General Psychiatry*, 63(3), 273–279. <https://doi.org/10.1001/archpsyc.63.3.273>
- Barnes, D. E., Yaffe, K., Byers, A. L., McCormick, M., Schaefer, C., & Whitmer, R. A. (2012). Midlife vs late-life depressive symptoms and risk of dementia: Differential effects for alzheimer disease and vascular dementia. *Archives of General Psychiatry*, 69(5), 493–498. <https://doi.org/10.1001/archgenpsychiatry.2011.1481>
- Barrow, L., Rouse CE, Rouse CE, Rouse C. The economic value of education by race and ethnicity; Economic Perspectives:14..
- Bauer, G. R. (2014). Incorporating intersectionality theory into population health research methodology: Challenges and the potential to advance health equity. *Social Science & Medicine*, 110, 10–17. <https://doi.org/10.1016/j.socscimed.2014.03.022>
- Black, D., Haviland, A., Sanders, S., & Taylor, L. (2006). Why do minority men earn less? A study of wage differentials among the highly educated. *The Review of Economics and Statistics*, 88(2), 300–313. <https://doi.org/10.1162/rest.88.2.300>
- Boulton M. A price on freedom: The problems and promise of the vietnam era G.I. Bills. Bureau, U. C. (1940). Highest educational levels reached by adults in the U.S. Since [Census.gov https://www.census.gov/newsroom/press-releases/2017/cb17-51.html](https://www.census.gov/newsroom/press-releases/2017/cb17-51.html). (Accessed 17 May 2022).
- Cermakova, P., Formanek, T., Kagstrom, A., & Winkler, P. (2018). Socioeconomic position in childhood and cognitive aging in Europe. *Neurology*, 91(17), e1602–e1610. <https://doi.org/10.1212/WNL.0000000000006390>
- Cermakova, P., Pikhart, H., Ruiz, M., Kubinova, R., & Bobak, M. (2020). Socioeconomic position in childhood and depressive symptoms in later adulthood in the Czech Republic. *Journal of Affective Disorders*, 272, 17–23. <https://doi.org/10.1016/j.jad.2020.03.099>
- Collier, P. J., & Morgan, D. L. (2008). "Is that paper really due today?": Differences in first-generation and traditional college students' understandings of faculty expectations. *Higher Education*, 55(4), 425–446. <https://doi.org/10.1007/s10734-007-9065-5>
- Covinsky, K. E., Yaffe, K., Lindquist, K., Cherkasova, E., Yelin, E., & Blazer, D. G. (2010). Depressive symptoms in middle age and the development of later life functional limitations: The long term impact of depressive symptoms. *Journal of the American Geriatrics Society*, 58(3), 551–556. <https://doi.org/10.1111/j.1532-5415.2010.02723.x>
- Cutler, D. M., & Lleras-Muney, A. (2010). Understanding differences in health behaviors by education. *Journal of Health Economics*, 29(1), 1–28. <https://doi.org/10.1016/j.jhealeco.2009.10.003>
- Fuller-Rowell, T. E., Curtis, D. S., Doan, S. N., & Coe, C. L. (2015). Racial disparities in the health benefits of educational attainment: A study of inflammatory trajectories among african American and white adults. *Psychosomatic Medicine*, 77(1), 33–40. <https://doi.org/10.1097/PSY.0000000000000128>
- Fuller-Rowell, T. E., & Doan, S. N. (2010). The social costs of academic success across ethnic groups. *Child Development*, 81(6), 1696–1713. <https://doi.org/10.1111/j.1467-8624.2010.01504.x>
- Gavin, A. R., Walton, E., Chae, D. H., Alegria, M., Jackson, J. S., & Takeuchi, D. (2010). The associations between socio-economic status and major depressive disorder among blacks, latinos, asians and non-hispanic whites: Findings from the collaborative psychiatric epidemiology studies. *Psychological Medicine*, 40(1), 51–61. <https://doi.org/10.1017/S0033291709006023>
- Glymour, M. M., Avendaño, M., Haas, S., & Berkman, L. F. (2008). Lifecourse social conditions and racial disparities in incidence of first stroke. *Annals of Epidemiology*, 18, 904–912. <https://doi.org/10.1016/j.annepidem.2008.09.010>, 12.
- Gugushvili, A., Zhao, Y., & Bukodi, E. (2019). 'Falling from grace' and 'rising from rags': Intergenerational educational mobility and depressive symptoms. *Social Science & Medicine*, 222, 294–304. <https://doi.org/10.1016/j.socscimed.2018.12.027>
- Link, B. G., & Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior*, 80–94. <https://doi.org/10.2307/2626958>. Published online.

- Lorant, V. (2003). Socioeconomic inequalities in depression: A meta-analysis. *American Journal of Epidemiology*, 157(2), 98–112. <https://doi.org/10.1093/aje/kwf182>
- Matthay, E. C., Hagan, E., Gottlieb, L. M., et al. (2019). Alternative causal inference methods in population health research: Evaluating tradeoffs and triangulating evidence. *SSM Popul Health*, 10, Article 100526. <https://doi.org/10.1016/j.ssmph.2019.100526>
- Melchior, M., Ziad, A., Courtin, E., Goldberg, M., Zins, M., & van der Waerden, J. (2018). Intergenerational socioeconomic mobility and adult depression. *American Journal of Epidemiology*, 187(2), 260–269. <https://doi.org/10.1093/aje/kwx252>
- Merolla, D. M. (2018). Completing the educational career: High school graduation, four-year college enrollment, and bachelor's degree completion among Black, hispanic, and white students. *Sociology of Race and Ethnicity*, 4(2), 281–297. <https://doi.org/10.1177/2332649217727552>
- Mirowsky, J., & Ross, C. E. (2017). *Education, social status, and health*. Routledge. <https://doi.org/10.4324/9781351328081>
- The US Burden of Disease Collaborators, Mokdad, A. H., Ballestreros, K., et al. (2018). The state of US health, 1990–2016: Burden of diseases, injuries, and risk factors among US States. *JAMA*, 319(14), 1444. <https://doi.org/10.1001/jama.2018.0158>
- Morrissey, K., & Kinderman, P. (2020). The impact of childhood socioeconomic status on depression and anxiety in adult life: Testing the accumulation, critical period and social mobility hypotheses. *SSM - Population Health*, 11, Article 100576. <https://doi.org/10.1016/j.ssmph.2020.100576>
- Nicklett, E. J., & Burgard, S. A. (2009). Downward social mobility and major depressive episodes among Latino and asian-American immigrants to the United States. *American Journal of Epidemiology*, 170(6), 793–801. <https://doi.org/10.1093/aje/kwp192>
- Phelan, J. C., Link, B. G., & Tehranifar, P. (2010). Social conditions as fundamental causes of health inequalities: Theory, evidence, and policy implications. *Journal of Health and Social Behavior*, 51(1 suppl), S28–S40. <https://doi.org/10.1177/0022146510383498>
- Pratt, L. A., Druss, B. G., Manderscheid, R. W., & Walker, E. R. (2016). Excess mortality due to depression and anxiety in the United States: Results from a nationally representative survey. *General Hospital Psychiatry*, 39, 39–45. <https://doi.org/10.1016/j.genhosppsych.2015.12.003>
- Ross, C. E., & Mirowsky, J. (2006). Sex differences in the effect of education on depression: Resource multiplication or resource substitution? *Social Science & Medicine*, 63(5), 1400–1413. <https://doi.org/10.1016/j.socscimed.2006.03.013>
- Ross, C. E., & Van Willigen, M. (1997). Education and the subjective quality of life. *Journal of Health and Social Behavior*, 38(3), 275–297. <https://doi.org/10.2307/2955371>
- Smith WA, Hung M, Franklin JD. Racial battle fatigue and the MisEducation of Black men: Racial microaggressions, societal problems, and environmental stress. :21..
- Steffick, D. (2000). *Documentation of affective functioning measures in the health and retirement study*. Institute for Social Research, University of Michigan. <https://doi.org/10.7826/ISR-UM.06.585031.001.05.0005.2000>
- Steger, M. F., & Kashdan, T. B. (2009). Depression and everyday social activity, belonging, and well-being. *Journal of Counseling Psychology*, 56(2), 289–300. <https://doi.org/10.1037/a0015416>
- Tooth, L., & Mishra, G. (2013). Intergenerational educational mobility on general mental health and depressive symptoms in young women. *Quality of Life Research*, 22(7), 1589–1602. <https://doi.org/10.1007/s11136-012-0310-8>
- Turvey, C. L., Wallace, R. B., & Herzog, R. (1999). A revised CES-D measure of depressive symptoms and a DSM-based measure of major depressive episodes in the elderly. *International Psychogeriatrics*, 11(2), 10.
- Vable, A. M., Cohen, A. K., Leonard, S. A., Glymour, M. M., Duarte, C. d. P., & Yen, I. H. (2018). Do the health benefits of education vary by sociodemographic subgroup? Differential returns to education and implications for health inequities. *Annals of Epidemiology*, 28(11), 759–766.e5. <https://doi.org/10.1016/j.annepidem.2018.08.014>
- Vable, A. M., Gilsanz, P., Nguyen, T. T., Kawachi, I., & Glymour, M. M. (2017). Validation of a theoretically motivated approach to measuring childhood socioeconomic circumstances in the Health and Retirement Study. In A. Fraser (Ed.), *PLoS ONE* (Vol. 12), Article e0185898. <https://doi.org/10.1371/journal.pone.0185898>, 10.
- Vines, A. I., Baird, D. D., McNeilly, M., Hertz-Picciotto, I., Light, K. C., & Stevens, J. (2006). Social correlates of the chronic stress of perceived racism among Black women. *Ethnicity & Disease*, 16(1), 101–107.
- Walsemann, K. M., Gee, G. C., & Gentile, D. (2015). Sick of our loans: Student borrowing and the mental health of young adults in the United States. *Social Science & Medicine*, 124, 85–93. <https://doi.org/10.1016/j.socscimed.2014.11.027>
- Warburton, E. C., Bugarin, R., & Nunez, A. M. (2001). *Bridging the gap: Academic preparation and postsecondary success of first-generation students* (Vol. 83). Published online.
- Ward, J. B., Haan, M. N., Garcia, M. E., Lee, A., To, T. M., & Aiello, A. E. (2016). Intergenerational education mobility and depressive symptoms in a population of Mexican origin. *Annals of Epidemiology*, 26(7), 461–466. <https://doi.org/10.1016/j.annepidem.2016.05.005>
- Ward, J. B., Robinson, W. R., Pence, B. W., et al. (2018). Educational mobility across generations and depressive symptoms over 10 Years among US latinos. *American Journal of Epidemiology*, 187(8), 1686–1695. <https://doi.org/10.1093/aje/kwy056>
- Wilbur, T. G. (2021). Stressed but not depressed: A longitudinal analysis of first-generation college students, stress, and depressive symptoms. *Social Forces*, 100(1), 56–85. <https://doi.org/10.1093/sf/soaa091>
- Zajacova, A., & Lawrence, E. M. (2018). The relationship between education and health: Reducing disparities through a contextual approach. *Annual Review of Public Health*, 39(1), 273–289. <https://doi.org/10.1146/annurev-publhealth-031816-044628>
- Zhang, Z., Jackson, S. L., Gillespie, C., Merritt, R., & Yang, Q. (2023). Depressive symptoms and mortality among US adults. *JAMA Network Open*, 6(10), Article e2337011. <https://doi.org/10.1001/jamanetworkopen.2023.37011>