College selectivity and health in mid and retirement age

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Abstract

While the association between more education and better health outcomes is well-documented, relatively little is known about the association between school quality and adult health. The primary objective of this study is to quantify the association between attending a selective college and depression and general health status in middle and retirement age.

This study uses data from the Wisconsin Longitudinal Study (WLS), a cohort based on a random sample of 1957 High School (HS) graduates in Wisconsin re-interviewed in 1993 and 2004. We considered a college to be selective based on the Barron's rating of college selectivity which takes into account average SAT scores. Our outcomes were general health status (SF-12MCS and SF-12PCS) in 2004 and depression symptoms (CESD scores) in 1993 and 2004. To estimate a casual effect and adjust for potential unmeasured confounders we used coarsened exact matching (CEM) to create analytical weights. We estimated weighted linear regressions in the matched datasets. CEM matched for gender, 1957 residence, mother's education, father's occupation, having a sibling, HS type, HS college preparatory class, semesters of HS math (sample-specific median split), IQ categories (61 – 97, 98 – 104, 106 – 115. 117 - 145), and sample-specific quartiles of HS rank. All analyses were stratified by parental income and included continuous measures of parental income and individual's HS rank.

Among respondents with high parental income, attending a selective college led to lower CESD and higher SF-12 MCS and PCS, indicating less depressive symptoms in mid- and retirement-age and better physical and mental health at retirement-age. Among respondents with low parental income, attending a selective college led to statistically significant lower depressive

symptoms in early adulthood (1993) but by retirement age any health advantage associated with attending a selective college has dissipated. Our results suggest selective college attendance conveys important psychological and general health benefits but primarily among those from privileged backgrounds.

Introduction

Strong associations between years of schooling/ degree credentials and health outcomes (Cutler & Lleras-Muney, 2008) have been consistently documented. However, little is known about the role of school quality on adult health (Braveman et al., 2011). Most of the research available on school quality and health has focused on the effects of primary and middle school characteristics on adolescent health. Studies have found that indicators of poor school quality such as having a large percentage of students who feel disengaged are associated with more smoking, alcohol and marijuana use among students (Birnbaum et al., 2003; West et al., 2004; Henderson et al., 2008; Dundas et al., 2006; McNeely & Falci, 2004). Two recent studies that examined changes in primary/secondary school quality associated with school desegregation found decreases in the racial disparity in disability in older ages (Frisvold & Golberstein, 2013) as well as statistically significant improvements in adult self-rated health, smoking, obesity, and mortality (Frisvold & Golberstein, 2010).

Previous studies of school quality and health raise three major theoretical questions. First, is childhood a critical period for school quality or are school differences at college age also influential? Second, do health benefits of better school quality persist into later life, after students have left school? Finally, it is important to understand whether the benefits of school quality accrue to children regardless of childhood socioeconomic background.

To date, three studies have investigated postsecondary school quality and health, using indicators of college selectivity to proxy for quality. Fletcher & Frisvold found that students attending a selective college had lower tobacco and marijuana use (Fletcher; & Frisvold, 2011), and that attending a selective college predicted lower BMI in older ages (Fletcher; & Frisvold, 2012).

Ross and Mirowsky also reported that college selectivity was associated with better physical functioning and self-rated health in older adults (Ross & Mirowsky, 1999). None of these studies evaluated differences in effects for children from low SES backgrounds, but there is strong theoretical reason to think the benefits of attending an elite college may differ for individuals with low childhood SES. Social scientists have long debated about who benefits the most from college attendance - individuals who are most likely to attend or individuals who are least likely to go to college. Results for labor market outcomes have suggested heterogeneity in the returns for attending an elite college. Socially disadvantaged groups seem to derive the largest income benefits from going to an elite college including individuals who are unlikely to be college students (Brand & Xie, 2010) and Black/Hispanic racial minorities with less educated parents benefit the most from attending an elite college (Dale & Krueger, 2011). Since socioeconomic status is a major pathway linking college selectivity and health in older age (Figure 1), we expect individuals from low household incomes may also derive the largest health benefits from elite college attendance. Socially advantaged individuals may already have the threshold level of social resources and knowledge and cognitive reserve from other sources necessary to access achieve a high standard of health and may not derive any additional health benefits from attending an elite college. On the other hand, evidence from research on transitions from low childhood to high adult SES suggests that socioeconomic gains may some come at the expense of health. Upward social mobility is associated with greater allostatic load and worst cardiovascular health, especially for disadvantaged groups (Brody et al., 2013; Marin et al., 2008). Such heterogeneity in effects may have important implications for policies addressing persistent socioeconomic disparities in adult Americans.

The primary objective of this study is to quantify the effect of attending a selective college versus a non-selective college on depression and general health status in middle- and retirement-age. This paper extends previous findings by investigating whether effects differ depending on the respondents' childhood socioeconomic background. We hypothesize any association between college quality and adult health will be heterogeneous, based on cumulative advantage such as parental socioeconomic status.

Methods

Participants were from the Wisconsin Longitudinal Study (WLS), a longitudinal survey following a random sample of 10,317 men and women who graduated from Wisconsin high schools in 1957. The WLS survey includes extensive information on childhood and adult social and health conditions. This analysis was restricted to WLS participants who attended a US college within two years of high school graduation (N = 3,157). Respondents completed a mailed questionnaire in 1992-1993 and phone or mail-in questionnaires in 2004-2006. A further 455 individuals were excluded due to missing covariates used in the coarsened exact matching procedure and 1009 were excluded due to missing information on the college attended. Final sample size was 1693 WLS respondents (834 in the low parental socio-economic group and 859 in the high parental income group).

College quality was determined by Barron's rating of college selectivity in Barron's Profiles of American Colleges 1969 edition, which used information on median SAT examination scores for recent freshman classes, grade average or class rank required for admission, and the admissions rate. Individuals were considered to have graduated from a "selective" college if they reported a college degree from a school Barron's has categorized as "most", "highly", or "very"

competitive. Non-selective colleges were those categorized by Barron's as "competitive" or "not competitive". An example of a selective college is University of Wisconsin at Madison and an example of a non-selective college is State University of Wisconsin.

Our primary outcomes were measures of depression symptoms (Center for Epidemiological Studies-Depression (CESD) scores) in mid-life (1993, when respondents were average age 55) and general health status (SF-12) in mid-life and retirement age (2004-2006, when respondents were average age 65). CESD is a widely used self-report measure of depressive symptoms developed for large-scale community-based studies, and a higher score indicates more depressive symptoms. SF-12 is a brief inventory of self-reported mental and physical health used to estimate two meta-scores, the Physical Component Summary (SF-12 PCS) and the Mental Component Summary (SF-12 MCS)(Ware et al., 1996). SF-12 PCS and SF-12 MCS scores have a range of 0 to 100, with higher score indicating better functioning. Each of these continuous measures was z-transformed. The z-score for the SF-12 scores used the mean and the standard deviation for the age-specific US population (Ware et al., 1995) while the z-score for CESD was based on the empirical sample.

We examined the effect of having a degree from an elite college with a two-step analysis technique: (1) coarsened exact matching (CEM) to create analytical weights; and (2) linear regression on the matched datasets including additional covariates to reduce residual confounding. CEM matches individuals with the aim of reducing the imbalance in covariates between 2 groups using monotonic imbalance bounding. Unmatched individuals were dropped from the analysis.

We adjusted for the following covariates by matching: gender (male/female), residence in 1957 (urban/rural), mother's education (0, 1-8, 9-12, 13-16, 16+ years of schooling), father's occupation in 1957 (skilled/ white-collar/professional vs. unskilled/farming/not known), having at least one sibling (Yes vs. No), type of high school (religious/private vs. public), took a college preparatory class in high school (Yes vs. No), intact family in 1957 (Yes vs. No), semesters of algebra, trigonometry in high school (sample-specific median split), IQ in 1957 (categories based on overall WLS sample 61 – 97, 98 – 104, 106 – 115. 117 - 145), high school rank 1957 (percentile rank-normalized categorized into sample-specific quartiles). We stratified all analyses by parental income (median split) and included continuous measures of parental income and high school rank to account for possible residual confounding. All analyses were conducted in Stata (version 12).

Results

Of the 834 eligible WLS respondents in the low parental socio-economic group, 244 were matched; of 859 in the high parental income group, 273 were matched. The multivariable L1 distance (a multivariate measure of imbalance ranging from 1 for complete separation to 0 for perfect global match that is calculated based on the differences of all model covariates for the case vs control groups) decreased after matching. After unmatched observations are removed, CEM weights ranged from 0.48 to 4.9 in the low parental income group and 0.25 to 7.5 in the low parental income group.

Sociodemographic characteristics of the matched samples are displayed in Table 1. The average age of the WLS respondents was 54 in 1993 and 65 in 2004. The majority of the sample was

male and had at least one sibling. The majority of the respondents in the matched sample of high parental respondents resided in a large, urban area in Wisconsin at baseline and had fathers who worked as a skilled/white collar or professional.

Attendance at a selective college was associated with lower depressive symptoms in both middle- and retirement-age among those with high parental income (Table 2). Among respondents from families with low income, selective college attendance was associated with a CESD-score that is a 0.43 standard deviation (95% CI = -0.82, -0.03) less than the other WLS participants at middle-age but no statistically significance difference at retirement-age. Among those with high parental income, respondents who attended a selective college reported a SF12 mental health score 0.37 standard deviation and a SF12 physical health score 0.27 standard deviation higher than the US general population. Among respondents with low parental income, however, elite college attendance did not lead to any statistically different SF-12 MCS or PCS score at retirement-age.

Discussion

Among individuals from a high SES background, we find that WLS participants who attended a selective college had lower depressive symptom scores at age 58 and 65 compared to those who attended a non-selective college. Similarly, selective college attendance predicted better general mental and physical health at age 65 for adults with high SES childhoods. In contrast, for individuals from low SES backgrounds, selective college attendance was associated with lower depressive symptoms only at age 58, but not at age 65; further, selective college attendance did

not predict either general mental or general physical health at age 65 for low-SES background individuals.

Our results suggest that elite colleges may reinforce and extend childhood social class advantages. Previous studies focusing on elite college indicate the socioeconomic benefits fade over time (Brand et al, 2006). Health benefits associated with elite college may also fade over time, at least among those with low parental incomes. For respondents from lower parental income households, elite college was only associated with lower depressive symptoms at middle-age; elite college did not convey any health advantage in retirement age among this subpopulation. Individuals who are from disadvantaged backgrounds may be stymied in their efforts to convert financial or other benefits gained from attending an elite college into tangible and lasting health improvements. By contrast, respondents from higher parental income households who attended an elite college experienced less depressive symptoms at both middle- and retirement-age as well as better general physical and mental health status at retirement-age. Our results from the sample of high parental income suggest that the effect of college selectivity on decreasing depressive symptoms may actually strengthen over time; the decrease associated with an elite college degree was larger in 2004 than in 1993.

Previous research on the effects of an elite college degree has centered on socioeconomic benefits. While some studies suggest no benefits or only short-term benefits (Black & Smith, 2004; Brand & Halaby, 2007; Dale & Krueger, 2002), other studies found college selectivity increased income and occupational status for graduates (Brewer, Eide, & Ehrenberg, 1999; Monks, 2000; Trusheim & Crouse, 1981; Hoekstra, 2009). Our results looking at health in

middle-and retirement-age suggest there may be differential health effects associated with attending a selective college depending on childhood socioeconomic status. Previous research on the health costs of upward social mobility provides several plausible psychological biological explanations for this finding. Individuals from low socioeconomic backgrounds who attend elite colleges may have a predisposition towards "John Henryism", a coping style characterized by a determination to succeed through hard work and constant effort in the face of environmental stressors (James, 1994) that has been associated with worst health (Bennett et al., 2004). Other research utilizing a status inconsistency conceptual framework (Everett Cherrington, 1945) found that individuals who differed on two or more dimensions of social status reported high psychological stress and high blood pressure (Dressler;, 1988, 1991).

Sociological theory has long argued that the postsecondary educational system is an important source of stratification in modern society (Stevens et al., 2008). Higher quality education is linked to better adult socioeconomic outcomes (Card & Krueger, 1992; Jamison et al., 2007; You, 2014). Postsecondary institutions structure opportunities affecting health, conveying human capital (e.g. occupational characteristics, income/wealth measures), social capital (e.g. friends, networks) (Gerber & Cheung, 2008), and cultural capital (e.g. higher health literacy; Seymour & Lunde, 1991; Pearson, 2008). In this manner, it may subsequently influence health through educational attainment, peer networks, socioeconomic trajectories, cognitive skill formation and psychological well-being (Figure 1) (Cutler; et al., 2006). College may be an especially crucial educational institution because early adulthood is an important developmental stage when behavioral patterns and living conditions relevant to subsequent health are established.

Since the 1940s the United States has experienced a significant expansion in college education in the twentieth century, especially among sociodemographic groups that have traditionally been excluded from higher education such as women, African Americans and Latino Americans (Baker & Vélez, 1996; Graham, 1978; Juhn et al., 2005). Given the substantial variation in the quality of colleges and universities, estimating returns to higher education based on quantity of education alone can be misleading. More research to investigate the heterogeneous health effects associated with college quality. Our finding that attendance at a selective college leads to persistent health benefits suggest there are long-term advantages associated with higher quality colleges. However, that lack of any statistically significant findings at retirement-age among individuals from disadvantaged childhood backgrounds implies interventions at multiple time points and throughout the lifecourse may be needed to effectively address disparities.

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Figure 1. Pathways linking school quality to mid- and retirement-age health outcomes

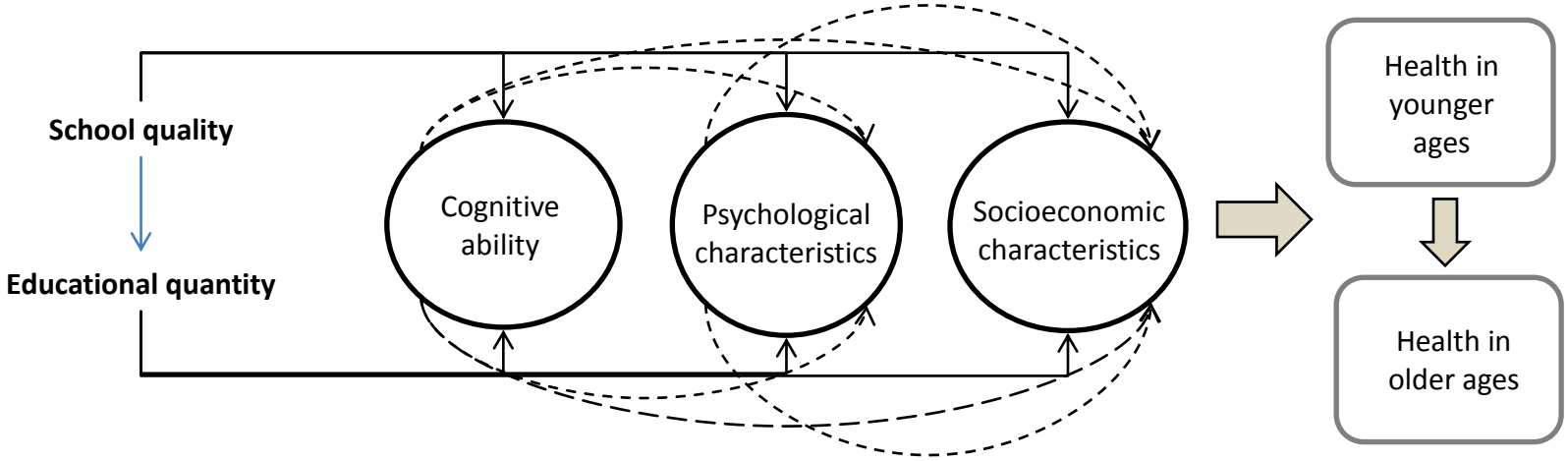

Table 1: Sociodemographic characteristics of elite college degree-graduates and matched non-elite degree graduates, Wisconsin Longitudinal Study

	High parental income		**Low parental income**	
	Elite	*Non-elite*	*Elite*	*Non-elite*
Covariate	*N (%)*	*N (%)*	*N (%)*	*N (%)*
N	156	117	109	135
Male	101 (65)	67 (57)	74 (68)	95 (70)
Residence in 1957 – Large, urban	86 (55)	65 (56)	25 (23)	27 (20)
Has at least one sibling	151 (97)	113 (97)	108 (99)	134 (99)
Intact family in 1957	156 (100)	117 (100)	108 (99)	134 (99)
Father's occupation: Skilled/White collar/ Professional	147 (94)	108 (92)	54 (50)	60 (44)
Mother's education: <=8 years	4 (3)	5 (4)	24 (22)	30 (22)
Mother's education: 9-12	102 (65)	73 (62)	71 (65)	89 (66)
Mother's education: 13-16	18 (12)	15 (13)	11 (10)	13 (10)
Mother's education: =>16	32 (21)	24 (21)	3 (3)	3 (2)
IQ: 61– 104	35 (22)	33 (28)	21 (19)	33 (24)
IQ: 106 – 115	40 (25)	35 (30)	34 (31)	45 (33)
IQ: 117 – 145	81 (52)	49 (42)	54 (50)	57 (42)
Private/ religious high school	27 (17)	23 (20)	7 (6)	9 (7)
Semesters of HS math (median split)	96 (62)	57 (49)	105 (96)	127 (94)
College preparatory course	136 (87)	98 (84)	75 (68)	88 (65)
HS rank: Quartile 1	27 (17)	26 (22)	16 (15)	23 (17)
HS rank: Quartile 2	49 (31)	30 (26)	36 (33)	51 (38)
HS rank: Quartile 3	32 (21)	27 (23)	17 (16)	23 (17)
HS rank: Quartile 4	48 (31)	34 (29)	40 (37)	38 (28)

For the high parental income matched sample, the median split was 6 semesters of HS math and for the HS rank quartile 1 was 67-101, quartile 2=102-111, quartile 3=112-120, and quartile 4=121-139. For the low parental income matched sample, the median split was 4 semesters of HS math and for the HS rank quartile 1 was 71-103, quartile 2=104-112, quartile 3=113-120, and quartile 4=121-139.

Table 2: Regression results for depressive symptoms and general health status in 1993 and 2004 among CEM matched college graduates, Wisconsin Longitudinal Study[a]

	High Parental Income			
	CESD (1993)	*CESD (2004)*	*SF36 Mental (2004)*	*SF36 Physical (2004)*
Selective college	**-0.39** [b]	**-0.72** [b]	**0.37**[b]	**0.27** [b]
	(-0.70, -0.09)	**(-1.16, -0.29)**	**(0.14, 0.59)**	**(0.02, 0.52)**
Parental income	0.00	0.00	0.00	0.00
	(0.00, 0.00)	(0.00, 0.00)	(0.00, 0.00)	(-0.00, 0.00)
High school rank	0.00	0.04 [b]	-0.01	0.00
	(-0.01, 0.01)	(0.02, 0.05)	(-0.02, 0.00)	(-0.01, 0.00)
Constant	-0.01	-3.47	1.58	0.64
N	202	189	184	184
	Low Parental Income			
	CESD (1993)	*CESD (2004)*	*SF36 Mental (2004)*	*SF36 Physical (2004)*
Selective college	**-0.43** [b]	-0.04	0.17	0.04
	(-0.82, -0.03)	(-0.37, 0.29)	(-0.03, 0.37)	(-0.23, 0.30)
Parental income	0.01	0.00	0.00	0.00
	(-0.01, 0.02)	(-0.01, 0.01)	(-0.01, 0.01)	(-0.01, 0.01)
High school rank	0.00	-0.01	0.01	0.00
	(-0.02, 0.01)	(-0.02, 0.01)	(0.00, 0.01)	(-0.01, 0..01)
Constant	0.42	0.83	-0.20	0.16
N	192	182	179	179

[a] The coefficient is the expected difference in standard deviations of the outcome associated with each exposure variable; because the sample was matched on parental income and high school rank, these coefficients only account for residual confounding and are generally expected to be close to null.
[b] $p<0.05$