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Why Do College Graduates Behave More Healthfully Than Those Who Are Less Educated?

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Abstract

College graduates live much healthier lives than those with less education, but research has yet to document with certainty the sources of this disparity. This study examines why U.S. young adults who earn college degrees exhibit healthier behaviors than those with less education. I use data from the National Longitudinal Study of Adolescent to Adult Health, which offers information on education and health behaviors across adolescence and young adulthood (N = 14,265). Accounting for selection into college, degree attainment substantially reduces the associations between college degree attainment and health behaviors, but college degree attainment demonstrates a strong causal effect on young adult health. Financial, occupational, social, cognitive, and psychological resources explain less than half of the association between college degree attainment and health behaviors. The healthier behaviors of college graduates are the result of sorting into educational attainment, embedding of human capital, and mechanisms other than socioeconomic and psychosocial resources.

Keywords

college degree, health behaviors, United States, young adults

Health behaviors have clear practical and policy importance as a topic of study because they contribute so importantly to health and mortality risk in the United States. Understanding population health and personal well-being requires understanding of health behaviors. Epidemiologic calculations to translate actual causes of death (e.g., heart disease, cancer) into behavioral causes illustrate this point. In 2000, the leading behavioral cause of death was tobacco use (18.1% of total U.S. deaths), followed by poor diet and physical activity (16.6%), and alcohol consumption (3.5%; Mokdad et al. 2004). These percentages translate into hundreds of thousands of deaths every year.

Unhealthy behaviors tend to be most concentrated among lower socioeconomic groups. A massive literature has described the disadvantaged health and longevity of low-socioeconomic groups. Similar disadvantages apply to health behaviors: higher socioeconomic groups have healthier behaviors across a number of domains, including not smoking, more physical activity, better nutrition, healthier alcohol consumption patterns, and greater levels of seatbelt use, preventive healthcare, and use of smoke detectors (Cutler and Lleras-Muney 2010; Pampel, Krueger, and Denney 2010). Given the strong effect of health behaviors on health, socioeconomic disparities in health behaviors contribute to socioeconomic disparities in health and mortality (Brunello et al. 2016; Ho and Fenelon 2015; Mehta, House, and Elliot 2015). Of the components of socioeconomic status (SES), education is particularly important because it has the strongest

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relationship to health and is generally established earlier in the life course (Mirowsky and Ross 2003).

Despite the importance of health behaviors for health and longevity and the strong associations between education, health behaviors, and health, the field has made little progress in understanding the sources of disparities in health behaviors. Indeed, the topic raises key questions about how educational attainment in general and college degrees in particular translate into such critically important health and health behavior advantages. It is not clear if the effects of education are causal and, if they are, how they translate into healthy behavior. This study addresses these important gaps. First, I test for the causal effects of education on health behavior. Second, I examine how and why education confers broad benefits. I seek to determine whether college graduates behave more healthfully than individuals who are less educated because of differences prior to college or whether they gain new advantages with college degree attainment, and if the latter, what types of resources college graduates accrue that can account for healthier behavior.

BACKGROUND

Prior Research

Educational disparities in health behaviors are well documented: more educated individuals are less likely to smoke, more likely to engage in physical activity, and more likely to have a good diet (Centers for Disease Control 2013; Cutler and Lleras-Muney 2010; Margerison-Zilko and Cubbin 2013). The relationship exists across the range of educational degrees; more education is associated with healthier behaviors. For example, Pampel and colleagues (2010) report that, compared to adults with college degrees, those with some college education, a high school diploma, or no high school diploma have 2.3, 2.7, and 3.7 higher odds of being a current smoker, respectively.

Yet, the division between those with and without college degrees appears particularly wide. College degrees are qualitatively different from lower levels of attainment in a number of key ways. As Stevens, Armstrong, and Arum (2008) note, college sorts and stratifies individuals, develops social competencies, legitimizes official knowledge, and connects multiple institutions, such as the labor market, the family, and the nation-state. In addition to better health outcomes, college graduates display an increased likelihood of marriage, more tolerant social values, improved income and wealth accumulation, more stable and rewarding employment, a higher level of happiness, and greater civic engagement (Hout 2012). Generally, college degrees confer rewards, prestige, and respect in social life.

The strong, consistent associations demonstrating that highly educated individuals behave more healthfully could, however, emerge because college graduates are the kind of people who also behave healthfully. In other words, there could be "selection bias," because a select group of individuals attain higher education. Selection bias could be the result of important confounding influences, such as family socioeconomic background or personality traits. For instance, individuals who come from the highest quartile of household income are eight times more likely to attain a college degree than those in the lowest quartile (Cahalan and Perna 2015), and household income during the early life course may also shape health behaviors in young adulthood.

While selection bias offers a competing explanation for the effect of education on health behavior, disagreement persists on the extent to which preexisting differences account for this association. Few studies have tested if or how much of education's effects on health behaviors is due to selection, likely because such tests require special data and methods. Studies examining this question often use nonrepresentative samples, such as identical twins (Webbink, Martin, and Visscher 2010); others sample from a limited geographic area (Gilman et al. 2008) or use data sets on older cohorts (de Walque 2007). Results from these studies generally conclude that education has a causal effect on health behaviors (Conti and Heckman 2010; de Walque 2007), but those looking at siblings or twins often find attenuated or nonexistent effects (Gilman et al. 2008; Webbink et al. 2010). Recently, research has demonstrated that adolescence shapes later health behavior (Frech 2012) and that smoking emerges well before college attendance (Andersson and Maralani 2015; Maralani 2014), suggesting that the strong association between education and smoking may be spurious. The need for stronger tests of the selection hypothesis remains.

If the effects of education are real, then researchers also need to establish the mechanisms that might account for education's influence. An important gap in the research literature remains here as well. In support of the argument that education leads to healthier behaviors, scholars have offered a number of mechanisms as possibilities, including greater financial resources, healthier occupational

characteristics, improved cognitive abilities, enhanced psychological resources, and increased social capital (Cutler and Lleras-Muney 2010; Mirowsky and Ross 2003; Pampel et al. 2010). Despite the number of likely mechanisms, research has only begun to understand their respective contributions to the education–health behavior relationship. Cutler and Lleras-Muney (2010) provide the best study to date on the subject. They report that economic resources account for 30% of the relationship between educational attainment and health behaviors; knowledge and cognitive abilities account for 30%; social networks, 10%; and personality and taste, 0%. Altogether, their measures account for about 60% to 80% of the education gradient. Yet, the study has a number of limitations. The authors use multiple data sets (with different ages and cohorts), limit their sample to white adults, and do not examine any occupational measures. Additionally, the personality mechanisms are drawn from a range of life course stages, complicating the conclusions of whether they are mechanisms or confounding influences (Conti and Hansman 2013).

Theoretical Framework

Two opposing perspectives may explain the sources of education's strong association with health behaviors. One highlights the role of education in reproducing inequality across generations (social reproductionism), and the other focuses on education as the key to upward mobility (transformative theory).

Social reproductionism emphasizes how education allows individuals from high-status families to maintain their position. The illusion of meritocracy may justify social inequality, as employers use educational attainment to exclude individuals because of their social class, not because attainment reflects skills critical for employment (Berg 1971; Collins 1979). Teachers, staff, and administrators identify students from families with higher SES and offer them enhanced challenges and opportunities (Bourdieu and Passeron [1970] 1977). In contrast, students with working-class backgrounds receive education that prepares them for working-class jobs (Bowles and Gintis 1976, 2002; Willis 1977). Thus, individuals of higher social status continue in school and receive credentials that, rather than reflecting important skills learned in school, signify social class membership.

In contrast, *transformative theory* considers the positive functions of education in society. Rooted in a functionalist paradigm, this view uses a meritocratic rationale to explain social inequality, arguing that the social hierarchy results from variations in individual skills and qualifications (e.g., Davis and Moore 1945). The abilities, knowledge, and resources acquired through education allow individuals to enter more prestigious occupations and achieve higher incomes. This perspective is reflected in human capital theory, which argues that individuals acquire resources through education that yield higher income (Becker 1964). *Human capital* therefore refers to those skills and abilities that, through education, become embodied resources. Mirowsky and Ross (2003) apply human capital theory in describing how education imparts skills that are particularly important for health, such as a sense of mastery and personal control.

A causal effect of education on health behavior does not necessarily indicate that human capital is the mechanism through which education shapes health behaviors. It may be that there are mechanisms unrelated to the skills and abilities taught in school. For example, higher education may lead individuals to identify with a higher social position and want to set themselves apart from others through the adoption of health behaviors (Cockerham 2005). In this case, social distinction follows rather than precedes education (Bourdieu 1984). Just as consumption patterns signal to others one's social status (Veblen 1899), health behaviors can also communicate such signals. For instance, listening to classical music is associated with lower levels of smoking (Pampel 2006). Social distinction is influenced by college degrees but is not the result of skills and abilities learned through education as posited by human capital theory. Rather, it corresponds with a version of transformative theory that is broader than human capital theory.

I test for the explanatory power of different sets of resources that may provide insight into whether transformation is due to human capital or other mechanisms. If college graduates attain a set of skills and other resources that account for most or all of the effects of college degrees on health behavior, then a human capital perspective receives support. Mechanisms generally (though not definitively) falling under a human capital approach are financial, occupational, social, and cognitive/psychological resources.

Perhaps the most obvious explanation is that financial resources can support a healthy lifestyle. Individuals with higher educational attainment, and college degrees in particular, have higher personal earnings and total family income (Hout 2012).

College degrees facilitate access to higher-paying employment. Higher education also improves one's likelihood of marrying an individual of higher SES (Schwartz and Mare 2005) and can enhance one's financial literacy and skills. Economic assets can be used to buy better health behaviors. For example, gym memberships, smoking cessation aids, and weight loss programs can be purchased to improve health behavior. But education also enhances other economic benefits beyond income that may improve health behavior (Pampel et al. 2010). Health insurance benefits can promote healthier behaviors, such as treatment for tobacco dependency (Manley et al. 2003).

Employment and occupation may also facilitate healthier behaviors. College graduates are more likely to be employed and work in professional and managerial jobs (Hout 2012). Occupational status may capture norms and "class" in a way that financial resources cannot. Additionally, different jobs may confer advantages or disadvantages for health behaviors. For example, there may be workplace rules for when and where employees can smoke, and designated areas for smoking may be far from an office desk, whereas workers can smoke frequently on construction sites. Jobs also may require differential demands and effort while offering differential control and rewards for workers, which have important consequences for health behavior (Krueger and Burgard 2011; Mirowsky and Ross 2003).

Education also increases cognitive resources that can aid in acquiring health-related knowledge and in making healthy decisions. Cognitive resources include awareness of health benefits and risks and the ability to translate information and technology to improve health. Knowledge of the health consequences of different behaviors has historically been an important contributor to educational disparities in health behaviors. In today's society, however, awareness of the consequences of smoking and obesity are near universal (Link 2008; Winston et al. 2014), and thus, this type of knowledge appears inadequate to account for educational differences in these behaviors. Information and access to technology about ways to maintain health or become healthy may be more relevant for today's health behavior disparities.

Other skills, which can be called noncognitive traits or psychological resources, are developed through education and can help individuals practice healthier behaviors. These qualities include conscientiousness, self-efficacy, and other competencies that help individuals identify and achieve goals. As Mirowsky and Ross (2003) note, "Education develops the learned effectiveness that enables self-direction toward any and all values sought, including health" (p. 1). Individuals who are more educated view outcomes as contingent on their choices and action, which encourages and enables healthier behaviors.

Social resources, the benefits one gets through relationships with others in one's family or community, also provide a mechanism for education to shape health behaviors. First, education can improve behaviors through social support. Having social ties can reduce stress, improve mental health, and increase personal control, all of which may lead to healthier behaviors (Umberson, Crosnoe, and Reczek 2010). For instance, married men and women have healthier habits than those who are never married, divorced/separated, or widowed (Waite and Gallagher 2002). Second, behaviors spread through social networks, and a healthy social network can have positive effects on one's health behaviors (or conversely, an unhealthy network can result in negative effects; Christakis and Fowler 2007, 2008). College graduates are more likely to get and stay married, have social ties through civic life, and connect with other highly educated individuals (Hout 2012).

Hypotheses

Hypothesis 1: College degree attainment transforms individuals into behaving more healthfully (transformative theory) than those who are less educated.

I estimate the causal effects of college degree attainment on health behavior to evaluate this hypothesis. A strong, positive average causal effect of college degree attainment on health behavior indicates that health behaviors improve because of education, supporting the transformative perspective. Conversely, a weak or near-zero average causal effect demonstrates that observed associations merely signal prior differences (captured through adjustments for selection into college degrees) and are not caused by education, supporting social reproductionism.

Hypothesis 2: College graduates have greater financial, occupational, social, and cognitive/psychological resources than those with lower educational attainment, which allows them to behave more healthfully (human capital theory).

I conduct mediation analysis to test this hypothesis. If resources account for a substantial portion of the effects of college degrees on health behavior, a human capital approach to education is supported. If resources do not account for the effects of college degree attainment on health behavior, then a transformative theory highlighting nonresource mechanisms is supported.

DATA AND METHODS

Data

I used the National Longitudinal Study of Adolescent to Adult Health (Add Health). Add Health first collected data on 20,745 adolescents ages 11 to 18 in 1994–1995 and then conducted follow-ups in 1996, 2001, and 2007–2008. This study used respondent interviews at Waves I and IV. Of the 15,701 individuals who participated in Wave IV, 14,796 had a valid non-zero Wave IV weight and valid data on college degree attainment. An additional 531 women were omitted because they were or might have been pregnant at the time of the Wave IV interview, leaving a sample of 14,265 respondents.[1]

Add Health is well suited for this study because it is recent, is nationally representative, and offers detail on education, health behaviors, and potential mechanisms. The Add Health cohort is uniquely positioned to offer insight into current relationships between education and health behavior. Reaching 18 years of age around the turn of the twenty-first century, the Add Health participants reflect recent increases in educational attainment, and college degree attainment in particular. Importantly, detailed information collected during adolescence effectively captures selection into degree attainment. The data set covers the ideal age range, since it includes adolescent background factors that influence college degree attainment and health behaviors in young adulthood. Additionally, health behaviors in young adulthood are more consistent than earlier life course stages.

Measures

Dependent variables. All health behavior measures were taken from Wave IV. They include measures of smoking, obesity, physical activity, and nutrition. I focused on these measures because they contribute most notably to mortality and morbidity (Mokdad et al. 2004). There were many other health behaviors available in the survey, such as alcohol consumption and the use of sunscreen, seatbelts, and smoke detectors, but these behaviors have smaller effects on overall health.

Smoking was operationalized as a dichotomous measure of having smoked at all (or not) in the past 30 days.[2] Obesity was operationalized using a dichotomous indicator of obesity (≥30 body mass index [BMI]). Field interviewers measured height and weight used to calculate BMI (kg/m^2).[3]

Physical activity was operationalized through the sum total of items reported in response to questions asking the number of times (from zero to seven or more times) in the past seven days individuals participated in seven categories of activities, such as bicycling, skiing, sports participation, or walking for exercise. I summed the number of activities over the week for a continuous measure of activity with a range of 0 to 49.

Sugar-sweetened beverage and fast-food consumption represented two measures of nutrition. Sugar-sweetened beverage consumption was the number of sweetened drinks the respondent reported drinking in the past seven days. Add Health allowed respondents to report up to 99 drinks, and I recoded the measure to top-code at 40 drinks (<5% of the sample). Fast-food consumption was the number of times the respondent ate at a fast-food restaurant in the past seven days. Respondents reported up to 99 times, and I top-coded the measure at 21 times (<1% of the sample).

Independent variables. College degree attainment was measured with an Add Health–constructed variable taken from the Wave IV interview question asking about highest educational attainment. This dichotomous variable indicated whether or not individuals earned a four-year college degree. In Wave IV, individuals were young adults, or ages 24 to 32. Supplemental analyses examined whether results were sensitive to the age range of respondents.

A range of parent, school, and respondent information collected at Wave I (ages 11 to 18) informed the likelihood of college degree attainment or selection. A list of these variables is provided in Table 1. Except age at Wave IV, all variables were taken from Wave I.

Potential mechanisms for the relationship between college degree attainment and health behaviors were taken from respondent interviews in Wave IV (concurrent with health behavior outcomes) and included measures of financial resources, occupational characteristics, social relations, cognition, and psychological resources. Although measured in the same wave as the mechanisms, completion of education likely occurred several years earlier for most of the subjects,

Table 1. Covariates Used to Inform Likelihood of College Degree Attainment.

Female	Getting along with students scale
Vocabulary score	College expectations scale
Disabled	Desire for college attendance scale
Household smoker	Expectations to live to 35 scale
Parent heavy episodic drinking	Expectations killed by 21 scale
Parent receiving public assistance	Protective factors scale
Parent educational attainment	Depressive symptoms scale
Parent smoker	Ever had sex
Wave IV age	Self-rated health
Race-ethnicity	How often missed school
U.S. born	Smoking status
Mom is professional	Number of close friends that smoke
Dad is professional	Body mass index
Income-to-needs ratio	Alcohol consumption
Social control scale	Days in past year drunk/high
Parent–child closeness scale	Number of close friends that drink
Parent disappointment for child not graduating college	Physical activities in past week
Household size	Visited dentist within past year
Ever repeated grade	Vegetable consumption
Ever suspended	Sweet snack consumption
Ever expelled	How often wears seatbelt
Ever truant	Usually gets enough sleep
Scale of grades	Screen time hours
School integration scale	Delinquent behaviors scale
Getting along with teachers scale	Religious attendance scale
Problem with attention scale	Religious importance scale
Problems with homework scale	Perceived neighborhood quality scale

Source: National Longitudinal Study of Adolescent to Adult Health Waves I and IV.
Note: All covariates are from Wave I, except age at Wave IV.

temporally preceding the resource measures. But the concurrent measurement of mechanisms and health behavior outcomes leaves open the possibility of reverse causality, and associations could overstate the extent to which mechanisms lead to health behaviors. Cognition was not captured in Wave IV, so I used a Wave III measure as a proxy. These limitations prevent strong causal conclusions with regard to mediation. Nonetheless, estimating the role of these mechanisms among young adults contributes to our understanding of the college degree–health behavior relationship.

Household income-to-needs ratio, personal earnings, home ownership, debt-to-assets ratio, number of financial hardships, and health insurance constituted financial resources. I calculated household income to needs as the ratio of the reported total household income to the household size–specific poverty threshold given in 2007 by the U.S. Census Bureau. Total household income included all sources of income from all household members who contribute to the household budget and was recoded to the midpoint of each of the categories, except the top code of $150,000+, which was recoded to $200,000. Personal earnings was a continuous measure that included all income that the respondent earned before taxes. For those who responded that they did not know how much they earned, a categorical question captured their best guess of personal income. Home ownership was a dichotomous variable representing whether the respondent or his or her spouse owned or was buying his or her residence.

A categorical measure indicated whether respondents would have something left over, break even, or be in debt (referent) if they sold all major possessions, cashed in investments and other assets, and paid off all debts. The number of financial hardships was a count of six different hardships in the past 12 months, such as eviction or loss of

utilities due to nonpayment. Last, a dichotomous measure captured whether respondents reported no health insurance (coded 1) or some type of health insurance coverage (coded 0).

Employment status, job satisfaction, and personal efficacy at work constituted occupational resources. I categorized employment status as higher-status employment, lower-status employment, and unemployed/not in labor force. Unemployed/not in labor force included those responding that they do not work for pay for at least 10 hours a week and those who were incarcerated during the interview.[4] Higher-status employment included working at least 10 hours a week in jobs such as managers, engineers, or teachers (prefixes 11 to 29 using the Standard Occupational Classification System). Lower-status employment included active-duty military personnel and those working 10 or more hours per week in jobs such as orderlies or machinists (prefixes 31 to 55 using the Standard Occupational Classification System). There was a small number of individuals ($n = 241$) who had never worked 10 hours a week and were missing for these measures (whose values were later imputed). Job satisfaction was represented with a five-point scale of responses to the question, "How satisfied are you with the job, as a whole?" Personal efficacy at work was the average of three items asking about decision making, doing the same thing repeatedly, and employee supervision.

Social resources included marital status, number of close friends, religiosity, and volunteerism. Marital status was a dichotomous indicator of whether the respondent was married or not.[5] Respondents reported the number of close friends they had, and the categorical responses were recoded to the midpoint to make a continuous measure. I created a scale of religiosity through averaging responses on the importance of religious faith to the respondent and how often the respondent attended religious services. A dichotomous variable indicated if the respondent volunteered or did community service work in the previous 12 months, with incarcerated individuals coded as not having volunteered.

Cognition was measured using a Wave III picture vocabulary test. A percentile rank score from this test represented individual performance. Psychological resources included scales for mastery, perceived stress, and depressive symptoms.[6] The Add Health–constructed mastery scale operationalized an individual's sense of control based on how much respondents agreed with five statements about their sense of control. Add Health also created a constructed variable for Cohen's Perceived Stress Scale that combined responses to four questions about how individuals felt about how things were going during the past 30 days. Last, I used the short form of the Center for Epidemiological Studies Depression Scale (CES-D) to measure respondents' depressive symptoms. This Add Health–constructed variable combined responses to five questions, such as how often the respondent felt sad or could not shake the blues.

Analytic Approach

The analysis used regression models with propensity scores to account for selection into educational attainment. As mentioned in the introduction, those attaining college degrees differ from those who do not in important ways. Whereas standard regression models account for preexisting differences using control variables, collinearity prevents adjustment on many factors. Additionally, standard regression models using control variables yield average differences across the sample, which may not apply to some individuals, such as those who have a zero (or near-zero) probability of attaining a college degree. In contrast, propensity score methods allow for adjustment across a large number of factors and focuses the analysis on those who are comparable. A propensity score approach, however, is also limited. Notably, propensity score methods assume that there are no unobserved factors shaping selection, known as the ignorability assumption. But a randomized controlled trial assigning college degrees is neither practical nor ethical. The data are well suited for propensity scores, because I included a very large number of variables collected during adolescence that help shape degree attainment. Thus, a propensity score approach improved on associational methods.

I first documented health behavior differences between college graduates and those with less education. I then used propensity scores in inverse probability–weighted (IPW) regression models to account for selection into college degree attainment and estimate causal effects. IPW regression models weighted individuals according to the inverse probability of the treatment condition that occurred (college degree attainment or not).[7]

To determine which mechanisms accounted for the college degree–health behavior relationships, I used the mediation model as outlined in Baron and Kenny (1986), which identified four mediation criteria. The independent variable of interest (college degree or not) needs to be a significant predictor of the outcome (criterion 1) and the mediator

Table 2. Unadjusted Descriptive Statistics of Health Behavior Outcomes across College Degree Attainment (U.S. Young Adults Ages 24–32; *N* = 14,265).

Variable	Range	Full Sample	College Degree	No College Degree
Current smoker	0–1	.36	.19	.44
Obese	0–1	.37	.27	.42
Number of physical activities	0–49	6.40	6.85	6.19
Sugary beverages	0–40	11.10	7.43	12.81
Fast food	0–21	2.39	1.77	2.67

Source: National Longitudinal Study of Adolescent to Adult Health Wave IV.

examined (criterion 2). Second, models should compare the effect of the independent variable of interest (college degree or not) in two models, one excluding and one including the mechanism variable. If the effect of college degrees is reduced in magnitude in the model including the mechanism (criteria 3) and the mechanism variable is significant (criterion 4), then mediation is identified.

The selection model considered selection into college degrees, not into the different mechanisms. Thus, one cannot consider the mediators to be "causal" in this framework because there are likely confounders shaping both mediators and outcomes (and that are different than those for college degree attainment). Because I was concerned with the mediation more than the effects of these mechanisms on the outcome, however, this was not a critical limitation.

I conducted the IPW approach in two steps, separating the propensity score estimation and the weighted regression. This allowed me to adjust the regression model for continuous and dichotomous outcomes, account for missingness with multiple imputation, and incorporate mechanism variables.[8]

To retain the full sample, I used multiple imputation with a Markov chain Monte Carlo approach to create 10 data sets. All dependent and independent variables were used to inform the imputation model, and auxiliary variables (high school earnings and two biological parents at Wave I) were also incorporated. The percentage of imputed values ranged from 0% to 20% across the variables, with an average of 2.1% missing across the variables.

RESULTS

Table 2 displays the means for each health behavior for the sample and as a whole, and by college degree attainment. Overall, those with a college degree have healthier behaviors than those who do not have this degree. More than twice as many young adults without a college degree currently smoke compared to those with a degree. College graduates are far less likely to be obese compared to those with less education. Degree holders exhibit significantly more physical activity, drink fewer sugar-sweetened beverages, and eat fast food less often than those with lower educational attainment.

I now turn to IPW models that use propensity scores to account for selection into college degree attainment.[9] I retained the nonsignificant variables because they still contribute to the model and because overfitting these models improves propensity score results (Lunceford and Davidian 2004). However, because this model is likely overfitted, individual coefficients should not be interpreted. Importantly, this model produces a predicted probability of college degree attainment for each individual, which is his or her propensity score. The propensity scores appear to capture selection very well, because the means of the variables predicting college degree attainment are much more similar when individuals are matched via their propensity scores.[10] I created probability weights through calculating the inverse probability of the treatment condition (degree attainment or not) that occurred. A small number of individuals (<1%) had very high weights that were top-coded at 14. Of these individuals, most (n = 133) displayed low propensities of attaining a college degree but went on to earn such a degree; fewer (n = 7) had very high propensity scores but did not earn the degree.

Table 3 presents the adjusted effects of college degree attainment on health behaviors. The table shows the coefficients from regression models incorporating the probability weights and predicting each of the health behavior outcomes. I compared these adjusted effects to unadjusted effects created from the same models that exclude the probability weights and present the reduction in the difference in the right column. For all health behaviors, college degree

Table 3. Coefficients Representing the Effects of College Degree Attainment on Health Behavior Outcomes in Young Adulthood (N = 14,265).

Variable	Unadjusted Effect	IPW Adjusted Effect	Reduction in Effect
Logistic regression coefficients			
Smoking	−1.18***	−.90***	23.7%
Obesity	−.63***	−.29***	54.0%
OLS regression coefficients			
Number of physical activities	.66***	.71***	−7.6%
Sugary beverages	−5.38***	−3.98***	26.0%
Fast food	−.90***	−.55***	38.9%

Source: National Longitudinal Study of Adolescent to Adult Health Waves I and IV.
Note: Each effect is from a separate model predicting the health behavior. IPW adjusted effects use inverse probability weighting to account for selection. IPW = inverse probability–weighted; OLS = ordinary least squares.
***p < .001 (two tailed).

attainment has a significant effect after accounting for selection. The effects are largest for smoking (odds ratio [OR] = .41) and sugar-sweetened beverage consumption (Cohen's d = –.37) and smaller for fast food (Cohen's d = –.20), obesity (OR =.75), and physical activity (Cohen's d = .12). Accounting for selection clearly reduces the effect of college degree attainment on all outcomes except physical activity. On the other hand, over one half of the association between college degree attainment and obesity is accounted for through selection into college degrees. Fast food, sugary beverages, and smoking demonstrate smaller reductions. However, most importantly, these causal estimates display that college degree attainment has strong effects beyond selection.

Turning to the mediation models, Table 4 shows descriptive statistics for each of the potential mechanisms. Most individuals have more assets than debt (60%), most have health insurance (79%), and most are employed (82% in higher- or lower-status occupations). About two fifths of individuals are married, and over one third volunteer. Looking at the means of these mechanisms by degree attainment, those with college degrees have greater financial, occupational, social, and cognitive/psychological resources compared to those without. For example, 9% of college graduates have no health insurance, while 27% of those less educated are without coverage. A notable exception is marital status, as similar proportions of graduates and nongraduates are married. The far-right column of Table 4 displays the results of ordinary least squares and logistic regression models accounting for selection through IPW. Each row shows the relationship between college degrees with that independent variable. Similar to the patterns in the descriptive statistics, college degrees significantly predict most of the mediators except for marital status. Because one of the mediation criteria is whether college degree attainment is significantly related to each mediator, I no longer consider marital status as a potential mediator.

Table 5 presents coefficients and significance levels for the effects of college degree attainment on health behavior before and after including different groups of mechanisms.[11] All models account for selection through IPW, so the coefficients for college degree attainment in the base model indicate the health behavior advantage for graduates net of preexisting differences. I then compared this coefficient to the college degree coefficients in the subsequent models, each of which include a different group of mechanisms. I used Wald tests to evaluate whether each group of mechanisms was significant, though all but one (occupational mechanisms predicting obesity) were significant. The final model includes all mechanisms.

For smoking, college degree attainment has a coefficient of –.90 in the base model and –.61 in the model including all mechanisms, resulting in a reduction of the effect of college degrees by 32%. Of the groups of mechanisms, financial resources reduces the college degree effect the most (18% reduction), followed by occupational variables (13%). Social and cognitive/psychological mechanisms have minimal effects. After considering selection into college degrees and all mechanisms, the effect of college degree attainment on smoking remains surprisingly strong (OR = .54).

For obesity, financial resources also displays the strongest mediation (24% reduction), followed by occupation and cognitive/psychological resources.

Table 4. Unadjusted Means of Resources and College Degree Attainment Effects on Resources (N = 14,265).

Variable	Means			Coefficients and Significance of College Degree (vs. Not) Predicting Each Resource
	Full Sample	College Degree	No College Degree	
Financial				
Household income-to-needs (0–19)	3.82	5.38	3.09	1.52***
Personal earnings (0–1,000,000)	35,168	47,554	29,407	13,856***
Home ownership	.40	.47	.37	.28***
Debt–assets				
Some left over	.61	.65	.58	referent
Even	.18	.13	.21	−.31***
Left with debt	.21	.22	.21	.15**
Number of financial hardships (0–6)	.51	.17	.66	−.37***
No health insurance	.21	.09	.27	−.93***
Occupational				
Employment				
Higher status	.33	.63	.19	−1.22***
Lower status	.49	.25	.60	−.55***
Unemployed/not in labor force	.18	.12	.21	referent
Job satisfaction (1–6)	2.15	2.07	2.19	−.08**
Personal efficacy at work (–2.1–1.3)	.00	−.20	.09	−.21***
Social				
Married	.42	.42	.41	−.00
Number of close friends (0–10)	4.44	5.24	4.06	.72***
Religiosity (–1.6–1.6)	−.01	.05	−.04	.10***
Volunteers	.36	.53	.28	.73***
Cognitive/psychological				
Vocabulary score (0–100)	50.18	65.08	43.24	8.97***
Mastery scale (5–25)	19.47	20.30	19.08	.84***
Perceived stress (0–16)	4.84	4.17	5.16	−.75***
CES-D (0–15)	2.61	2.09	2.85	−.55***
Diet/activity				
Number of activities (0–49)	6.39	6.85	6.19	.71***
Sugary beverages (0–40)	11.10	7.43	12.81	−3.98***
Fast food (0–21)	2.39	1.77	2.67	−.55***

Source: National Longitudinal Study of Adolescent to Adult Health Waves I, III, and IV.
Note: Ranges for continuous variables given in parentheses. College degree effects are from ordinary least squares, logistic, and multinomial regression models controlling for selection with inverse probability weighting. CES-D = Center for Epidemiological Studies Depression Scale.
**$p < .01$, ***$p < .001$ (two tailed).

Surprisingly, the effect of college degrees increases when social resources and diet/exercise are included. Including all of the mechanisms results in a modest reduction (24%) in the effect of college degree attainment on obesity.

Number of physical activities displays an interesting pattern, as over half of the effect of college degree attainment on this outcome is accounted for by social resources. The full results of this model show fairly strong effects for number of friends

Table 5. Effects of College Degree Attainment on Health Behaviors, Accounting for Selection through Inverse Probability Weighting (N = 14,265).

	Base	Base + Financial	Base + Occupation	Base + Social	Base + Cognitive/ Psychological	Base + Diet/ Exercise	Base + All
Logistic regression							
Smoking	−.90***	−.74***	−.78**	−.85***	−.85***		−.61*
Obesity	−.29***	−.22***	−.25***	−.31***	−.25***	−.30***	−.22**
OLS regression							
Number of physical activities	.71***	.56**	.63***	.32*	.55**		.37*
Sugary beverages	−3.98***	−3.12***	−3.38***	−3.62***	−3.60***		−2.42***
Fast food	−.55***	−.44***	−.48***	−.50***	−.38		−.30***

Source: National Longitudinal Study of Adolescent to Adult Health Waves I, III, and IV. OLS = ordinary least squares.
*p < .05, **p < .01, ***p < .001 (two tailed).

(b = .20) and volunteerism (b = 1.48).[12] It may be that these variables capture an overall active lifestyle that includes both social and physical activities. Cognitive/psychological, financial, and occupational mechanisms each reduce the effect of college degrees on physical activity. When all variables are considered together, however, the college degree effect is stronger than in the model including social resources, suggesting that there is considerable overlap among these mechanisms.

The mediation patterns for the effect of college degree attainment on sugary beverage consumption show similar patterns as smoking. Financial variables explain the most (22%), followed by occupation (15%), cognitive/psychological (10%), and social (9%) resources. Together, these variables explain just under 40% of the effect of college degrees. In contrast, the effect of college degree attainment on fast-food consumption is most strongly mediated by cognitive/psychological resources (31% reduction), followed by financial, occupational, and social resources. Together, these mechanisms explain 46% of the effect of college degree attainment on fast food consumption, net of selection.

The results reveal different patterns in the types of mechanisms accounting for college degree effects on the different outcomes, but financial resources accounted for the largest portion of the relationship across outcomes. Importantly, the effects of college degree attainment remain significant for all health behaviors even after controlling for all of the mechanisms and accounting for selection. Although the effects have been reduced substantially from the observed associations, there is much left unexplained.

Sensitivity Analyses

Results from similar models that do not employ multiple imputation and that use propensity score matching rather than IPW are remarkably similar, suggesting the findings are robust to specifications.[13] To determine the sensitivity of the results to the recoding of those individuals with exceptionally high inverse probability weights, I conducted additional analyses omitting these individuals. The results of these analyses show similar patterns, but the adjusted effects of college degree attainment are slightly larger without these individuals. If instead of omitting those with high weights, I restrict the sample to those within the range of "common support" (i.e., have propensities not less than the minimum and not greater than the maximum of the opposite treatment condition), the results are nearly identical to those presented here.

Further analysis determined whether findings are sensitive to the threshold of education. Health behaviors generally have a linear relationship with educational attainment such that the more education one attains, the healthier one behaves. However, the largest discrepancies in behaviors are observed at the college degree threshold; using some college experience rather than a four-year degree generally results in similar patterns but smaller effects. I also assessed whether findings are sensitive to respondents who had not achieved a college degree but were in school at Wave IV. Excluding these individuals (approximately 1,600) produced results with nearly identical patterns to those presented here, though the overall effects of college degree attainment are smaller. Models examining only older individuals (ages 26 to 32 or 28 to 32) also produced very similar patterns but

with effect sizes slightly larger to those presented here. Last, I determined the extent to which those individuals who do not graduate high school affect the findings. Models omitting these 1,112 individuals produced similar patterns. Effect sizes were slightly smaller, and mechanisms generally explained slightly smaller proportions. Overall, these extensive sensitivity analyses support the substantive conclusions presented here.

DISCUSSION

This analysis shows that college degree attainment has a causal influence on improving the health behaviors of U.S. young adults. That is, college degree attainment captures more than simply selection of those who are already prone to healthy behavior. Accounting for selection into college degrees substantially reduced the observed associations, however, suggesting that degrees also reflect important prior differences. For each health behavior except physical activity, the college degree effect was smaller after controlling for likelihood to attain a college degree. The average percentage reduction across outcomes was 27%, with the largest reduction observed for obesity (54%). For other outcomes, the effects of college completion appear dominant. The discrepancy in relative contributions of selection to the college degree advantage across obesity and smoking is particularly interesting. Given that problems of obesity have emerged more recently than smoking, the longer and richer history on smoking disparities may have disproportionately shaped our understanding of health behaviors. Further research comparing life course processes in the education gap for these two outcomes may shed light on how selection and causation together produce health behavior disparities.

These results confirm prior research demonstrating both the importance of educational attainment and prior characteristics that shape both education and health behaviors. Other studies have shown the importance of earlier health behaviors for both educational attainment and later health behaviors (i.e., Andersson and Maralani 2015; Maralani 2014; Pudrovska, Logan, and Richman 2014). Although I do not interpret the model predicting college degree attainment from adolescent characteristics, the results demonstrate that earlier health behaviors are positively associated with college graduation.[14] These associations support the approach of this study that accounts for health behavior and other early life course differences that differentially shape likelihood of college completion. More generally, the results demonstrate that there are important processes linking college degrees and health behaviors both before and after college graduation.

The study's findings related to the mechanisms underlying the college degree–health behavior relationships were somewhat surprising. As a whole, the mediators explained less than half of the effects of college degrees on any outcome. The mediators did a particularly poor job in accounting for mechanisms related to obesity, as the full model reduced the coefficient for college degrees by less than one quarter. While financial resources was the strongest mediator for smoking, obesity, and fast-food consumption, it explained less than 25% of the effect of college degrees for all outcomes. Cognitive and psychological resources had surprisingly small mediation effects, especially for smoking, as it reduced the effect of college degree attainment only by less than 6%.

Resource mechanisms are limited to the available measures, and more complete measurement could produce greater mediation effects. Variables operationalizing social resources, cognitive/psychological resources, and diet/activity may be particularly limited. Available social resource variables do not offer detailed information on emotional support, which could be an important social resource that college graduates employ. Additionally, stress may be an important social and biological pathway for education's effect (Thoits 2010). A measure of perceived stress is included as a psychological resource, but a more thorough analysis of stressors could yield additional insights. The scale for personal mastery and the abbreviated CES-D scale are likely limited in their representations of efficacy and depressive symptoms more broadly. Diet and exercise did nothing to account for education's effects on obesity, but these measures were unable to get at duration and intensity of physical activity or detailed nutritional indicators. These measurement issues suggest that the results may be interpreted as a lower bound of mediation effects. However, measurement error of independent and dependent variables are not unique to this study, but the mediational effects are still smaller than those presented in other social science research.

The mechanism results diverge from prior research and from Cutler and Lleras-Muney (2010) in particular. In contrast to the results reported here, Cutler and Lleras-Muney find that similar mechanisms explain a higher proportion of the education–health behavior relationship (60% to 80%), knowledge and cognitive ability explain approximately 30% of the relationship, and social networks account for 10%. Compared to their analysis, this

study examines college degree attainment (rather than the full educational gradient), focuses on a more recent cohort in young adulthood, includes a more limited list of health behaviors, and explicitly accounts for selection through propensity scores. Yet, the results here point to occupational measures as important mechanisms; Cutler and Lleras-Muney did not include any occupational measures. Recent research highlights the ability of occupation to capture inequality and "life conditions" better than financial variables (Weeden and Grusky 2012). Future research examining occupation and health behaviors in detail could provide further insight into mechanisms for education's effects.

Both selection and transformation theories were supported, as prior characteristics explained some but not all of the health behavior advantages of college graduates. The transformative power of college degrees appears to be due somewhat to human capital but also to mechanisms other than resources. The education–health behavior relationship thus appears to be complex, going beyond any one theoretical approach. As such, college degree attainment may be characterized as a metamechanism in that it produces multiple mechanisms that, in turn, shape health (and health behaviors; Freese and Lutfey 2011).

Because of this multiplicity of mechanisms, policies and programs intended to reduce health behavior disparities targeting a particular mechanism (or group of mechanisms) will likely achieve little success (Phelan, Link, and Tehranifar 2010). Health behavior disparities may be better addressed through changing upstream influences that promote educational attainment and social equality more generally (Hummer and Hernandez 2013). Additionally, since a substantial portion of the college degree–health behavior relationship is evident in adolescence, policy makers seeking to reduce disparities have incentive to focus earlier in the life course, starting during or before adolescence.

This study has a number of conclusions that can help shape future research efforts studying educational disparities in health behaviors. First, future data collection and analysis should consider how to identify the contributions of nonresource mechanisms to education's effects on health behaviors (Freese and Lutfey 2011). Social skills and distinction may be a way to understand how education shapes preferences that in turn influence behaviors. College graduates report that social skills are one of the most important things they learn in college (Chambliss and Takacs 2014). How to comport oneself and navigate social situations (particularly among other college-educated persons) is a way in which individuals express their social class, and such skills are connected to health behaviors. Yet, it is difficult to measure social skills or conceptualize distinction. Researchers can also incorporate structural factors more explicitly through considering the physical and institutional environments of individuals. A growing body of research is demonstrating the importance of residential location and other settings for health behaviors (e.g., Blok et al. 2013), but to my knowledge no study has developed a comprehensive analysis of the role of physical environment in mediating the effect of education (or SES more broadly) on health behavior. Research highlighting the agentic, dynamic role of institutions in the production of health disparities can further contextualize individual behavior (Freese and Lutfey 2011).

Second, understanding health behavior disparities will require further research to determine the sensitivity of the results to historical context. Using a recent cohort allows for examination of current patterns and processes, but comparing magnitudes of causal, selection, and mediation effects across historical periods may elucidate the structural conditions associated with health behavior disparities.

Third, researchers should identify potential heterogeneity. Examination of differences across race-ethnicity, gender, and nativity status is beyond the scope of this analysis, but there may be important heterogeneity in selection into educational attainment or in returns to degrees. Testing for differences can shed light on how SES intersects with other identities to produce inequality.

Limitations

The conclusions of this study should be interpreted in light of its limitations. First, as described above, mechanisms may be omitted or have measurement error. Second, the study does not use an experimental design. Randomized controlled trials for this topic are impossible, and I must therefore rely on methods designed to estimate causal relationships from observational data. Though propensity score methods are not without weakness, this study improves on prior associational methods through this approach. Third, this study did not consider genetic predispositions to educational attainment. Recent advancements show that individual risk scores for educational attainment developed from genomewide data are in part socially patterned (Domingue et al. 2015). Future research bringing together social and genetic information to

understand the production of educational and social inequalities is promising.

CONCLUSION

The results presented here demonstrate that college degrees both signal prior differences and transform the health behaviors of graduates. Health behavior disparities are therefore the product of social reproduction and positive returns to higher educational attainment. These positive returns are somewhat due to greater resources, such as income, but perhaps to a smaller extent than previous research has postulated. Overall, the healthier behaviors exhibited by college graduates appear to be the result of diverse and complex processes characterized by sorting into educational attainment, embedding of human capital, and mechanisms other than socioeconomic and psychosocial resources.

SUPPLEMENTAL MATERIAL

The appendices are available in the online version of the article.

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NOTES

1. As illustrated in online Appendix A, those who were included in the study sample are significantly more likely to be white (compared to black, Hispanic, or other race-ethnicity), female, and U.S. born compared to those who were omitted due to attrition or other criteria. Those who were omitted had lower vocabulary scores and higher depressive symptoms but also lower body mass index (BMI). Smoking rates did not differ. The analytic approach in this study carefully controls for many sociodemographic and health characteristics that may differ across sample inclusion. Although differential attrition is a concern in any longitudinal health study, the approach mitigates this issue.
2. Analyses using daily smoking (smoking 30 out of the past 30 days) rather than current smoking produced similar results that did not differ substantively.
3. Results examining continuous BMI rather than obesity produced similar results.
4. A small number of individuals in the sample were incarcerated at the time of the Wave IV interview (n = 65). The prison environment likely structures both educational opportunities and health behaviors but cannot be included in the model without knowing when and how long the individual entered prison. Rather than exclude the experiences and contexts of these individuals, I retained them in the sample.
5. I also examined cohabitation but excluded it because it did not differ across college degree attainment.
6. I acknowledge that *psychological resources* is an imprecise term. Others use different terminology to refer to these characteristics, such as "noncognitive" (e.g., Farkas 2003) or "soft skills" (e.g., Heckman and Kautz 2012), but these terms are also imprecise.
7. The result of inverse probability–weighted (IPW) regression models should be the same as matching, assuming that there are no propensity scores equivalent to 0 or 1 (and that the ignorability assumption is met as in matching). Studies find that IPW regression models produce unbiased results (Busso, Dinardo, and McCrary 2009; Lunceford and Davidian 2004). I use IPW rather than matching because the former allows for a flexible regression approach that can easily add in new variables (i.e., mechanisms), whereas the latter does not easily provide a framework for mediation.
8. The Stata package t-effects conducts the IPW approach in one step, combining the propensity score estimation and weighted regression (StataCorp 2013). Coefficients are identical for the two processes, but standard errors are slightly larger when the propensity score estimation and weighted regression are separated.

9. Online Appendix B provides results from the logistic regression model predicting college degree attainment.
10. See online Appendix C.
11. Full results of the models are available in online Appendices D through H.
12. See online Appendix F.
13. See online Appendix I.
14. See online Appendix B.

REFERENCES

Andersson, Matthew A., and Vida Maralani. 2015. "Early-life Characteristics and Educational Disparities in Smoking." *Social Science & Medicine* 144:138–47.

Baron, Reuben M., and David A. Kenny. 1986. "The Moderator–Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations." *Journal of Personality and Social Psychology* 51(6):1173–82.

Becker, Gary S. 1964. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. New York: Columbia University Press.

Berg, Ivar. 1971. *Education and Jobs: The Great Training Robbery*. Boston: Beacon Press.

Blok, David J., Sake J. de Vlas, Pepijn Van Empelen, Jan Hendrik Richardus, and Frank J. van Lenthe. 2013. "Changes in Smoking, Sports Participation and Overweight: Does Neighborhood Prevalence Matter?" *Health & Place* 23:33–38.

Bourdieu, Pierre. 1984. *Distinction: A Social Critique of the Judgement of Taste*. Cambridge: Harvard University Press.

Bourdieu, Pierre, and Jean C. Passeron. [1970] 1977. *Reproduction in Education, Society, and Culture*. Thousand Oaks, CA: Sage.

Bowles, Samuel, and Herbert Gintis. 1976. *Schooling in Capitalist America: Educational Reform and the Contradictions of Economic Life*. New York: Basic Books.

Bowles, Samuel, and Herbert Gintis. 2002. "Schooling in Capitalist America Revisited." *Sociology of Education* 75(1):1–18.

Brunello, Giorgio, Fort Margherita, Schneeweis Nicole, and Winter-Ebmer Rudolf. 2016. "The Causal Effect of Education on Health: What Is the Role of Health Behaviors?" *Health Economics* 25(3):314–36.

Busso, Matias, John E. DiNardo, and Justin McCrary. 2009. "New Evidence on the Finite Sample Properties of Propensity Score Matching and Reweighting Estimators." IZA Discussion Paper No. *3998*. Retrieved April 29, 2015 (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1351162).

Cahalan, Margaret, and Laura Perna. 2015. *Indicators of Higher Education Equity in the United States*. Washington, DC: Pell Institute for the Study of Opportunity in Higher Education.

Centers for Disease Control. 2013. "Adult Participation in Aerobic and Muscle-strengthening Physical Activities—United States, 2011." *Morbidity and Mortality Weekly Report* 62(17):326–30.

Chambliss, Daniel F., and Christopher G. Takacs. 2014. *How College Works*. Cambridge, MA: Harvard University Press.

Christakis, Nicholas A., and James H. Fowler. 2007. "The Spread of Obesity in a Large Social Network over 32 Years." *New England Journal of Medicine* 357(4):370–79.

Christakis, Nicholas A., and James H. Fowler. 2008. "The Collective Dynamics of Smoking in a Large Social Network." *New England Journal of Medicine* 358(21):2249–58.

Cockerham, William. 2005. "Health Lifestyle Theory and the Convergence of Agency and Structure." *Journal of Health and Social Behavior* 46(1):51–67.

Collins, Randall. 1979. *The Credential Society: An Historical Sociology of Education and Stratification*. New York: Academic Press.

Conti, Gabriella, and Christopher Hansman. 2013. "Personality and the Education–Health Gradient: A Note on 'Understanding Differences in Health Behaviors by Education.'" *Journal of Health Economics* 32(2):480–85.

Conti, Gabriella, and James J. Heckman. 2010. "Understanding the Early Origins of the Education–Health Gradient: A Framework That Can Also Be Applied to Analyze Gene–Environment Interactions." *Perspectives on Psychological Science* 5(5):585–605.

Cutler, David, and Adriana Lleras-Muney. 2010. "Understanding Differences in Health Behaviors by Education." *Journal of Health Economics* 29(1):1–28.

Davis, K., and Wilbert E. Moore. 1945. "Some Principles of Stratification." *American Sociological Review* 10(2):242–49.

de Walque, Damien. 2007. "Does Education Affect Smoking Behaviors? Evidence Using the Vietnam Draft as an Instrument for College Education." *Journal of Health Economics* 26(5):877–95.

Domingue, Ben, Dan Belsky, Dalton Conley, Kathleen Harris, and Jason Boardman. 2015. "Polygenic Influence on Educational Attainment." *AERA Open* 1(3):1–13. doi: 10.1177/2332858415599972.

Farkas, George. 2003. "Cognitive Skills and Noncognitive Traits and Behaviors in Stratification Processes." *Annual Review of Sociology* 29:541–62.

Frech, Adrienne. 2012. "Healthy Behavior Trajectories between Adolescence and Young Adulthood." *Advances in Life Course Research* 17(2):59–68.

Freese, Jeremy, and Karen Lutfey. 2011. "Fundamental Causality: Challenges of an Animating Concept for Medical Sociology." Pp. 67–81 in *Handbook of the Sociology of Health, Illness, and Healing*, edited by B. A. Pescosolido, H. K. Martin, J.D. McLeod, and A. Rogers. New York: Springer.

Gilman, Stephen, Laurie Martin, David Abrams, Ichiro Kawachi, Laura Kubzansky, Eric Loucks, Richard Rende, Rima Rudd, and Stephen Buka. 2008. "Educational Attainment and Cigarette Smoking: A Causal Association?" *International Journal of Epidemiology* 37(3):615–24.

Heckman, James J., and Tim Kautz. 2012. "Hard Evidence on Soft Skills." *Labour Economics* 19(4):451–64.

Ho, Jessica Y., and Andrew Fenelon. 2015. "The Contribution of Smoking to Educational Gradients in US Life Expectancy." *Journal of Health and Social Behavior* 56(3):307–22.

Hout, Michael. 2012. "Social and Economic Returns to College Education." *Annual Review of Sociology* 38:379–400.

Hummer, Robert, and Elaine Hernandez. 2013. "The Effect of Educational Attainment on Adult Mortality in the United States." *Population Bulletin* 68(1):1–16.

Krueger, Patrick M., and Sarah A. Burgard. 2011. "Work, Occupation, Income, and Mortality." Pp. 263–88 in *International Handbook of Adult Mortality*, edited by R. G. Rogers and E. M. Crimmins. New York: Springer Science+Business Media.

Link, Bruce G. 2008. "Epidemiological Sociology and the Social Shaping of Population Health." *Journal of Health and Social Behavior* 49(4):367–84.

Lunceford, Jared K., and Marie Davidian. 2004. "Stratification and Weighting via the Propensity Score in Estimation of Causal Treatment Effects: A Comparative Study." *Statistics in Medicine* 23(19):2937–60.

Manley, Marc W., Tom Griffin, Steven S. Foldes, Carolyn C. Link, and Rebecca A. J. Sechrist. 2003. "The Role of Health Plans in Tobacco Control." *Annual Review of Public Health* 24:247–66.

Maralani, Vida. 2014. "Understanding the Links between Education and Smoking." *Social Science Research* 48:20–34.

Margerison-Zilko, Claire, and Catherine Cubbin. 2013. "Socioeconomic Disparities in Tobacco-related Health Outcomes across Race-ethnic Groups in the United States: National Health Interview Survey 2010." *Nicotine & Tobacco Research* 15(6):1161–65.

Mehta, Neil K., James S. House, and Michael R. Elliott. 2015. "Dynamics of Health Behaviours and Socioeconomic Differences in Mortality in the USA." *Journal of Epidemiology and Community Health* 69(5):416–22.

Mirowsky, John, and Catherine Ross. 2003. *Education, Social Status, and Health*. New York: Aldine de Gruyter.

Mokdad, Ali H., James S. Marks, Donna F. Stroup, and Julie L. Gerberding. 2004. "Actual Causes of Death in the United States, 2000." *Journal of the American Medical Association* 291(10):1238–45.

Pampel, Fred C. 2006. "Socioeconomic Distinction, Cultural Tastes, and Cigarette Smoking." *Social Science Quarterly* 87(1):19–35.

Pampel, Fred C., Patrick M. Krueger, and Justin T. Denney. 2010. "Socioeconomic Disparities in Health Behaviors." *Annual Review of Sociology* 36:349–70.

Phelan, Jo C., Bruce G. Link, and Parisa Tehranifar. 2010. "Social Conditions as Fundamental Causes of Health Inequalities: Theory, Evidence, and Policy Implications." *Journal of Health and Social Behavior* 51(S1):S28–40.

Pudrovska, Tetyana, Ellis Scott Logan, and Aliza Richman. 2014. "Early-life Social Origins of Later-life Body Weight: The Role of Socioeconomic Status and Health behaviors over the Life Course." *Social Science Research* 46:59–71.

Schwartz, Christine R., and Robert D. Mare. 2005. "Trends in Educational Assortative Marriage from 1940 to 2003." *Demography* 42(4):621–46.

StataCorp. 2013. *Stata Statistical Software: Release 13*. College Station, TX: Author.

Stevens, Mitchell L., Elizabeth A. Armstrong, and Richard Arum. 2008. "Sieve, Incubator, Temple, Hub: Empirical and Theoretical Advances in the Sociology of Higher Education." *Annual Review of Sociology* 34:127–51.

Thoits, Peggy A. 2010. "Stress and Health: Major Findings and Policy Implications." *Journal of Health and Social Behavior* 51(1):S41–53.

Umberson, Debra, Robert Crosnoe, and Corinne Reczek. 2010. "Social Relationships and Health Behavior across the Life Course." *Annual Review of Sociology* 36:139–57.

Veblen, Thorstein. 1899. *The Theory of the Leisure Class: An Economic Study of Institutions*. New York: MacMillan.

Waite, Linda, and Maggie Gallagher. 2002. *The Case for Marriage: Why Married People Are Happier, Healthier and Better Off Financially*. New York: Broadway Books.

Webbink, Dinand, Nicholas G. Martin, and Peter M. Visscher. 2010. "Does Education Reduce the Probability of Being Overweight?" *Journal of Health Economics* 29(1):29–38.

Weeden, Kim A., and David B. Grusky. 2012. "The Three Worlds of Inequality." *American Journal of Sociology* 117(6):1723–85.

Willis, Paul. 1977. *Learning to Labor: How Working Class Kids Get Working Class Jobs*. New York: Columbia University Press.

Winston, Ginger J., Erica Caesar-Phillips, Janey C. Peterson, Martin T. Wells, Johanna Martinez, Xi Chen, Carla Boutin-Foster, and Mary Charlson. 2014. "Knowledge of the Health Consequences of Obesity among Overweight/Obese Black and Hispanic Adults." *Patient Education and Counseling* 94(1):123–27.

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