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Origins and Destinations, but How Much and When?
Age-Graded Disparities in Health Behaviors by Parental and Own Education Levels

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ABSTRACT

Educational inequalities in health behaviors are well-known, but the timing by and extent to which ascribed versus achieved statuses inform such inequalities are not well-understood. This important process of "switch off" between parental (ascribed, "origin") factors and personally attained (achieved, "destination") factors is embedded in educational disparities in health behaviors. This process unfolds across the life course and is intertwined with other endogenous mechanisms involving economic, cognitive, psychological and social resources across adolescence and adulthood. Drawing on the National Longitudinal Survey of Adolescent and Adult Health, we analyze how age-graded disparities in health behaviors are associated with parental and own education (and their interactions) across the life course. We study these patterns with respect to smoking, obesity, drinking, and physical activity. Our preliminary results show important variability in which resources dominate which parts of the life course and how this differs by age and specific health behavior.

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Higher educational attainment is associated with healthier behaviors or lifestyles (Pampel et al. 2010). While explanations for these educational disparities depend on the behavior studied, candidate mechanisms usually involve some mixture of occupational, financial, cognitive, psychological and social capitals and resources that accumulate in tandem with educational attainment (Cutler and Lleras-Muney 2010; Lawrence 2017). However, a lingering issue for understanding these educational health mechanisms has been that correlated resources are timed and embedded differently across the early life course, some taking root or having effectiveness prior to completing higher or even secondary education.

Early in the life course, parental economic status shapes constraints and opportunities for health and social learning or transmission of health behaviors to children. As the life course progresses, individuals sort into school, work, and peer situations that, overall, tend to diminish or at least change the role of parental factors in shaping personal health (Bauldry et al. 2012; Johnson et al. 2016). Gradients in health behaviors emerge from a confluence of resources associated with familial socioeconomic status, on the one hand, and those accumulated through one's own educational attainment, on the other (e.g., Bauldry et al. 2012, 2016; Boylan et al. 2018; Pampel et al. 2014). The shifting roles of origin and destination resources in shaping health behavior remain to be understood: namely, how parental and personal education independently and together inform health behaviors across the life course.

Another related oversight is possible synergistic effects of educational attainment and parental education, which would be consistent with unequal benefits to higher education by parental background. While these socioeconomic interactions have been studied for income (Brand and Xie 2010) and general mental and physical health (Bauldry 2014, 2015; Ross and Mirowsky 2011; Schaan 2014; Schafer et al. 2013), health behaviors remain overlooked. Health behaviors differ across life course transitions, making them important to study specifically.

In this study, we draw on the National Longitudinal Survey of Adolescent and Adult Health (Add Health) to study the shifting roles of parental and own education in shaping in health behaviors. Because most resources relevant to educational health disparities have parental as well as non-parental or personal contributions, examining age-graded differences will help identify the backdrop against which specific, endogenous mechanisms involving economic, cognitive, psychological and social factors transpire. By considering parental and own educational attainments, as well as their potential interaction in evolving health gradients, we move toward a broader understanding of the pathways connecting education to health.

BACKGROUND

Many population studies find substantial differences in health behaviors by level of education (Lawrence 2017; Pampel et al. 2010). Behaviors cluster into "healthy" or "unhealthy" lifestyles, where healthy lifestyles show substantial differences by educational attainment (e.g., Lawrence et al. 2017). While these educational patterns are well-established, they also show a large amount of variation by behavior, life-course timing, and mechanisms implicated (e.g., Crosnoe and Riegle-Crumb 2007; Maralani 2014; von Hippel and Lynch 2014). For instance, educational differences in body mass are usually more modest than educational differences in smoking. The associations between education and behaviors like smoking and body mass are largely due to selection processes prior to college. These behaviors show varying degrees of association with intra-educational mechanisms (such as classroom sorting, peer networks, school achievement, attachment, and transitions) and with post-educational mechanisms (such as occupational, financial, and social capital) (Carroll et al. 2018a, 2018b; Lawrence 2017; Maralani 2014).

Mechanisms connecting educational attainment to health behaviors vary in their roots in "selection," or dynamics occurring prior to final educational attainment, versus "causation," or factors taking shape after education is presumably completed (Johnson et al. 2016). A second, related, insight across studies is that relevant mechanisms or factors for disparities differ by behavior (Conti and Heckman 2010; Cutler and Lleras-Muney 2010; Lawrence 2017). Circumscribing both these insights, however, is a somewhat incoherent sense of how these behaviors fit into the accumulation of human capital and into a shift from parental to personal resources, both of which gradually occur over the early life course which culminates in transitions to adult roles. In other words, we lack an overarching understanding of how these proximal mechanisms are organized by broad shifts in life-course socioeconomic statuses and by developmental age. Such an understanding would be valuable for understanding the shifting roles of more proximal (endogenous) mechanisms within a life-course framework. Mechanisms shaped distally by parental and/or personal education are likely to include economic, cognitive, psychological and social factors during and after educational attainment, all of which have demonstrated associations with educational disparities in health behaviors.

Observed health disparities reflect combinations of developmental age and parental background (origin) and attained (destination) socioeconomic influences. Age builds in developmental and social transitions. Parental or childhood socioeconomic status, and parental health, show "long arms" to adult health (Daw et al. 2017; Boardman et al. 2012; Montez and Hayward 2011), which operate partly through own health behaviors and educational attainment. Thus far, the literature on changing roles of origin and destination has been restricted to later-life analyses of functional health (e.g., Haas 2008) or general health (e.g., Andersson 2016; Schaan 2014) or to analyses that obscure the changing contributions of socioeconomic origins or destinations (e.g., Pampel et al. 2014; Skalamera and Hummer 2016; Ziol-Guest, Duncan, and Kalil 2009). Other work examines life transitions such as beginning college or sorting into marital, family, or work roles, and how these transitions are linked to changes in health behaviors (e.g., Bauldry et al. 2016; Frech 2014; Miech et al. 2015; Walsemann et al. 2018), but these analyses usually do not reveal age-graded differences in selection or in health behaviors.

In addition to leaving unclear the dynamic associations among origins, destinations, and health behaviors across the early life course, research has yet to consider potential interactions among parental and own education in structuring health behaviors. Generally, research to date has found that higher education is more strongly associated with well-being, income, and networks during adulthood among low-propensity individuals or those from socioeconomically disadvantaged family backgrounds (e.g., Brand and Xie 2010; Schafer et al. 2013). These unequal estimated returns to education suggest that higher education improves adult life chances disproportionately for the underprivileged, in part by compensating for early-life social and economic disadvantages. However, because behaviors are not only embedded in unique developmental trajectories but also shaped by social and work transitions, they may show differing interactions. Schaan (2014) and Andersson (2016) recently found that synergies between parental and own education in structuring general mental and physical health disparities are age-dependent (see also Ross and Mirowsky 2011). Because health behaviors are determinants of general health, any socioeconomic synergies for health behaviors may be age-dependent as well.

OVERVIEW OF THE PRESENT STUDY

Drawing on national longitudinal data (Add Health), we examine inequalities in health behaviors by parental education and personal education across the life course. First, we investigate age-based differences in health behaviors. Then, we examine whether these vary by personal educational attainment, parental education, or both. This provides insight into whether socioeconomic origins and/or destinations show changing links to health behaviors across the early life course. Then, we test for synergies among parental and own education to examine whether health behaviors show patterns of resource substitution or cumulative (dis)advantage previously found for general mental and physical health measures.

DATA AND METHODS

Data for this study come from Waves I, III, and IV of the National Longitudinal Study of Adolescent to Adult Health (Add Health), which was funded by the National Institute of Child Health and Human Development (NICHD). In-depth interviews with 20,745 American adolescents in grades 7 – 12 were conducted at Wave I between April and December 1995 and between April and August 1996. Respondents were selected using a multi-state, stratified, random, school-based cluster sampling procedure. Add Health also collected data on adolescents' parents through a parent questionnaire administered to a residential parent (typically mother) with information on their current partner (typically father). Wave III follow-up interviews were conducted between 2001 and 2002 when respondents were young adults between ages 18-26 with approximately 15,197 of the original respondent surveyed at Wave I. Wave IV interviews were conducted in 2007-2008 when participants were adults aged between 24 and 34 years old and included 15,701 respondents from the original sample. At all three survey waves, interviews were held in the respondents' homes. The analysis sample is restricted to respondents with valid survey weights to account for the sampling design and attrition. About

half (51%) of respondents were male and two-thirds (66%) identified as non-Hispanic white. Sixty-one percent of respondents lived with two biological parents (in Wave I).

Dependent Measures: Health Behaviors

We use four health behavior outcomes from Waves I, III, and IV. They include measures of smoking, alcohol consumption, obesity, and physical activity, and each was dichotomized such that a value of 1 indicates the less healthy form of the behavior.

Current Smoking. The outcome of smoking behavior was operationalized using self-reported smoking in the past 30 days. Respondents were asked whether they had ever smoked cigarettes regularly (at least 1 cigarette a day for 30 consecutive days), and on how many of the last 30 days they smoked cigarettes. These measures were used to construct an indicator for whether respondents were current smokers, which we define as smoking at least 10 cigarettes in the past 30 days (Maralani 2014).

Binge Drinking. Respondents were asked about their alcohol consumption, including how often they consumed five or more alcoholic beverages at one time over the past 12 months. A measure for binge drinking was constructed from responses to this question affirming the respondent drank 5 or more drinks in a row at least 1 or 2 days a week over the past year (Olson, Hummer, and Harris 2017).

Obesity. Field interviewers took measurements of respondents' heights and weights at each wave and these reports were utilized to calculate body mass index (BMI, kg/m^2). Respondents with a BMI ≥ 30 met criteria for obesity and were classified as "obese" (Lawrence 2017).

No Physical Activity. Interviewers also asked respondents about their physical activity habits. Several questions prompted respondents to report how many times (from zero to seven or more) during the past week they participated in several categories of physical activities, such as bicycling, sports, or walking for exercise. Physical inactivity was coded by respondent reports of zero incidences of participation in the past 7 days across the measures of exercise activity (Olson et al. 2017).

Independent Measures

Parent Education. At Wave I, the responding parent reported the education level of both parents on the parent questionnaire, which were used to construct measures with the following response categories: did not graduate from high school, graduated from high school only, attended some college, graduated from four-year college or higher. The maximum level of education was utilized when both were reported, and either was used when one was missing.

Respondent Educational Attainment. Respondents were asked at Wave IV, "What is your high school graduation status?" and "What is the highest level of education that you have achieved to date?" These items were used to construct a measure for educational attainment with the response categories matching those for parent education (did not graduate from high school,

graduated from high school only, attended some college, graduated from four-year college or higher).

PRELIMINARY RESULTS

Parental and Own Education Levels

Approximately 30% of respondents had parents who were college graduates, while 31% had parents with some college education, and 27% had parents who had obtained high school degrees (only 12% of respondents had parents with below a high school education). By Wave IV, 30% of respondents had obtained a college degree, 43% having some college, 20% with a high school degree only, and 7% with less than a high school education.

Health Behavior Trends: High School (Wave I), College (Wave III), Post-College (Wave IV)

At Wave I, respondents were about 15 years old on average. Approximately 15% of adolescents were current smokers at Wave I, 7% engaged in binge drinking at least once per week, one in ten (10%) met the criteria for obesity (BMI > 30), and 5% reported no physical activity.

In Wave III, respondents typically were in their early 20s, and unhealthy behaviors were far more common. The proportion of respondents who were current smokers doubled (32%) as did weekly binge drinking (15%). Obesity quadrupled to 41%, and approximately 19% of young adults in the sample reported no physical activity, or near quadruple.

Wave IV health behavior trends, when respondents averaged about 28 years old, look similar, though prevalences of unhealthy behaviors are slightly lower. Smoking remained similar (30%), as did binge drinking (12%). Obesity (37%) and no physical activity (15%) decreased slightly.

Health Behaviors by Wave (Age) and Parental and Own Education Levels

Figure 1 shows the educational disparities in each health behavior across the Add Health survey waves (values are given in the appendix table).

We show these disparities by parent education and by the respondent's educational attainment (in Wave IV). Both types of education track significantly with all health behaviors at all waves, except for binge drinking at selected waves. However, there is considerable variation in how much and when these educational measures predict differences in health behaviors. This is broadly consistent with differing roles of selection and causation across the life course and across health behaviors.

Smoking and Obesity

For smoking, disparities by parental and respondent educational attainment already are present by approximately age 15 (at Wave 1; Maralani 2014). Slopes essentially run parallel to Wave III

(approximately age 21), consistent with stable disparities and the overwhelming importance of pre-college processes to educational smoking disparities. Meanwhile, smoking disparities by parental education are noticeably weaker, consistent with prior work documenting the importance of school and peer, rather than strictly parental, influences (Andersson and Maralani 2015). Stable smoking prevalence across Waves III and IV (seen in both graphs) reflect relatively slight changes in initiation as well as quitting (Maralani 2013). While the respondent educational gradient follows a well-known negative gradient in smoking, the parental gradient is irregular, with lowest smoking prevalence among respondents with either low (less than high school) or high (college or higher) levels of parental education.

Parental and respondent education track with body mass in highly similar ways, especially during high school and after college. This suggests not only that origins and destinations are both important to body mass differences, but also that obesity, like smoking, is highly based in selection during or prior to high school (von Hippel and Lynch 2014). Body mass disparities remain fairly stable in size from high school (Wave I) to college (Wave III). However, at the same time, college attainment specifically predicts lower prevalence of obesity against all other education levels, which cluster close together. More specifically, respondent educational attainment is especially predictive of not being obese in adulthood; parental college likewise shows a uniquely strong link to body mass against all other parental education levels. These dual findings across parental and respondent educational attainment are broadly consistent with the importance of selection on the one hand and the documented importance of college-linked resources for lowered adulthood risk of obesity net of selection into college (see Lawrence 2017).

Binge Drinking and No Physical Activity

Drinking differences by parental education emerge in college and are present after college as well. The parental gradient is positive, such that higher parental education is linked to higher binge drinking well into adulthood. In contrast, the drinking gradient by final respondent education present during high school (Wave I), contracts and inverts during college (Wave III), then widens post-college (Wave IV). Rigorous course-taking during high school is predictive of final attainment (college) and lower rates of binge drinking during high school (Crosnoe and Riegle-Crumb 2007). While binge drinking during college is normative, explaining the slight gradient inversion during Wave III, drinking post-college is highly differentiated by work and family transitions, explaining a widening gradient in Wave IV. Most notably, high school dropouts and college graduates diverge sharply. Overall, parental and respondent educational attainments show countervailing or opposing gradients for adulthood (Wave IV) drinking, but the respondent educational gradient is larger in magnitude.

Gradients for no physical activity are present for parental as well as respondent education. During high school (Wave I) and adulthood (Wave IV) they look quite similar across both types of education. However, around college age (Wave III), they become differentiated more fully by

respondent education, suggestive of social or peer effects on physical activity during college that remain intact during the post-college years (Wave IV).

NEXT ANALYTIC STEPS

Following these preliminary descriptive results, we will estimate longitudinal multilevel models of health behavior by age. These models will adjust for demographic background and will estimate changing associations with parental and respondent education by age, as well as synergies between parental and respondent education and how these synergies shift by age. These models will reveal fine-grained, age-graded patterns that expand upon the coarse, wave-based descriptive parental and respondent gradients documented here, while also allowing for synergistic effects across life-course parental and respondent socioeconomic statuses.

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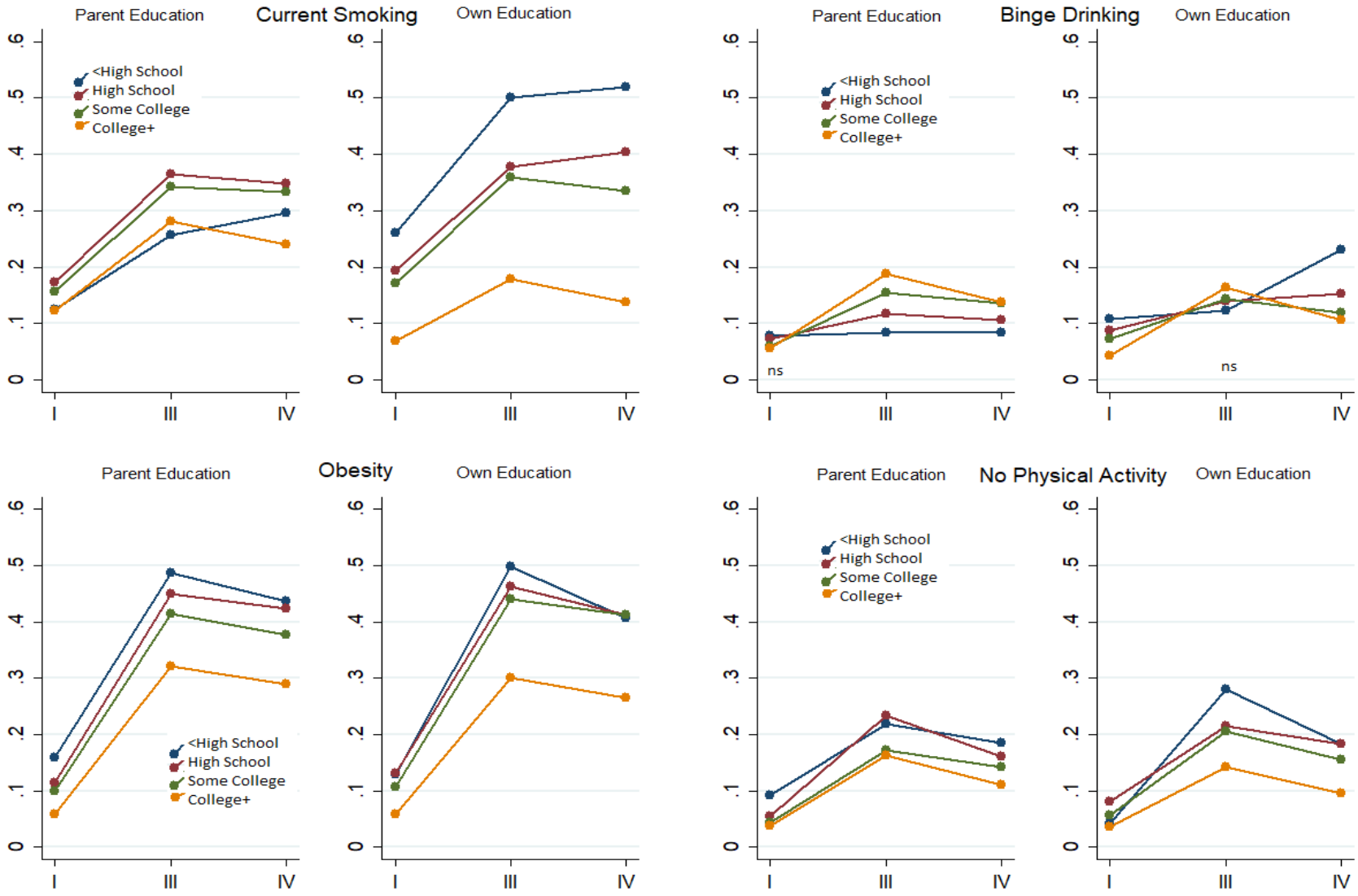
Figure. Health Behavior Disparities, by Wave, Parent Education and Own (Respondent) Education



Note. All educational disparities are significant by wave ($p < .05$; Chi square) unless denoted *ns*.

Appendix. Health Behaviors by Respondent Education and Parent Education (Add Health Waves 1, 3, and 4).

	Wave 1		Wave 3		Wave 4	
Health behavior						
Current cigarette smoker						
Own education		***		***		***
< High school	.260		.501		.519	
High school degree	.193		.378		.404	
Some college	.171		.360		.335	
College degree	.069		.179		.138	
Parent education		***		***		***
< High school	.124		.257		.297	
High school degree	.174		.365		.349	
Some college	.156		.342		.334	
College degree	.123		.282		.240	
Binge drinker						
Own education		***		ns		**
< High school	.108		.122		.230	
High school degree	.087		.140		.152	
Some college	.072		.143		.120	
College degree	.043		.163		.107	
Parent education		ns		***		***
< High school	.078		.084		.083	
High school degree	.072		.118		.106	
Some college	.059		.155		.135	
College degree	.055		.189		.137	
Obese						
Own education		***		***		***
< High school	.130		.498		.406	
High school degree	.132		.463		.412	
Some college	.107		.441		.413	
College degree	.058		.301		.266	
Parent education		***		***		***
< High school	.160		.486		.436	
High school degree	.114		.449		.423	
Some college	.100		.415		.377	
College degree	.059		.322		.289	
No physical activity						
Own education		***		***		***
< High school	.042		.280		.184	
High school degree	.081		.215		.184	
Some college	.056		.205		.155	
College degree	.036		.143		.096	
Parent education		***		***		***
< High school	.093		.218		.186	
High school degree	.055		.233		.161	
Some college	.044		.173		.142	
College degree	.039		.162		.111	

Note. Proportions weighted to correct for sample design and attrition. Chi-square tests of independence by respondent and parental education. ***p <0.001, **p <0.01, *p <0.05, *ns* = not significant.