Early-Life Characteristics and Emergent Educational Disparities in Health

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Submission for 2015 PAA Annual Meeting

The association between education and health outcomes during adulthood, including self-rated health, disease burden, and physical limitations, is one of the most robust findings in the population health literature (Cutler and Lleras-Muney 2010; Pampel, Krueger and Denney 2010). Still, it remains unclear when and how educational health disparities emerge during the life course (Elo 2009; Pampel et al. 2011). An important remaining puzzle in the existing literature is explaining the fact that disparities in health behaviors are present well before education is actually completed. For instance, differences in smoking by eventual educational attainment emerge during early adolescence (Maralani 2014). Similarly, educational differences in adult body mass have important links to characteristics and choices made in adolescence (von Hippel and Lynch 2014).

In this study, we draw on representative longitudinal data from a UK birth cohort that includes life-course histories of smoking and BMI into adulthood. While prior work has characterized age-specific educational disparities in health behaviors among adolescents and adults, it has been hampered by a lack of data from the pre-teen years. Without data linking childhood to adulthood, it has been impossible to study in detail the potential factors that might explain how educational and health trajectories become intertwined across the early life course in ways that inform adult outcomes. The British cohort data offer extensive early-life measures of cognitive, non-cognitive, psychosocial, socioeconomic, and health characteristics beginning at birth and continuing through adolescence and adulthood. Using these data, we examine how much of the early-life differences in smoking and BMI by the education respondents eventually obtain is explained by characteristics present in childhood. Using this approach, we pinpoint how and when educational health disparities emerge, based on characteristics and endowments that are present *before education actually is acquired.*

BACKGROUND

Substantial associations between education and adulthood physical health have been documented (for reviews, see Adler and Stewart 2010; Conti and Heckman 2010; Grossman 2006; Pampel et al. 2010). Researchers have recently directed their attention to understanding the mechanisms behind these observed associations (e.g., Chandola et al. 2006; Cutler and Lleras-Muney 2010). While knowledge of the mechanisms may be important for reducing educational disparities in adult health in the population, it may be even more important for identifying the common causes of both education and health. Broadly construed, these early-life causes may shed light on promising targets for preventative, cost-effective interventions aimed at improving both educational attainment and health (Campbell et al. 2014).

A life-course paradigm illuminates health disparities as they emerge (e.g., Braveman and Barclay 2009; Maralani 2014; Schreier and Chen 2013; Schafer, Wilkinson and Ferraro 2013; von Hippel and Lynch 2014). This paradigm defines health as a multifaceted, age-graded process involving the accumulation of health behaviors, outcomes, and risk factors, rather than as an aggregated, distal outcome such as adulthood mortality or comorbidity rate. By focusing on "norms, expectations, and constraints that characterize the age grades" (Crosnoe and Riegle-Crumb 2007:268), it situates individuals within changing social roles and contexts linked to homes, schools, and neighborhoods. In short, life-course research focuses on childhood, adolescence, and young adulthood to illuminate the "how" and "when" — the specific mechanisms and their specific patterns of timing — driving the associations between education and overall physical health for middle- to late-aged individuals. Meanwhile, it also describes the direct effects of childhood general health on adulthood general health (Elo 2009).

Despite the promise of the life-course paradigm, it has yet to successfully explain emergent educational disparities in health behaviors. Disparities in smoking and body mass by eventual educational attainment, such as degrees eventually completed or standardized achievement tests, are already apparent by grade school or early adolescence (Maralani 2014; Schreier and Chen 2013; Widome et al. 2013; von Hippel and Lynch 2014). It remains unclear, however, how these educational disparities originate. Educational differences in health behaviors such as diet, exercise and smoking contribute substantially to mid- to late-life inequalities in physical health (Cutler and Lleras-Muney 2010; Pampel et al. 2010), but these behaviors have their origins in childhood and adolescence. Thus, the disparities observed in adulthood are in fact anchored to a much earlier part of the life course. Our study aims to explain these links.

Educational Disparities in Smoking. Across adolescence and young adulthood, several distinct smoking trajectories are present, including nonsmokers, quitters, late escalators, stable light smokers, and stable high smokers (Costello et al. 2008), which can be masked by unconditional studies of age-specific hazards or proportions (e.g., Chen and Jacobson 2012; Chen and Kandel 1995). The presence of these distinct trajectories suggests that individuals may initiate smoking conditional upon social or educational experiences. Several studies of smoking have found that differences in smoking by eventual educational attainment are present by the teenage years (e.g., Farrell and Fuchs 1982; Maralani 2014; Widome et al. 2013). However, due to data limitations, these studies have not evaluated antecedent characterisics prior to adolescence. While substance use itself is not readily observed prior to early adolescence (e.g., for legal reasons; Chen and Jacobson 2012), common antecedents of educational attainment and substance use are likely present from very early in life (Conti and Heckman 2010).

Educational Disparities in Body Mass. Educational attainment shows a negative association with body mass in adulthood (Mirowsky and Ross 2003; Pampel et al. 2010). We also know that body mass trajectories across the life course are traceable to maturational processes and to a variety of psychosocial and economic circumstances (Lane et al. 2013; Schreier and Chen 2013; Raposa et al. 2014).It remains unclear, however, how these various factors explain emergent educational disparities in body mass. For example, much of the health-promoting effect of postsecondary education on body mass index observed at age 29 can be explained by family socioeconomic disadvantage, peer bullying, and early differences in academic performance such as grades and test scores present at age 15 (von Hippel and Lynch 2014). However, as was the

case with smoking, it remains unclear when these disparities actually emerge and whether there are underlying mechanisms present before age 15 that predict both educational attainment and body mass in adulthood.

DATA

Our analyses use the 1970 British Cohort Study (BCS; N=17198) to estimate the importance of early life characteristics and endowments to emergent educational disparities in smoking and body mass. The British cohort data offer a unique opportunity for understanding the origins of socioeconomic health disparities from childhood to adulthood. There is no comparable longitudinal dataset available for the United States (see Braveman and Barclay 2009, Tables 4 and 5). In contrast, the British cohort data offer data across a full sweep of the life course and collect extensive health and socioeconomic measures. These data also include detailed smoking and body mass information for both respondents and their parents.

RESEARCH DESIGN

***Key Contribution*.** We extend the existing literature by conducting a life-course investigation of emergent disparities in health behaviors by the eventual educational attainment respondents go on to complete. Relative to prior work, our design pinpoints how and when educational health disparities actually emerge and the potential mechanisms linking education and health in adulthood.

Dependent Variables. We will use smoking and body mass (BMI) as the outcome measures. BCS collects a full smoking history that begins in childhood, including dates of initiation and quitting, number of attempts at quitting, and current smoking status. In addition to the child's own history, parental smoking histories also are collected, and data on smoking habits of friends are available. Body mass is measured repeatedly in terms of both mass index and waist circumference, and parental weight information is available at multiple time points.

Potential Mechanisms. Educational disparities in health are well-theorized, at least with regard to adulthood (Cutler and Lleras-Muney 2010; Link 2008; Grossman 2006; Mirowsky and Ross 2003; Link and Phelan 1995; Ross and Wu 1995). But the evidence also shows that this theoretical perspective is limited with regard to educational disparities in health behaviors because the mechanisms specified are conceptualized as operating in adulthood rather than adolescence (Maralani 2014). In order to understand educational disparities in adult outcomes such as smoking and body mass, which originate much earlier in the life course, our existing theories need to refocus on mechanisms operating in childhood and adolescence. Our study takes this approach by studying a wide range of characteristics, endowments, and experiences in childhood, including cognitive skills, non-cognitive skills, psychosocial characteristics, and socioeconomic and health endowments (Aizer and Currie 2014; Conti et al. 2010; Conti and Hansman 2013; Schreier and Chen 2013).

Cognitive skills or endowments are measured by standardized test scores and academic performance across the curriculum, collected at ages 5, 10 and 16. Tests at age 5 focus on vocabulary and picture copying. Early start schooling (school before 4.5 years) is also considered

to be a cognitive endowment. Indicators of *non-cognitive skills or endowments* include social development or adjustment (e.g., shyness, social skills) as well as psychological, depression and anxiety symptoms, self-esteem and locus of control, and concentration or behavioral problems, measured at ages 4, 5, 10, and/or 16, and based on student/respondent, parent and teacher reports.

Psychosocial characteristics or endowments, assessed from birth through age 16, are based on family, peer, and academic resources. *Familial psychosocial endowments* include intact household and coresidence with biological parents (or child's age at parental death or separation, as appropriate), number of siblings, sibling health, parental health behaviors, quality of parent-child relationships, time spent in nursery school, and parental educational expectations and cognitive abilities. *Peer psychosocial endowments* include number and ease of making friendships, health behaviors of friends, peer delinquency, and frequency of informal social interaction with friends. *Academic endowments* include favorable parent-teacher relationships, teacher-child rapport, and school type (comprehensive, grammar or independent).

Socioeconomic endowments are measured as parental occupational grades, educational levels, income, and ages of mother and father at completion of education. Finally, *health endowments* (birth to age 16) will include birth weight, perinatal parental health and health behaviors (including smoking during pregnancy), absence of health complications during infancy, height, and physical health during childhood.

Approach: Age-Specific Educational Health Trajectories. Because respondents are followed into adulthood, we will use later BCS waves to determine the final educational attainment of respondents. Then, we will group respondents by final attainment level, and analyze age trajectories of smoking and body mass beginning in childhood through age 34. Trajectories of smoking behavior will focus on smoking initiation (Maralani 2013, 2014:29, Figure 1 this document).

Figure 1 offers a published example of our guiding approach to health behavior trajectories. This figure depicts age-specific probabilities of beginning to smoke regularly, by eventual level of education. Educational disparities clearly are present by early adolescence. While the estimated probabilities in Figure 1 hold basic demographic factors constant (age, gender, race/ethnicity), they do not account for early-life antecedents of education and smoking behavior. As these childhood endowments are factored in, educational health disparities (i.e. differences between probability lines in Figure 1) should narrow or may even be eliminated, which would be consistent with a partial or full explanation of these disparities by childhood characteristics. In keeping with this research strategy, our analyses will show whether and how childhood characteristics and endowments explain away the age-specific differences between eventual (final) education and health behaviors (smoking and BMI). In total, our analyses seek to explain educational health disparities based on characteristics present *before education is actually acquired*.

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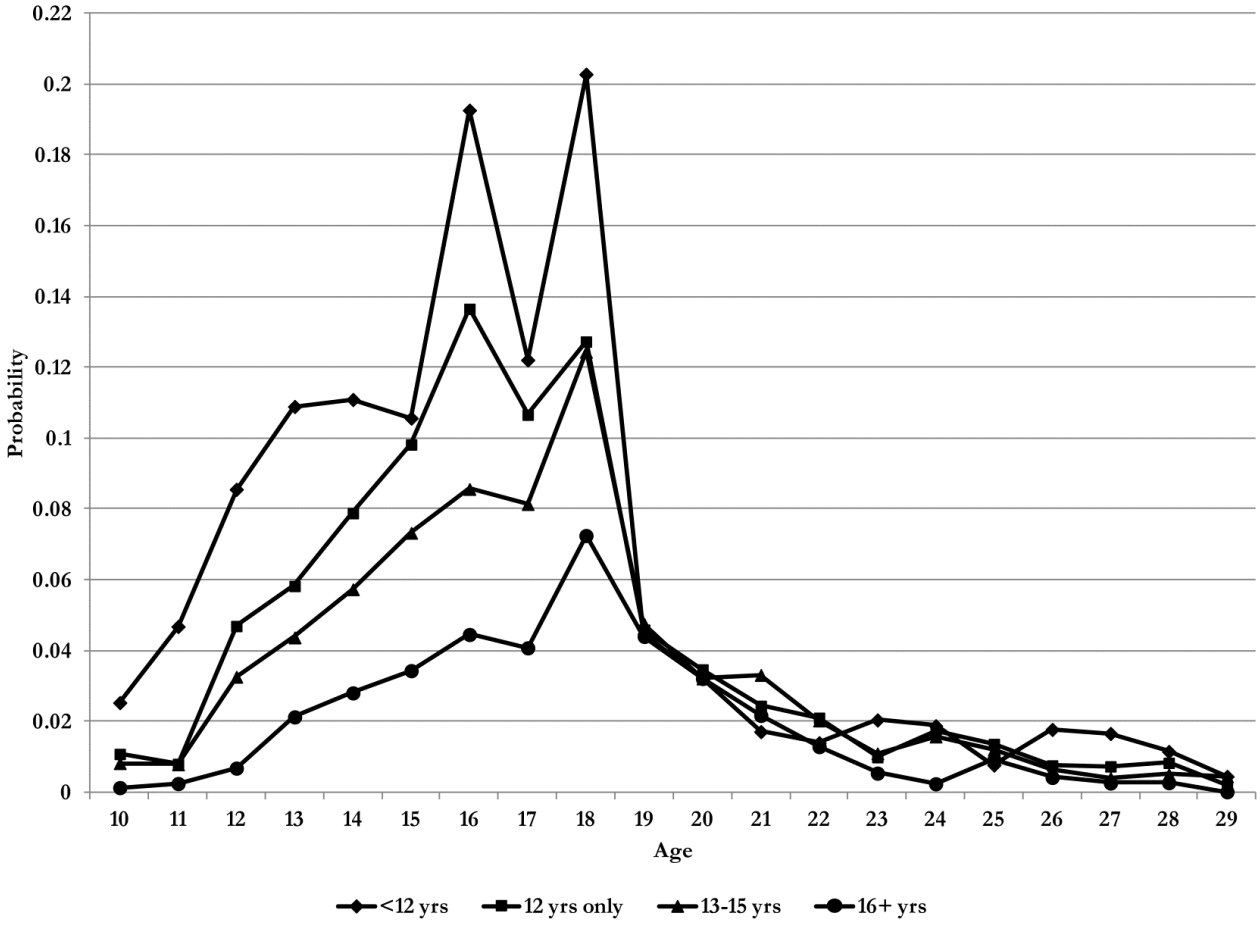
Figure 1. Discrete time hazard of initiation of smoking regularly by education and age, Add Health (N= 180,812 person years)



Notes: Analyses are weighted to correct for sample design and attrition. Model controls for age in single years, gender, race/ethnicity, and education level measured at Wave IV when most respondents were ages 25 to 29.

Source: Maralani (2014)