



# The kid's speech: The effect of stuttering on human capital acquisition<sup>☆</sup>



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## ABSTRACT

A number of studies have shown that childhood speech disorders such as stuttering are associated with lower test scores and educational attainment. However, it is unclear whether these associations are causal in nature or whether they can be explained by difficult-to-measure heterogeneity at the community, family, or individual level. Using data from the National Longitudinal Study of Adolescent Health and ordinary least squares, we show that stuttering is negatively associated with high school grades, the probability of high school graduation, and the probability of college attendance. However, empirical specifications with family fixed effects or controls for learning disabilities such as Attention Deficit Hyperactivity Disorder suggest that these associations can, in large part, be explained by difficult-to-measure heterogeneity.

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## 1. Introduction

Recently, economists have begun to explore the extent to which chronic childhood and adolescent health conditions such as Attention Deficit Hyperactivity Disorder (Currie & Stabile, 2006; Fletcher & Wolfe, 2008), depression (Fletcher, 2010), migraine headache (Rees & Sabia, 2011; Sabia & Rees,

2011), and obesity (Kaestner & Grossman, 2009; Sabia, 2007; Zavodny, 2013) interfere with the acquisition of human capital. The current study adds to this fast-growing literature by using data from the National Longitudinal Study of Adolescent Health (Add Health) to estimate the effects of stuttering, a common speech disorder, on academic performance and educational attainment.

It has been argued that children who stutter are treated differently by their teachers, are reluctant to ask questions in the classroom, and often have difficulty interacting with, and learning from, their fellow students (Bashir & Scavuzzo, 1992; Craig & Tran, 2006). Previous researchers have, in fact, shown that speech disorders are associated with sharply lower scores on tests of reading and math (Catts, 1993; Catts, Fey, Tomblin, & Zhang, 2002; Catts, Bridges, Little, & Tomblin, 2008; Dockrell, Lindsay, & Palikara, 2011; Eide, Showalter, & Goldhaber, 2010; Harrison, McLeod, Berthelsen, & Walker, 2009; Knox, 2002; Law, Rush, Schoon, & Parsons, 2010; Nathan, Stackhouse, Goulandris, & Snowling, 2004; Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998; Walker, Greenwood, Hart, & Carta, 1994). There is also evidence,

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albeit weaker, that children with speech disorders go on to receive fewer years of education than their counterparts without speech disorders (O'Brian, Jones, Packman, Menzies, & Onslow, 2011; Johnson, Beitchman, & Brownlie, 2010; Snowling, Adams, Bishop, & Stothard, 2001). These results are consistent with the hypothesis that speech disorders, through interfering with classroom learning and adding to the cost of investing in human capital, lead to reduced academic performance and educational attainment. However, previous studies in this area have typically relied on non-representative samples, and, to our knowledge, no previous study has attempted to account for the potential influence of unobservables. Thus, there exists the possibility that the negative association between having a speech disorder and academic performance is spurious—i.e., driven by difficult-to-measure factors at the level of the community, family or individual.

The Add Health data contain detailed information on the behavior, personality, and family background of respondents. This richness allows us to observe, and control for, a much wider variety of potentially confounding factors than were available to the majority of previous researchers. In addition, by comparing the experiences of siblings with discordant stuttering experiences, we are able to control for family-level unobservables such as parental involvement. Finally, there is evidence that ADHD and other learning disabilities such as dyslexia are associated with stuttering (Ajdacic-Gross et al., 2010; Arndt & Healey, 2001; Blood & Seider, 1981; Blood, Ridenour, Qualls, & Hammer, 2003; Blood, Blood, Kreiger, O'Connor, & Qualls, 2009). Because the Add Health asked questions aimed at assessing whether respondents had a learning disability such as Attention Deficit Hyperactivity Disorder (ADHD) or dyslexia, we are able to explore whether these factors help explain the relationship between stuttering and the outcomes under study.

Our baseline ordinary least squares (OLS) estimates suggest that stutters have lower grades than their counterparts who do not suffer from a speech disorder. Stuttering is also associated with a lower probability of graduating high school and a lower probability of attending college, results that are consistent with the argument that stuttering directly interferes with classroom learning. However, when we restrict our sample to full biological siblings (including twins) and add family fixed effects, these associations become much smaller in magnitude, consistent with the hypothesis that family-level unobservables play an important role. Moreover, when we control for a history of ADHD or the presence of another learning disability, the estimated effects of stuttering shrink dramatically and become statistically indistinguishable from zero at conventional levels. These findings suggest that the impact of stuttering on human capital acquisition is much weaker than previously argued.

## 2. Background

### 2.1. Definition, prevalence, incidence, and causes of stuttering

Stuttering (also known as stammering) is a speech disorder in which sounds, syllables or words are repeated

or prolonged, disrupting the flow of speech. It typically begins early in life, and can be accompanied by eye-blinking, head jerks and facial grimaces.<sup>2</sup> Sufferers sometimes avoid particular words, speak in a rapid monotone, or even adopt an accent in order to keep from stuttering. Most children who stutter eventually outgrow it, but some do not.

Estimates of the lifetime incidence of stuttering range from 4 percent to as high as 8.5 percent (Gordon, 2002; Mansson, 2000; Reilly et al., 2009).<sup>3</sup> The prevalence of stuttering among all adults in the United States is approximately one percent (Kang et al., 2010), and estimates of prevalence among children and adolescents are typically on the order of one to two percent, but are often based on non-representative samples (Craig & Tran, 2005).<sup>4</sup>

Researchers once thought that stuttering could be caused by parental speech patterns (Nippold & Rudzinski, 1995). Although this hypothesis has fallen out of favor, the exact causes of stuttering are still a mystery (Viswanath, Lee, & Chakraborty, 2004). Studies of twins and adoptees provide evidence of a genetic component to stuttering (Dworzynski, Remington, Rijdsdijk, Howell, & Plomin, 2007; Felsenfeld & Plomin, 1997; Felsenfeld et al., 2000; Ooki, 2005), but what precisely is being inherited is not known (Subramaniana & Yairi, 2006).<sup>5</sup> Recent work by Kang et al. (2010) has pinpointed several gene mutations that appear to be directly linked to stuttering, but these mutations account for, at most, only a small fraction of the total number of stutters in the general population (Kang et al., 2010, p. 684).

### 2.2. Why might stuttering be related to the outcomes under study?

In an often-cited article, Bashir and Scavuzzo (1992) discussed why speech disorders might lead to academic

<sup>2</sup> When first onset is before adolescence, it is called developmental stuttering; when caused by trauma to the brain, it is called acquired stuttering (Craig & Tran, 2006).

<sup>3</sup> Incidence refers to the percentage of the population under study who stuttered at some point in their lives. Prevalence refers to the percentage of the population under study who stutter at a given point in time. Most studies have found incidence rates on the order of 4 percent (Gordon, 2002, p. 278). However recent work suggests that the incidence of stuttering may be higher than 4 percent. For instance, Mansson (2000) found that the incidence of stuttering among children from the Danish island of Bornholm was 5.2 percent; Reilly et al. (2009) found that the incidence of stuttering among children living in Melbourne Australia was 8.5 percent.

<sup>4</sup> A recent analysis of data from the 2003 National Survey of Children's Health found much higher prevalence rates among U.S. children and adolescents, but grouped other types of speech impairments with stuttering and stammering. The results of this analysis are available at: <http://www.nidcd.nih.gov/health/statistics/vsl/problems.htm>.

<sup>5</sup> Subramaniana and Yairi (2006, p. 201) speculated that: Quite likely, the postulated major gene(s) and other genetic components transmit a number of traits, some of which contribute to the expression of stuttering. This constellation of genes may vary from one family to another. Furthermore, a particular characteristic that increases the susceptibility for stuttering may not, by itself, cause the stuttering. But, when it co-occurs with certain other characteristics, stuttering may be expressed. As stated, however, the nature of these genes and their expression is not currently known.

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