The Gendered Impact of Family Adversity:

The Effects of Having a Disabled Sibling at Various Ages on Educational Attainment

Anna Penner

A large portion of disability research focuses on the effect of having a disabled child in a family. However, this research tends to focus on the effect on parents, and while there is a large body of research examining sibling effects on later life outcomes, the disability literature has only briefly examined effects on the family's non-disabled children. Given that recent estimates suggest that one in eight families in the United States have a disabled child (Hogan 2012), understanding the effects of disabled siblings is a critical issue for understanding how family processes reproduce inequality and impact individuals' later life outcomes. Combining the disability literature and the sibling literature, I investigate if there is an effect of having a disabled sibling on educational attainment, especially focusing on gender differences over various ages.

DISABILITY EFFECTS

Studies on the consequences of disability on the family rarely focus on the non-disabled siblings in the family (Saxena and Adamsons 2013). Rather, much of the literature on disability and the family considers the impact on parents and parental stress. Mothers' stress level, depression, and adaptation are common concerns (Ekas and Whitman 2011; Baker, Seltzer, and Greenberg 2011). If non-disabled siblings are considered in studies, it is often after the effect on parents has been examined, and research investigates how the effect on the parents trickles down to the non-disabled siblings, rather than studying the non-disabled sibling firsthand (Dyson 2010; Meyer, Ingersoll, and Hambrick 2011). While parental stress certainly impacts children, it is important to investigate possible direct effects of having a disabled sibling on non-disabled children.

There have been a variety of studies considering the immediate effects of having a disabled sibling on the non-disabled children in the family. Eisenberg, Baker, and Blacher (1998) investigate the effect of placing the disabled child in a long-term care facility on the non-disabled children and find that whether the disabled sibling lives at home or in a long-term care facility there is little difference on the family environment or the psychological adjustment of non-disabled siblings. Additionally, Lardieri, Blacher, and Swanson (2000) find that sibling relationships are affected by the presence of a child with a learning disability in the family. Unfortunately, research that specifically examines the siblings of disabled children often does not consider later life outcomes, but looks at the immediate childhood impact (Stoneman 1998). This vein of research is similar to studies that find positive effects on socialization among children who have siblings during preschool as mentioned below in the Sibling Effects section; however, the effect of having a disabled sibling at a young age is widely found to be negative rather than positive (Eisenberg, Baker, and Blacher 1998). Research that goes beyond preschool aged siblings focuses on behavioral adjustment (Meyer, Ingersoll, and Hambrick 2011), and there is no research on the educational outcomes of these siblings.

Studies that do assess later life impacts of those who have a disabled sibling typically focus on the relationships between the disabled and non-disabled siblings. There are substantial differences in expectations for adolescents and young adults who have disabled siblings than those who do not. These young adults are relied on to play a significant role in caring for their disabled sibling (Seltzer et al. 2005) with significant differences by gender as to who provides that care later in life (Krauss et al. 1996). Research considering young adults who have a disabled sibling often compare two different types of disabilities; for example, those that are mentally developmentally delayed and those with mental illness (Greenberg et al. 1999). These

studies find that there are often differences in outcomes depending on the disability. For example, adults who had a sibling with a mental disability were almost twice as likely to expect to be involved in providing care for their sibling compared to those whose siblings were mentally ill. This is largely due to the fact that mental disability is often diagnosed during childhood, but mental illness often is not diagnosed until late adolescence or adulthood. As such, the siblings of mentally disabled individuals are accustomed to the disability, while siblings of those with mental illness have had less time to adapt to their sibling's illness and the unpredictable nature of mental illness makes it difficult for them to plan ahead (Greenberg et al. 1999). Other studies that examine sibling relationships also consider the similarities and differences of having a sibling who is autistic or who has Down syndrome and find that there are significant differences in the closeness or warmness of the sibling relationship depending on the type of disability (Hodapp and Urbano 2007). However, these are often qualitative works and little research has focused on the effect of having a disabled sibling using a nationally representative sample or a large dataset, or considers more general measures of academic attainment (Seltzer et al. 2005, but see Hogan 2012). In considering the effect that having a disabled sibling has on educational attainment, this study not only adds to the literature on disabled children and their families, but also to the broader literature on sibling effects.

SIBLING EFFECTS

The sibling literature considers how factors such as family size, birth order, sibling density (the number of siblings and their closeness in age), and gender composition impact later life outcomes such as educational attainment (Conley 2000; Hauser and Sewell 1985; Powell and Steelman 1990; Powell and Steelman 1993). Research in this vein argues that families have

limited resources, and suggest that the more a family invests in a given child (e.g. attention, nutrition, education) the better that child will do, so that children with fewer siblings may do better than those with more, older siblings may do better than younger siblings, and boys, who are often conferred greater capital by their parents, may do better than girls.

There are a number of studies that look at the gender composition of families with very little consensus as to the exact effects on later life outcomes. Conley (2000) builds on the sex minority hypothesis in which Rosenberg (1965) suggests that a child who is a gender minority in a sibship (e.g. a girl with only boy siblings) would receive more attention from their parents and hence may perform better in school. Conley builds on the sex minority hypothesis showing that in fact the number of opposite sex siblings decreases educational attainment. In contrast to Conley's findings, Butcher and Case (1994) find that while women with more brothers do better than women with more sisters, there is no gender composition effect for men. Hauser and Kuo (1998) find contradictory evidence to the Butcher and Case findings, suggesting that there is no support for gender composition affecting educational attainment. Still other research shows that having additional brothers hurts grades more than additional sisters but that there is no gender composition difference for siblings on standardized tests (Powell and Steelman 1990).

A significant amount of research focuses on the family's impact on later life outcomes. Factors such as family size and birth order greatly impact educational attainment (Powell and Steelman 1990). Featherman and Hauser (1978) find that for each additional sibling in a family, there is a decrease in educational attainment of -.2 years, suggesting that in larger families, children will complete fewer years of education. The number of siblings is often linked to educational outcomes due to resource dilution (Anastasi 1956; Conley 2000; Downey 2001). The resource dilution theory states that any given family has a set number of resources; if there is

only one child in the family, that child receives all of those resources. In larger families, the resources must be divided up so that each child gets fewer resources—the larger the family size, the fewer resources each child receives. This may manifest itself as monetary support from parents, as well as time and emotional support that have to be shared with multiple siblings, thus leaving less for each individual child. This is particularly pertinent to families with a disabled child, as there will likely be fewer resources available due to loss of parental income, additional medical costs, and time spent at therapies and hospitals among other time and money consuming activities that are important for the quality of life of a disabled child.

Resource dilution corresponds with the confluence model (Zajonc and Markus 1975; Zajonc 1976), which says that in larger families, the intellectual performance drops with each child according to birth order since younger children will have less one-on-one time with their parents but learn from their older siblings. As such, according to the confluence model, the oldest child has the highest intellectual performance while the youngest has the lowest, and the youngest child has the most substantial decrease in intellectual performance from the sibling directly preceding him/her in birth order. Borrowing from the confluence model and resource dilution theory, many studies consider both the size of the sibling set and birth order to examine educational outcomes as they are closely related and play an important role in educational attainment (de Haan 2010; Downey 2001). Consideration is also given to density within the sibling set which shows that having child close together (more dense) has a negative effect on educational outcomes compared to siblings that are more widely spaced (Powell and Steelman 1990).

Timing has also been considered along with density; for example, the effect of having siblings during preschool compared to later in childhood. While having a large number of

siblings negatively affects educational attainment later in life, there is evidence that young children with siblings navigate relationships in the classroom better than children with no siblings (Downey and Condron 2004). This suggests that while there are negative aspects to having a larger number of siblings for educational attainment overall, there are also benefits early in life because young children will be better socialized if they have siblings, than their peers with no siblings (Brody 1998). This corresponds to disability studies that consider the effects siblings have on young autistic children and their socialization prior to entering school (Begum and Blacher 2011).

It is important to use the literature on sibling effects on educational attainment to particularly assess siblings of disabled children. The little work that has been done on the later life outcomes of having a disabled sibling focuses on the relationship between siblings and how it affects their career choices, but no work has been done using a population based-sample (Seltzer et al. 2005) or examines educational attainment which impacts career opportunities. It is important to look beyond conclusions reached in small samples to see what the larger implications are, and to look beyond the relationship between siblings to see in what ways having a disabled sibling impacts later life outcomes.

It is critical to utilize the information known about sibling effects in the study of disability consequences on educational attainment. Educational outcomes in many ways mark the beginning of the transition to adulthood, and as such are a critical step in looking at the broader impacts of having a disabled sibling on later life outcomes. Any gap in educational attainment between those who do and do not have disabled siblings should be researched. This is particularly important given the large number of children who have disabled siblings who are

negatively affected, given that those effects ultimately will impact the wider community and the American educational system and labor market more broadly.

THE CURRENT STUDY

Given research suggesting that women carry a disproportionate share of unpaid work such as caregiving (Hochschild 1989), I examine whether the effects of having a disabled sibling during childhood vary for men and women. This is particularly relevant given research by Aronson et al. (1996) showing that gender differences in caregiving exist even among adolescents, with girls providing on average 8 hours more care a week for younger siblings than boys. Similarly Dodson and Dickert (2004) find that low-income families depend on children, and particularly girls to engage in household chores and carework and hence spend less time engaging in educational activities. These findings are particularly interesting considering research suggesting that women's educational attainment has recently surpassed men's (Buchmann and DiPrete 2006) so that while on average girls are providing more carework, they are still performing better in school than their male counterparts.

I examine the effects of having a disabled sibling during childhood on American young adults' educational attainment, measured by both high school completion and the number of years of education competed. I hypothesize that young adults who had a disabled sibling during childhood will be less likely to complete high school and will complete fewer years of education than young adults whose siblings are not disabled. Secondly, I examine the gender differences in the effects of having a disabled sibling in childhood on American young adults' educational attainment. I hypothesize that the effect of having a disabled sibling in childhood will be particularly pronounced among females since they will provide even more carework than their

female counterparts and will be expected to continue to do so into adulthood. Finally, I hypothesize that having a disabled sibling earlier in childhood will lead to particularly deleterious outcomes since key resources are being given to the disabled child rather than the non-disabled sibling at a critical developmental age.

This study acts as a test of the relative strength of the resource dilution theory in explaining educational attainment differences between young adults with and without disabled siblings. Using resource dilution theory, we can gain a better understanding of sibling impacts in families with a disabled sibling. If children in large families have lower educational attainment, it could be that children who have a disabled sibling also experience a decrease due to substantial resource dilution, since the disabled child consumes more of the family resources than a non-disabled child typically would.

DATA

I use data from the National Longitudinal Survey of Youth 1979 Children and Young Adults (CNLSY) sample. The CNLSY data are ideally suited for this research as they provide a nationally representative family-based sample. The National Longitudinal Survey of Youth 1979 is a series of cohort surveys conducted by the United States Department of Labor, Bureau of Labor Statistics. Starting in 1986, the CNLSY conducted surveys annually until 1994, at which point they conducted surveyed biennially (Bureau of Labor Statistics 2011). Only child surveys were administered until 1994 when surveys targeting youths and young adults were also implemented. Questionnaires include questions pertaining to schooling, interactions with parents, and home responsibilities, among other things.

Beginning in 1986, surveys were administered to all of the children born to female respondents of the National Longitudinal Survey of Youth 1979 (NLSY79) cohort. The mothers who participated in the NLSY79 study were ages 14-22 in 1979, and by 1986 were 21-29 years old, and over 50 percent had least one child. Because the respondents of the CNLSY survey are children who are linked to their mother's identifying information in the NLSY79 survey, sibling sets are easily identified. Many recent adolescent and young adult studies, such as the National Longitudinal Survey of Youth 1997 or the National Longitudinal Survey of Adolescent Health focus only on one adolescent in a family unit; some include multiple siblings, but the numbers are low resulting in insufficient statistical power to examine questions around how disabled children affect their siblings. Further, in surveys focusing on one child in a family, if questions are asked about siblings, it is difficult to ascertain if any siblings are disabled, making the CNLSY an ideal data source for this type of analysis. Further, the CNLSY data addresses the need for large sample sizes in disability research as previous research has tended to focus on smaller sample sizes, a need that is highlighted by Seltzer et al. (2005).

SAMPLE

I have two analytic samples due to the different age ranges used for measuring academic achievement. My first analytic sample includes 2,647 CNLSY respondents who are at least 24 years old and have at least one sibling. I restrict analyses to respondents aged 24 or older so as to allow respondents time to complete college while not unduly biasing the sample by selecting only children born to young mothers. My second analytic sample includes 3,889 CNLSY respondents who are at least 19 years old and have at least one sibling. I restrict these analyses to respondents who are 19 or older to allow them time to graduate from high school.

I restrict my sample to only include respondents who answered questions regarding their educational attainment and respond to race and gender information; 432 cases are lost through these restrictions. Twenty percent of the survey's respondents responded affirmatively to having a disability at some point in this study (the disabled respondents are not included in my sample). This is greater than the national estimates of the number of families with disabled children in the United States, but it is important to remember that while at any given point roughly 12 percent of the families in the United States have children who are disabled, over the course of several years a disability may come and go. Some disabilities may be controlled or corrected, while other more severe disabilities may result in the death of the child. These factors may account for the difference between the 12 percent of families with disabled children that is measured cross-sectionally, and the 20 percent represented in my data that is measured cumulatively. Of the included respondents, 30 percent (N=807) had at least one disabled sibling at some point during their childhood (measured as prior to age 18). Descriptive statistics of key variables for the first analytic sample (educational attainment as measured in years of schooling) are presented in Table 1.

[Insert Table 1 about here.]

DEPENDENT VARIABLE

Educational attainment is measured using two variables. The first captures the number of years of education completed by respondents who are 24 or older. The second captures whether respondents over age 19 completed high school. These data come from the most recent information provided about the respondents' education.

INDEPENDENT VARIABLES

Disability Measures. Having a disabled sibling is measured using information on the self-reported disabilities of respondents. Following the Americans with Disabilities Act of 1990, disability is defined as "a physical or mental impairment that substantially limits one or more major life activities; a record of such an impairment; or being regarded as having such an impairment" (Americans with Disabilities Act, 2009). A respondent is classified as having a disability if they answered yes to being affected by or having the following options in the CNLSY survey: crippled; orthopedic handicap; epilepsy/seizures; hearing difficulty or deafness; learning disability; mental retardation; minimal brain dysfunction; chronic nervous disorder; and autism in any of the surveys from 1986 to 2010. After ascertaining whether a respondent had a disability, data is examined to see whether that respondent has a sibling. If the disabled respondent has a sibling in the sample, the sibling is coded as having a disabled sibling.

Gender. Another key independent variable is gender. As previously noted, females are more likely to take on caregiving and household duties than males, and as such it is important to investigate whether having a disabled sibling particularly affects their educational attainment. Gender is also combined with the variable for having a disabled sibling to specifically investigate the interaction effect of having a disabled sibling on males and females.

Timing. To investigate any differences in the effect of having a disabled sibling at various ages, I include four dummy variables for pre-school, elementary, junior high, and high school to see if having a disabled sibling at any of these times is particularly deleterious for educational attainment.

Family Characteristics. Family often plays a large part in educational attainment in adolescents and young adults. I control for two family characteristics: the family's

socioeconomic status and family size. The family's socioeconomic status is controlled for using the mother's education. This information is accessible through the NLSY79 data, and can be linked to the CNLSY data through the mother's identification number. Family size is found in the CNLSY data by looking at how many children are linked to the mother's identification number.

Respondent characteristics. The characteristics of respondents that I account for include race, birth order, and age. Questions regarding the race of the respondents are among those asked in the survey. Race is controlled for using a series of dummy variables. Birth order and the number of siblings were tested for collinearity and yielded very low variance inflation factors (less than 1.39), indicating that including both variables is not problematic. The sample only includes respondents who are age 24 or 19 or older (depending on the analytic sample), but age is controlled for to account for the fact that those who are older are more likely to have graduated from high school and have more years of education.

METHODS

I use three sets of models for my analysis. In the first set of models I use OLS regression to estimate the effects of having a disabled sibling on years of education completed. For the second set of models, I examine the likelihood of graduating from high school using logistic regression models. In the third model, I use OLS regression and seemingly unrelated estimates to investigate differences between age groups. All models include cluster-robust standard errors to account for the clustering of respondents within families. Additionally, using the same models discussed above, I consider the difference in educational attainment between males and females,

as well as examining the effects of being male and having a disabled sibling together to ascertain the interaction effects are.

RESULTS

[Insert Table 2 about here.]

Table 2 reports results of OLS regressions examining years of education, comparing respondents who had a disabled sibling during childhood to respondents whose siblings were not disabled. Model 1 presents results from a bivariate model comparing respondents with a disabled sibling to all other respondents, and shows that they typically receive .52 years less education. This is a substantial and highly significant difference, and reveals that individuals who had a disabled sibling complete significantly less education than those with non-disabled siblings.

Model 2 builds on the results presented in model 1, and shows that the relationship between having a disabled sibling and educational attainment varies significantly by gender. I find that women who had a disabled sibling complete almost three-quarters of a year (.72) less than women without a disabled sibling. Among men, however, individuals with a disabled sibling as children typically received .34 fewer years (-.72+.38) of education than men without a disabled sibling. The magnitude of these differences is also noteworthy as it reveals that women's advantage in educational attainment is completely eliminated among individuals with disabled siblings. That is, while women without a disabled sibling typically obtain half a year (.54) more education than men without a disabled sibling, women who have a disabled sibling earn less education than men without a disabled sibling.

To ensure that the results found above are not being driven by differences in factors such as race, socioeconomic status, birth order, and family size, model 3 introduces controls for these factors. The results in model 3 are largely the same as those presented in model 2, though the gap among women with and without a disabled sibling shrinks from .72 years to .51 years once these factors are taken into consideration. Thus, while the control variables account for a significant portion of the relationship between having a disabled sibling and educational attainment, they do not explain away the gap in educational attainment between individuals with and without disabled siblings. Interestingly, however, supplementary analysis reveals that, unlike model 2, the difference between the educational attainment of men with and without disabled siblings is not statistically significant. Given that the main effect of having a disabled sibling and the interaction effect of being male and having a disabled sibling are of nearly equal magnitude and opposite sign, this is perhaps not surprising, but it does indicate that the differences between individuals with and without disabled siblings are driven almost entirely by the differences among women. These findings support my first and second hypotheses; young adults who have a disabled sibling have lower academic achievement and this penalty is largely borne by women who have a disabled sibling.

Looking at indicators of resource dilution, we see that family size and birth order affect educational attainment, but not to the same degree as having a disabled sibling does, with each additional sibling respondents incur a penalty of -.09 years. Concerning birth order, respondents on average earn .24 years less education than the sibling older than them, so that the second child earn .24 years less of education compared to the oldest child, and the third child earns .24 years less compared to the second child.

[Insert Table 3 about here.]

Table 3 follows a similar format as table 2, but instead of examining educational attainment in years, table 3 reports odds ratios from logistic regression models examining high school graduation rates. Model 1 shows that overall, the odds of graduating from high school are substantially lower (.60) for respondents who had a disabled sibling in childhood. As in the previous table, model 2 shows that women with disabled siblings do substantially worse, while men experiences less of a penalty for having a disabled sibling. Model 3 introduces controls, which as before do not substantially alter the results. As in table 2, women with a disabled sibling are substantially less likely to graduate from high school, while for men there is no statistically significant difference (as before, if anything, men with disabled siblings do slightly better than men without disabled siblings). Again, I find support for my first two hypotheses as these findings show that young adults who have a disabled sibling are less likely to graduate from high school, and the odds of graduating from high school are considerably lower for girls than for boys.

[Insert Table 4 about here.]

A gendered effect on educational attainment also appears when distinguishing between various age groups. In table 4, model 2 shows that having a disabled sibling during the elementary years on average decreases the years of education for a female by .63 years (supplementary analyses show that the odds of graduating from high school decreases substantially (.69) for females). In contrast, boys who had a disabled sibling during elementary

school have no statistically significant difference from their male peers who did not have a disabled sibling during elementary school. There are similar effects on educational attainment if a child has a disabled sibling during junior high or high school (models 3 and 4). Supplementary analyses using seemingly unrelated estimation indicate that these differences are moderately significantly different than the values of having a disabled sibling during elementary school (.057 for junior high and .002 for high school).

Further, model 1 indicates that the difference in educational attainment is the largest among those who had a disabled sibling prior to elementary school and this coefficient is significantly different from those that had a disabled sibling while in elementary or junior high and is marginally significantly different for those who had a disabled sibling during high school (.062). Additionally, while there are distinct gender differences in educational attainment once a child is school-aged, there are no gender differences during the preschool years. Having a disabled sibling when a child is less than six years old decreases their over all average years of education attained by -.83. There is no significant difference between boys and girls, suggesting that having a disabled sibling early on in life is particularly deleterious for all children, but after entering school, that effect is moderated for boys and exacerbated for girls.

In sum, I find that respondents with disabled siblings have lower educational attainment than respondents who do not have a disabled sibling. Respondents with disabled siblings have lower educational attainment and are less likely to complete high school than their peers who do not have a disabled sibling possibly due to the additional stress placed on those with a disabled sibling and more drastic resource dilution. Additionally, I find that there are not gender differences for those who had a disabled sibling when they were in pre-school. However, the

female respondents' propensity to have higher educational attainment than males is eliminated when they had a disabled sibling during their educational career.

DISCUSSION

Drawing on previous research that disabilities affect not just individuals but families as a whole, I examine the effects of having a disabled sibling during childhood. Using unique data from the CNLSY, I examine disability in childhood with later life educational attainment. In particular I examine educational attainment, as measured both in the likelihood of graduating from high school and in years of education, and find that children growing up with disabled siblings on average receive half a year less education and have 60 percent lower odds of graduating from high school.

Further, drawing on research highlighting the gendered nature of carework, I examine gender differences in the effects of those with disabled siblings, showing that differences among women entirely account for the differences we observe. The odds that women with disabled siblings will graduate from high school are 72 percent of those women without a disabled sibling and on average women with a disabled sibling earn half a year less education than their female counterparts. Men, by contrast exhibit no statistically significant difference, and if anything have slightly better educational outcomes when they have disabled siblings. The magnitude of the results is substantial, and is large enough to offset the sizeable female advantage in educational attainment.

These findings are particularly interesting given the findings in which Buchmann and DiPrete (2006) suggest that boys do worse in school if their father is absent from the household. Families with disabled children tend to have higher divorce rates with the mother staying as the

primary caregiver (Hogan 2012). Yet in these families the girls are bearing the educational penalty and not the boys, which is what would be expected according to Buchmann and DiPrete. In future research I intend to look at more closely at the incidences of divorce in the CNLSY looking for links between divorce and the gender of the children, as girls are disproportionately affected by having a disabled sibling.

These findings inform the existing literature on disability effects as well as sibling effects by showing that sibling effects do indeed translate to disabilities studies and that the impact of having a disabled sibling should be examined in more depth. These findings suggest that resource dilution plays a role in the outcomes of siblings of disabled children, as their families funnel more resources to the disabled child leaving fewer resources for non-disabled children.

Further, data that considers siblings of disabled children can inform the resource dilution theory as well as the confluence model in a number of ways. Although this data does not provide a measure of intelligence, a consequent study that included IQ data along with educational attainment data in families with a mentally disabled child could shed more light on the confluence model, since the confluence model states that the family unit's intellectual atmosphere is what affects the children's intellectual outcomes. Thus if there is a child with severe mental disabilities, their siblings might also suffer intellectually. Additionally, as disabilities are broken down by type (mental or physical) and severity, a better understanding of the resource dilution theory could be developed. Depending on how much money or time is spent caring for the disabled sibling, there could be substantial evidence for resource dilution as one child takes up a significant portion of the resources.

As previously mentioned, this study lends itself to further research considering later life outcomes such as labor market outcomes and delinquency. As education is an early step in the

transition to adulthood, it is critical to look educational attainment before considering the broader impacts of having a disabled sibling on other later life outcomes. In future projects I will to use the depth of the CNLSY to investigate other later life outcomes such as labor market outcomes, delinquency rates, and family planning, as well as exploring the gender gaps that are particularly pronounced in this population.

Finding that the education penalty exists only among women has important policy implications. These results suggest that sisters are being disproportionately saddled with care of disabled siblings while brothers seem to be less so. Interestingly, supplementary analyses suggest that the effects of being the sister of a disabled child do not vary by whether respondents were older or younger than their disabled sibling, but younger brothers of disabled siblings had lower educational attainment than older brothers. Future research could investigate the sex composition of the sibling unit, and see what effect that has on the educational outcomes as the current literature on sibling sex composition is mixed in their findings (Conley 2000; Hauser and Kuo 1998; Butcher and Case 1994), and such a study could bring another sibling dynamic into that discussion.

Further, this research addresses a previously unconsidered topic with major policy implications. The United States' high school graduation rate is below average among OECD countries (OECD 2010). While boosting graduation rates will likely require broad efforts to engage students, to the degree that gains might be attained by implementing policies and practices based on a better understanding of children with disabled siblings, this project will generate policy relevant results.

It is particularly important to implement helpful policies aimed at women as the educational attainment of women with a disabled sibling suffers more than men's. This may

include better care options for the disabled child that allow their sisters not to be as concerned with caregving responsibilities. It is interesting to note, though, that girls typically spend more time than boys doing care-work as children and adolescents and yet still have higher educational attainment. As such, while providing alternate care options will likely help, there may be other programs that would also be beneficial to sisters of disabled children. Additional assistance may also include providing a support system geared specifically to siblings of disabled children that provide counseling or tutoring or even simply a place to be with other children whose siblings are disabled, giving them another support network. Further research should be conducted to see if girls with disabled sibling have worse grades than their counterparts without disabled siblings, as that might be a cause for their lower educational outcomes (Buchmann, DiPrete, and McDaniel 2008). It is important to be aware of the large negative effects as policy-makers continue making choices about further cuts during this time of financial austerity.

This study shows that disabilities have wide-ranging consequences not just for the disabled individuals, but for their families as well. While previous research focuses on parents, my results show that they have significant and substantial effects for siblings as well. In doing so, this study illuminates a previously hidden cost of disability on society.

References

Americans with Disabilities Act. 2009. *The public health and welfare*. Retrieved from http://www.ada.gov/pubs/adastatute08.htm. October 28, 2011.

Anastasi, Anne. 1956. "Intelligence and Family Size." *Psychological Bulletin.* 53(3):187-209.

Aronson, Pamela J., Jeylan T. Mortimer, Carol Zierman, and Michael Hacker. 1996. "Generational Differences in Early Work Experiences and Evaluations." Pp. 25-62 in *Adolescents, Work, and Family: An Intergenerational Development Analysis*, edited by Jeylan T. Mortimer and Michael D. Finch. Thousand Oaks: Sage Publications.

Baker, Jason K., Marsha Mailick Seltzer, and Jan S. Greenberg. 2011. "Longitudinal Effects of Adaptability on Behavior Problems and Maternal Depression in Families of Adolescents With Autism." *Journal of Family Psychology* 25(4):601-609.

Begum, Gazi and Jan Blacher. 2011. "The Siblings Relationship of Adolescents With and Without Intellectual Disabilities." *Research in Developmental Disabilities* 32:1580-1588.

Brody, Gene H. 1998. "Sibling Relationship Quality: Its Causes and Consequences." *Annual Review of Psychology* 49:1-24.

Buchmann, Claudia and Thomas A. DiPrete. 2006. "The Growing Female Advantage in College Completion: The Role of Family Background and Academic Achievement." *American Sociological Review* 71:515-541.

Buchmann, Claudia, Thomas A. DiPrete, and Anne McDaniel. 2008. "Gender Inequalities in Education." *Annual Review of Sociology* 34:319-337.

Bureau of Labor Statistics. 2011. *NLSY79 Children and Young Adults.* Retrieved from http://www.bls.gov/nls/nlsy79ch.htm December 4, 2013.

Butcher, Kristin and Anne Case. 1994. "The Effect of Sibling Sex Composition on Women's Education and Earnings." *Quarterly Journal of Economics* 109(3):531-563.

Conley, Dalton. 2000. "Sibship Sex Composition: Effects on Educational Attainment." *Social Science Research* 29:441-457

de Haan, Monique. 2010. "Birth Order, Family Size and Educational Attainment." *Economics of Education Review* 29(4):576-588.

Dodson, Lisa and Jillian Dickert. 2004. "Girls' Family Labor in Low-Income Households: A Decade of Qualitative Research." *Journal of Marriage and Family* 66(2):318-332.

Downey, Douglas B. 2001. "Number of Siblings and Intellectual Development-The Resource Dilution Explanation." *American Psychologist* 56(6-7):497-504.

Downey, Douglas B. and Dennis J. Condron. 2004. “Playing Well with Others in Kindergarten: The Benefit of Siblings at Home.” *Journal of Marriage and Family* 66(2):333-350.

Dyson, Lily. 2010. “Unanticipated Effects of Children with Learning Disabilities on Their Families.” *Learning Disabilities Quarterly* 33(1):43-55.

Eisenberg, Laurie, Bruce Baker, and Jan Blacher. 1998. “Siblings of Children with Mental Retardation Living at Home or in Residential Placement.” *Journal of Child Psychology and Psychiatry* 39(3):355-363.

Ekas, Naomi V. and Thomas L.Whitman. 2011 “Adaptation to Daily Stress among Mothers of Children with an Autism Spectrum Disorder: The Role of Daily Positive Affect.” *Journal of Autism and Developmental Disorders* 41(9):1202-1213.

Featherman, David L. and Robert M. Hauser. 1978. *Opportunity and Change.* New York: Academic Press, Inc.

Greenberg, J. S., M. M. Seltzer, G. I. Orsmond, and M. W. Karuss. 1999. “Siblings of Adults with Mental Illness or Mental Retardation: Current Involvement and Expectation of Future Caregiving.” *Psychiatric Services* 5:1214-1219.

Hauser, Robert M. and William H. Sewell. 1985. “Birth Order and Educational Attainment in Full Sibships.” *American Educational Research Journal* 22(1):1-23.

Hauser, Robert M. and Hsiang-Hui Daphne Kuo. 1998. “Does the Gender Composition of Sibships Affect Women’s Educational Attainment?” *The Journal of Human Resources* 33(3):644-657.

Hochschild, Arlie Russell. 1989. *The Second Shift*. New York: Avon Books.

Hodapp, Robert M., and Urbano, Richard C. 2007. “Adult Siblings of Individuals with Down Syndrome Versus with Autism: Findings From a Large-Scale US Survey.” *Journal of Intellectual Disability Research* 51:1018–1029.

Hogan, Dennis. 2012. *Exceptional Children, Challenged Families: Raising Children with Disabilities*. New York: Russell Sage Foundation Press.

Krauss, Marty Wyngaarden, Marsha Mailick Seltzer, Rachel Gordon, Donna Haig Friedman. 1996. “Binding ties: The roles of adult siblings of persons with mental retardation.” *Mental Retardation* 34(2):83-93.

Lardieri, Leigh, Jan Blacher, and H. Lee Swanson. 2000. “Sibling Relationships and Parent Stress in Families of Children with and without Learning Disabilities.” *Council for Learning Disabilities* 23(2):105-116.

Meyer, Katherine A., Brooke Ingersoll, and David Z. Hambrick. 2011. "Factors Influencing Adjustment in Siblings of Children with Autism Spectrum Disorders." *Research in Autism Spectrum Disorders* 5(4):1413-1420.

OECD. 2010. "Tertiary education graduation rates", *Education: Key Tables from OECD*, No. 1. doi: 10.1787/20755120-2010-table1. Accessed 10/30/11.

Powell, Brian and Lila Carr Steelman. 1990. "Beyond Sibship Size: Sibling Density, Sex Composition, and Educational Outcomes." *Social Forces* 69(1):181-206.

Powell, Brian and Lila Carr Steelman. 1993. "The Educational Benefits of Being Spaced Out: Sibship Density and Educational Progress." *American Sociological Review* 58(3): 367-381.

Rosenberg, Morris. 1965. *Society and the Adolescent Self-Image.* Princeton, NJ: Princeton University Press.

Saxena, Mamta and Kari Adamsons. 2013. "Siblings of Individuals with Disabilities: Reframing the Literature through a Bioecological Lens." *Journal of Family Theory and Review* 5(4):300-316.

Seltzer, Marsha Mailick, Jan S. Greenberg, Gael I. Orsmond, and Julie Lounds. 2005. "Life Course Studies of Siblings of Individuals with Developmental Disabilities." *Mental Retardation* 43(5)354-359.

Stoneman, Zolinda. 1998. "Research on Siblings of Children with Mental Retardation: Contributions of Developmental Theory and Etiology." Pp. 669-692 in *Handbook of Mental Retardation and Development*, edited by J. A. Burack, R. M. Hodapp, and E. Zigler. Cambridge: Cambridge University Press.

Zajonc, Robert B. 1976. "Family Configuration and Intelligence." *Science* 192(4236):227-236.

Zajonc, Robert B. and Gregory B. Markus. 1975. "Birth Order and Intellectual Development." *Psychological Review* 82(1):74-88.

Table 1. Descriptive Statistics

	Mean or %	Std Dev
Education		
Years completed (mean)	12.91	.043
Gradated from high school (%)	83.30	--
Family Characteristics		
Number of siblings (mean)	3.20	.025
Birth order (mean)	1.71	.018
Mother's education (mean, years)	12.36	.047
Individual Characteristics		
Age (mean, years)	28.46	.054
Sibling of disabled (%)	30.49	--
Male (%)	47.98	--
Black (%)	38.15	--
Hispanic (%)	23.84	--
Non-Hispanic, Non-Black (%)	38.01	--
Number of cases	2,647	

Note: Observations correspond to respondent most recent appearance in the data, and are restricted to those who were at least 24 years of age and have at least one sibling.

Table 2. Coefficients of OLS regression models predicting educational attainment in years by having a disabled sibling.

	Model 1	Model 2	Model 3
Disabled Sibling	-.52 ***	-.72 ***	-.51 ***
Male		-.74 ***	-.74 ***
Disabled Sibling X Male		.38 *	.43 *
Family Characteristics			
Number of Siblings			-.09 *
Mother's Education			.28 ***
Individual Characteristics			
Age			.00
Birth order			-.24 ***
Race (ref. = white)			
Black			-.57 ***
Hispanic			-.47 ***
Constant	13.07	13.44	10.93
R-squared	.0118	.0331	.1864
N	2,647	2,647	2,647

***p<.001, **p<.01, *p<.05, †p<.10 Two-tailed test.

Note: All models restricted to respondents age 24 or greater and compare respondents who had a disabled sibling during childhood to respondents whose siblings are not disabled.

Table 3. Odds ratios from logistic regression models predicting high school graduation by having a disabled sibling.

	Model 1	Model 2	Model 3
Disabled Sibling	.60 ***	.59 ***	.72 *
Male		.63 ***	.59 ***
Disabled Sibling X Male		.99	1.00
Family Characteristics			
Number of Siblings			.87 **
Mother's Education			1.23 ***
Individual Characteristics			
Age			1.07 ***
Birth order			.84 **
Race (ref. = white)			
Black			.78 *
Hispanic			.83
Psuedo R-squared	.0092	.0175	.1022
N	3,889	3,889	3,889

***p<.001, **p<.01, *p<.05

Note: All models restricted to respondents age 19 or greater and compare respondents with disabled siblings to respondents with siblings

Table 4. Coefficients of OLS regression models predicting educational attainment in years by having a disabled sibling at various ages.

	Model 1	Model 2	Model 3	Model 4
Schooling				
Preschool	-.65 ***			
Elementary School		-.63 ***		
Junior High School			-.53 **	
High School				-.58 **
Male	-.59 ***	-.73 ***	-.66 ***	-.69 ***
Disabled Sibling X Male	.19	.58 **	.53	.72 **
Family Characteristics				
Number of Siblings	-.09 †	-.11 **	-.11 **	-.11 **
Mother's Education	.30 ***	.28 ***	.28 ***	.28 ***
Individual Characteristics				
Age	.00	.00	.00	.00
Birth order	-.20 **	-.22 ***	-.25 ***	-.25 ***
Race (ref. = white)				
Black	-.63 ***	-.57 ***	-.57 ***	-.57 ***
Hispanic	-.49 **	-.46 ***	-.48 ***	-.49 ***
Constant	10.48	10.90	10.87	10.86
R-squared	.1951	.1893	.1834	.1844
N	1,691	2,599	2,645	2,647

***p<.001, **p<.01, *p<.05, †p<.10 Two-tailed test.

Note: All models restricted to respondents age 24 or greater and compare respondents who had a disabled sibling during childhood to respondents whose siblings are not disabled.