The Pennsylvania State University

The Graduate School

College of Health and Human Development

PARENTS' DIFFERENTIAL TREATMENT AND SIBLINGS' ACADEMIC OUTCOMES DURING ADOLESCENCE AND EMERGING ADULTHOOD

A Dissertation in

Human Development and Family Studies

by

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Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Doctor of Philosophy

August 2010

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ABSTRACT

There is a wealth of literature suggesting that parents' behaviors and attitudes have implications for adolescents' academic outcomes. This literature has been informative, but has typically focused on the interactions of only one parent-child dyad in the family. The two studies that comprise this dissertation used data from the National Longitudinal Study on Adolescent Health (Add Health) to examine whether parents' differential treatment of their offspring is associated with sibling' academic outcomes. Parents' differential treatment was measured by subtracting younger siblings' from older siblings' reports of parenting. Study 1 used 1008 sibling dyads to examine whether mothers' and fathers' differential treatment of their offspring on two parenting aspects (involvement in education and educational expectations) was associated with two outcomes for older siblings: their educational expectations during adolescence and their odds of starting college during emerging adulthood. This study also examined whether racial-ethnic group moderated these associations. Raw correlations in the overall sample showed positive associations between these sets of variables, but regression models suggested that parents' differential treatment was not associated with older siblings' achievement outcomes after controlling for their individual reports of parenting. Correlation analyses also suggested that the link between parents' differential treatment and siblings' achievement outcomes may be stronger for whites than for other racial-ethnic groups. Regression models including controls for older siblings' individual reports of parenting suggested a tendency for blacks to be more likely than whites to show negative associations between differential treatment and older siblings' achievement outcomes. Study 2 was motivated by national data showing that females are now more likely than males to attend college. This study used 565 mixed sex sibling dyads to examine whether maternal differential

treatment during adolescence could be associated with the odds of just sisters vs. just brothers in the family starting college during emerging adulthood. After controlling for other demographic variables, the gender gap favoring sisters was larger in black families than in other racial-ethnic groups and was larger in two parent biological family structures than in other family structures. A multinomial logistic regression model that controlled for family background factors and differences between siblings' academic achievement suggested that maternal differential treatment in educational expectations was associated with the odds of just sisters vs. just brothers in the family starting college. Overall, the findings suggested that differences in academic achievement may be more strongly linked than parents' differential treatment to sisters' and brothers' differential odds of starting college, but suggest the possibility that parenting factors could play a small role.

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ACKNOWLEDGEMENTS

To my advisor, Eric Loken, thank you for the countless hours you have spent over the years providing me with sound guidance and insightful feedback on my work. Thank you for the conscientiousness and care that you put into being my mentor. To Susan McHale, thank you for introducing me to sibling research, for the opportunity to work with you, and thank you for so many helpful comments and ideas during the early stages of this dissertation. To Hobart Cleveland, thank you for your sincere interest in helping to make my dissertation better and for your helpful comments on an earlier draft. To Aleksandra Slavkovic, thank you for teaching me about the world of discrete data. To Rayne Sperling, thank you for your enthusiasm and for your constructive comments during the proposal stage of this dissertation.

To my mother, Bob, Scott, Bobby, Jeni, Sue, John, and Ashley, thank you for all of your support along the way. Not a day goes by that I don't appreciate how amazingly lucky I am to have such a wonderful family. To my mom, especially, thank you for the example you set of strength and perseverance, even when our world seemed to have fallen apart. Thank you also for everything you did to make sure that I had the best in life and for always, always being there for me. To my dad, you have been with me in spirit during this journey; thank you for your example of hard work and high standards. To my cat, Bambo, thank you for the times that you kept me company while I worked on my dissertation. Thank you for the brief sections of my dissertation that you typed, even if they made no sense! And, finally, thank you to my husband and best friend, Christopher. Thank you for being you, for always believing in me, and for making me laugh even during the most challenging times. The path I had to travel to be able to complete this dissertation was, in some ways, unexpected, so thank you also for your constant love and support during all of this; I wouldn't have gotten here without you.

CHAPTER 1

INTRODUCTION

PARENTS' DIFFERENTIAL TREATMENT AND SIBLINGS' ACADEMIC OUTCOMES DURING ADOLESCENCE AND EMERGING ADULTHOOD

PARENTS' DIFFERENTIAL TREATMENT AND SIBLINGS' ACADEMIC OUTCOMES DURING ADOLESCENCE AND EMERGING ADULTHOOD

Adolescence and emerging adulthood are characterized by identity exploration, and by increases in autonomy and personal responsibility (Arnett, 2000; Crockett & Crouter, 1995; Marcia, 1966). During this time, individuals often ponder who they want to become and many of the decisions that they make will have both short- and long-term consequences, including decisions about education and occupation (Crockett & Crouter, 1995; Lerner & Galambos, 1998). There are many paths that individuals can take to reach financial independence and occupational success during adulthood; one path that may be beneficial to pursue is post-secondary education.

Post-secondary education has become increasingly important for attaining financial success in the U.S., largely because shifts in the economy during the past several decades have made it more difficult for individuals with a high school degree to find a well-paying job. Census data indicate that in 1999, individuals who had a bachelor's degree and worked full time earned an average of about $53,000 per year; comparable workers with a high school degree earned about $30,500 per year (United States Census, 2002). Education level is not the only factor that can impact transitions from school to work, but, on average, individuals who don't attain higher education may also face more challenges during this transition than those who do; some of these challenges include unemployment, accepting low-wage jobs, or struggling to find full-time work (Cook & Furstenberg, 2002; Haggerty, 1989). Struggles in an individual's work life can put them at risk for lower levels of psychological well-being (Lucas et al., 2004; McKee-Ryan et al., 2005).

Because of the potential benefits of post-secondary education, it is important to understand factors that predict college attendance. In addition to family background

characteristics (e.g. parent education and family income), individual and social factors have also been found to be associated with the likelihood of college attendance (Eccles, Vida, & Barber, 2004; Sewell, Haller, & Ohlendorf, 1970). Individuals who perceive themselves as more academically capable and who show higher academic achievement and educational expectations are more likely to attend college (Carpenter & Fleishman, 1987; Eccles et al., 2004; Hossler & Stage, 1992). Having friends who plan to attend a post-secondary institution is also positively associated with college attendance (Carpenter & Fleishman, 1987).

Parents' behaviors and attitudes may be another factor that impacts attainment of post secondary education (e.g. Eccles et al., 2004). Parents serve many roles, including that of role model, manager, disciplinarian and nurturer. Through these roles, parents are in a position to impact their offspring in important ways, including the way they view their academic capabilities, how they assess their ability and desire to further their education after high school and the decisions they ultimately make about pursuing a college degree (Eccles et al., 2004; Grolnick, Ryan, & Deci, 1991; Jodl et al., 2001). Research suggests that, on average, parents who show more involvement in their child's education, and who have higher educational expectations for their children, have adolescents with greater academic achievement, higher educational expectations, and a greater likelihood of attending and completing college (Eccles & Harold, 1993; Eccles et al., 2004; Fan & Chen, 2001; Flouri, 2006; Hossler & Stage, 1992; Trusty, 1998; but see Desimone, 1999 for an exception). The studies that have yielded these findings have been informative and have many strengths. The majority of this literature, however, has used samples that only include one of the children in the family.

Theoretical and empirical literature suggests that there is value in examining within-family dynamics and multiple parent-child dyads in the family. Family systems theory

highlights that the role family relationships play in developmental outcomes is complex and suggests that it is not just the parent-child dyadic relationship that may matter for a child's outcomes (Cox & Paley, 1997; Whitchurch & Constantine, 1993). Sibling research based on this theory suggests that parents may play a role in a child's outcomes not only through their interactions with that child, but also through their interactions with other offspring in the family (e.g. Feinberg & Hetherington, 2001).

In addition, ideas from both social learning theory and social comparison theory point to the potential for siblings to be influential figures in development. These theories suggest that our behaviors and self-perceptions are shaped by watching others, particularly those who are similar to us and with whom we regularly interact (Bandura, 1977; Festinger, 1954; Rogers, Smith, & Coleman, 1978). Given that siblings are typically raised in the same family and may share similarities such as genetics, gender, or relative closeness in age, they have the potential to influence individuals' outcomes and to be an important source of social comparison. Furthermore, although empirical literature often finds similarities between siblings' outcomes (e.g. delinquency and teenage pregnancy), some authors have noted that environmental factors may make siblings in the same family as different as two individuals from different families and that the similarities between them may be mostly due to genetic factors (Daniels et al., 1985; East & Jacobson, 2001; Rowe & Gulley, 1992; Slomkowski et al., 2005). This has prompted researchers to question whether siblings experience their family environments in the same way.

The notion that relationships beyond the parent-child dyad may matter for individual outcomes, the realization that siblings are in a prime position to influence one another, and research findings raising the possibility that siblings experience their family environment differently have all provided an impetus for research on parents' differential treatment of their

offspring. Through obtaining observer ratings of parents' interactions with each sibling or through asking parents or siblings to report on parental treatment of each sibling, researchers can calculate difference scores to measure parents' differential treatment (e.g. Brody, Stoneman, & McCoy, 1992; Shanahan et al., 2008). Literature on this topic suggests that many individuals do perceive that their parents treat them differently than they treat their sibling and that parents' differential treatment may have implications for siblings' behavioral and emotional outcomes (e.g. Shebloski, Conger, & Widaman, 2005). A greater degree of differential treatment on parenting aspects such as hostility and responsiveness has been found to be associated with greater differences in sibling outcomes (e.g. delinquency, negative emotionality) and being the less favored sibling may be associated with less desirable outcomes (Brody et al., 1992; Conger & Conger, 1994; Feinberg & Hetherington, 2001; Shebloski et al., 2005).

The differential treatment literature has produced many interesting findings through its focus on parenting domains such as warmth and negativity, and on sibling outcomes such as delinquency, emotionality, and self-esteem. This literature, however, has generally not focused on parenting domains specifically relevant to siblings' academic achievement. The two empirical papers that follow will focus on this topic. Both studies employ data from the National Longitudinal Study of Adolescent Health (Add Health) and contain sibling samples that are diverse in racial-ethnic composition, social class, and family structure.

The first paper is an initial step toward addressing the void of literature on whether parents' differential treatment is associated with siblings' achievement outcomes. This paper examines whether the difference between older and younger siblings' reports of two parenting aspects (involvement in education and educational expectations) is associated with two outcomes for older siblings: their educational expectations during adolescence and whether or not they

have started college during emerging adulthood. This paper will also examine whether racial-ethnic group moderates these associations; whether parents' differential treatment shows similar associations with developmental outcomes across racial-ethnic groups is largely unknown (McHale et al., 2005). This study will focus on siblings' reports of both mothers and fathers.

The second paper is motivated by the current national trend favoring females in college attendance; this gender gap is a reversal of the one seen in previous decades, which favored males. This paper will utilize a sample of mixed sex sibling dyads to focus on within family differences in sisters' vs. brothers' odds of starting college and whether sisters and brothers differ in their perceptions of their mothers' degree of involvement in their education and to what extent she expects them to attend college. The paper will then examine whether the difference between their perceptions of these maternal variables is associated with the odds of just sisters vs. just brothers in the family starting college, in order to infer whether family processes could play a role in the current gender gap in post-secondary education. Together, the findings from these two studies will be a first step toward investigating the role of within-family processes in siblings' achievement outcomes and will be among the first studies to examine parents' differential treatment of their offspring across diverse racial-ethnic groups.

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CHAPTER 2

THE ROLE OF PARENTS' DIFFERENTIAL TREATMENT IN SIBLINGS' EDUCATIONAL EXPECTATIONS AND ODDS OF STARTING COLLEGE

ABSTRACT

This study used 1008 sibling dyads from the National Longitudinal Study on Adolescent Health (Add Health) to examine two forms of mothers' and fathers' differential treatment of their offspring (involvement in education and educational expectations) and two achievement outcomes for older siblings (educational expectations during adolescence and odds of starting college during emerging adulthood). Parents' differential treatment was measured by subtracting younger siblings' from older siblings' reports of parenting. The first goal of this study was to examine correlates of parents' differential treatment. Siblings' degree of biological relatedness, family income, parent education level, and family structure all showed weak associations with some forms of parents' differential treatment. The second and third goals were to examine whether parents' differential treatment was associated with older siblings' outcomes and whether racial-ethnic group (white, black, other) moderated these associations. Raw correlations in the overall sample showed positive associations, but regression models suggested that parents' differential treatment was not associated with older siblings' achievement outcomes after controlling for their individual reports of parenting. Correlation analyses also suggested that the link between parents' differential treatment and older siblings' outcomes may be stronger for whites than for other racial-ethnic groups. Regression models including controls for older siblings' reports of parenting suggested a slight tendency for blacks to be more likely than whites to show negative associations between differential treatment and older siblings' achievement outcomes. Potential explanations for this finding are discussed.

THE ROLE OF PARENTS' DIFFERENTIAL TREATMENT IN SIBLINGS' EDUCATIONAL EXPECTATIONS AND ODDS OF STARTING COLLEGE

Although there are many pathways to attaining financial independence during adulthood, post-secondary education has become increasingly important in the U.S. for finding a well-paying job. On average, individuals with high school degrees earn only 56% of what individuals with bachelor's degrees earn and they are at an increased risk for poverty (Current Population Survey, 2008). Because decisions about whether or not to pursue post secondary education can have important implications, it is important to understand which factors might promote advantageous academic outcomes and higher education.

A large body of research has suggested that parents' behaviors and attitudes are associated with adolescents' academic outcomes (e.g. Eccles & Harold, 1993; Gill & Reynolds, 1999). This research has generally focused on the interactions of one parent-child dyad in the family, but parents may also play a role in a child's outcomes through their interactions with other offspring in the family (Shanahan et al., 2008). The present study will examine whether parents' differential treatment of their offspring is associated with older siblings' educational expectations during adolescence and their odds of starting college during emerging adulthood.

Factors Associated with College Attendance

Demographic characteristics (e.g. parent education) are associated with adolescents' likelihood of attending college, but many other factors, including academic motivation, may also be important (Carpenter & Fleishman, 1987; Eccles, Vida, & Barber, 2004; Sewell, Haller, & Ohlendorf, 1970). Eccles and colleagues (2004) found that students' persistence and perceptions of academic competence during sixth grade academic tasks were positively associated with their likelihood of being enrolled in college two years after high school. Furthermore, adolescents

who have higher educational aspirations are more likely to be enrolled in college track courses during high school and to attend college (Carpenter & Fleishman, 1987; Eccles et al., 2004; Sewell et al., 1970). Students who have greater mental ability and who demonstrate higher academic achievement are also more likely to attend college, both because they are more skilled students and because they are more likely to be encouraged to pursue higher education (Carpenter & Fleishman, 1987; Eccles et al., 2004; Hossler & Stage, 1992; Sewell et al., 1970; Sewell & Shah, 1968). Finally, interactions with others may impact which students decide to attend college. Having friends who plan to attend a post-secondary institution is associated with college attendance (Carpenter & Fleishman, 1987). Parents may also play a role in their children's educational attainment, through impacting their educational expectations, academic motivation and academic achievement, all of which have been found to be positively associated with the likelihood of attending a post-secondary institution (Carpenter & Fleishman, 1987; Eccles et al., 2004; Hossler & Stage, 1992; Jodl et al., 2001; Sewell et al., 1970; Sewell & Shah, 1968).

Parenting and Academic Outcomes

Two parenting factors that have emerged as predictors of adolescents' academic outcomes are parental involvement in education and parents' educational expectations (e.g. Eccles & Harold, 1993; Gill & Reynolds, 1999). Although fathers are sometimes included, this literature generally either only pertains to mothers or does not distinguish between mothers and fathers.

Parental Involvement in Education

The specific behaviors that parents engage in are likely to play a role in children's academic success, including involvement in their child's education. Parents may become

involved in many different ways, such as asking children about their school day, helping with homework, becoming involved in school governance, and attending school events. Research generally suggests that, regardless of how parental involvement in education is conceptualized, parents who are more involved have children and adolescents who show higher levels of academic performance (Eccles & Harold, 1993; Fan & Chen, 2001; Hill & Craft, 2003; Steinberg et al., 1992; Stevenson & Baker, 1987; but see Desimone, 1999 for an exception). Using a small nationally representative sample, Stevenson and Baker (1987) found that maternal involvement in education, as measured by involvement in school activities such as attending parent-teacher conferences, accounted for significant variance in children's school performance after controlling for mother's education level and child's gender and age. Adding maternal involvement as a predictor resulted in an increase of the R^2 from .04 to .15. In a sample of low SES, rural African American families, Brody, Stoneman, and Flor (1995) also found positive associations between both maternal and paternal involvement and children's academic competence.

Parental involvement in education has also been shown to be positively associated with adolescents' academic motivation and may have associations with educational expectations and educational attainment (Flouri, 2006; Grolnick & Slowiaczek, 1994; Ou, 2005; Trusty, 1998; Trusty, Plata, & Salazar, 2003). Using data from the National Education Longitudinal Study (NELS), Trusty (1998) found that high school seniors who reported that their parents attended more school activities expected to complete more years of schooling when they were interviewed two years after their senior year. Furthermore, Flouri (2006) found that mothers' and fathers' interest in their child's education at age 10 was positively associated with educational attainment at age 26.

There are many ways that parental involvement in education may positively impact academic outcomes. Parental involvement may convey that education is important and that the child should strive to be academically successful. Parental involvement may also convey to children that they are cared about and valued, perhaps facilitating children's perceptions of self-worth and competence. It may also be that when parents are involved, they are seen as a source of support that provides a buffer when academic life becomes stressful. There may also be direct effects of parental involvement. For example, children may do better in school when parents help with homework.

Few of these potential reasons for the positive association between parental involvement and achievement have been empirically examined. However, Grolnick and colleagues (2000) found that when mothers showed greater involvement with their sixth-graders, students experienced less of a decline in perceived academic competence during the transition from 6th to 7th grade (Grolnick et al., 2000). Similarly, Grolnick and Slowiaczek (1994) found that behavioral involvement (parental involvement in school activities) and cognitive/intellectual involvement (parents' encouragement of intellectual activities at home) were positively associated with school grades through their association with perceived academic competence. These findings suggest that one reason parental involvement in education is associated with better academic performance is that parents' involvement could convey to children that they are competent individuals who can succeed in academics.

Research also suggests that parental involvement may have associations with children's academic behavior in the classroom, which in turn, may be associated with children's academic achievement. Hill and Craft (2003) found that, for both European American and African American children, academic skills, such as being a self-starter or behaving well in the

classroom, were found to mediate between parental involvement in education and reading achievement. Perhaps parental involvement means that children come to value education and behave in ways that help them to excel in the classroom. Although more research is needed on the mechanisms through which parental involvement in education is associated with achievement outcomes, these studies suggest that parental involvement might facilitate higher educational expectations and increased college attendance through impacting children's self-perceptions, motivation, and behavior.

Parents' Educational Expectations.

Parents' expectations regarding adolescents' educational attainment may be another important factor associated with academic outcomes. Higher parental educational expectations are associated with higher academic achievement for children and adolescents (Englund et al., 2004; Fan & Chen, 2001; Gill & Reynolds, 1999). Furthermore, when parents expect their adolescents to complete more years of schooling, adolescents themselves also have higher educational aspirations (Carpenter & Fleishman, 1987; Gill & Reynolds, 1999; Hossler & Stage, 1992; Jodl et al., 2001; Sewell & Shah, 1968; Trusty & Pirtle, 1998; Trusty et al., 2003). Hossler and Stage (1992) found that parents' educational expectations were highly correlated with high school students' plans to attend college (r = .45). It may also be the case that parents' educational expectations have implications for the actual level of education that their offspring attain (Carpenter & Fleishman, 1987; Eccles et al., 2004; Sewell et al., 1970). Thompson and colleagues found that, for both African American and European American students, parents' educational expectations during students' senior year in high school was a predictor of post secondary educational attainment eight years after the students had completed high school (Thompson et al., 2006). Overall, research that has focused on the interactions of parents with

one child in the family suggests that parents' involvement in education and parents' educational expectations may be important for academic outcomes.

Parents' Differential Treatment

Family systems theory suggests the importance of looking beyond one dyad in the family to understand children's development; the interactions of each dyad may affect and be affected by all other family members (Cox & Paley, 1997; Whitchurch & Constantine, 1993). In support of family systems theory, the literature on parents' differential treatment suggests that parents may interact differently with different offspring in the family and that these differential interactions might have implications for child outcomes above and beyond how parents interact with each individual child (e.g. Feinberg & Hetherington, 2001). Through obtaining observer ratings or family reports of parents' interactions with each sibling, researchers can create measures of the difference between siblings' family experiences. For example, an observer rating of maternal hostility with the younger sibling might be subtracted from an observer rating of parental hostility with the older sibling to calculate a relative difference score (e.g. Conger & Conger, 1994). This difference score can then be used to examine associations between differential parenting and developmental outcomes.

Predictors of Parents' Differential Treatment

Although there is not much research on factors related to parents' differential treatment in involvement in education and educational expectations, there is research on factors related to differential maternal warmth and hostility. This literature suggests that parents show more equal treatment when siblings are more genetically related, closer in age, the same gender and more similar in abilities (Brody et al., 1992; Daniels et al., 1985; Reiss et al., 1994; Shebloski, Conger, & Widaman, 2005). Previous research has also found that more familial stress may be

associated with a greater degree of differential treatment (McHale, Kim, & Whiteman, 2006). This suggests the possibility that low SES families may show more differential treatment than high SES families in parenting domains such as involvement in education and educational expectations, given that, at least on average, low SES families may experience a greater degree of stress. Similar findings might result for non two-parent biological and ethnic minority families.

Differential Treatment and Developmental Outcomes

Although there is not much research on the association between differential treatment and achievement outcomes, research on other developmental outcomes suggests that a greater degree of differential treatment is associated with greater differences in sibling outcomes and less desirable outcomes for the less favored sibling (Brody et al., 1992; Conger & Conger, 1994; Feinberg & Hetherington, 2001; McHale et al., 2006; Shebloski et al., 2005). Conger and Conger (1994) found that the adolescent sibling who was the recipient of more paternal hostility at an initial assessment showed more delinquency than the more favored sibling two years later. Furthermore, although many studies on parents' differential treatment have not controlled for parents' absolute level of treatment toward each sibling, Feinberg and Hetherington (2001) found that differential warmth and negativity were associated with child outcomes (e.g. antisocial behavior) above and beyond the absolute level of warmth and negativity each parent showed toward each child. This suggests that the way each parent interacts with each sibling is of importance, but that actual or perceived differences between siblings' relationships with the same parent may also be associated with developmental outcomes. The current study will examine whether differential treatment in involvement in education and educational expectations

is associated with academic outcomes, and whether it is associated with these outcomes above and beyond the absolute level of parental treatment that individual adolescents receive.

Some research has also suggested that children may be more sensitive to paternal differential treatment than to maternal differential treatment, perhaps because children generally spend less time with their fathers, making paternal differential treatment more salient when it occurs (Feinberg & Hetherington, 2001). For example, Brody and colleagues (1994) found that fathers' differential treatment in negativity toward siblings, but not mothers', was a predictor of sibling relationship quality in middle childhood and early adolescence. Other research, however, which focused on differential treatment in parental warmth and in parent-child conflict, found that associations between differential treatment and outcomes were similar for mothers and fathers (Shanahan et al., 2008). These authors operationalized differential treatment as the difference between first-borns' and second-borns' individual perceptions of the parent-child relationship. As part of examining the association between parents' differential treatment and adolescents' academic outcomes, the current study will briefly examine whether parents' differential treatment has a stronger association with achievement outcomes when it is displayed by fathers, rather than mothers.

In addition to examining associations between parents' differential treatment and older siblings' achievement outcomes in the overall sample, the present study will also examine whether these associations are moderated by racial-ethnic group. The vast majority of studies on parents' differential treatment have only included European American families (e.g. Brody et al., 1992; Conger & Conger, 1994; Feinberg & Hetherington, 2001) or have included more than one racial-ethnic group (e.g. Daniels et al., 1985) but have not examined whether the implications of differential treatment differs across these groups. It therefore remains largely unknown whether

the types of associations seen between parents' differential treatment and children's outcomes in European American samples are universal across racial-ethnic groups (McHale et al., 2005).

Literature on parenting and culture suggest some reasons why the implications of parents' differential treatment may vary across racial-ethnic groups. First, different groups may interpret the same parenting behaviors differently. For example, a study by Gonzalez and colleagues (1996) found that when European Americans and African Americans observed the same sample of African American parents, European Americans had a greater tendency to label the African American parents as authoritarian (Gonzalez, Cauce, & Mason, 1996). These differing interpretations may sometimes mean that the same parenting behaviors show differential associations with child outcomes across racial-ethnic groups. Deater-Deckard and colleagues (1996) found that physical discipline was linked to externalizing behaviors for white youth, but not for black youth, and other literature suggests that the associations between Baumrind's parenting styles and achievement outcomes may be stronger and more consistently found for whites, as opposed to minority groups (Dornbusch et al, 1987; Dornbusch et al, 1990; Gonzalez et al, 2002; Steinberg et al, 1991). For example, Dornbusch and colleagues (1987), after controlling for parent education and child gender, found no associations between permissive, authoritarian or authoritative parenting and academic achievement within their subsample of African Americans. It should be noted, however, that there is also literature showing similar associations between parenting aspects and child outcomes across racial-ethnic groups in the U.S. (e.g. Hill and Craft, 2003), and that in some studies, there is less statistical power to detect parenting effects in minority groups than in European American groups (e.g. Dornbusch et al, 1987).

Another reason why associations between parents' differential treatment and outcomes could vary across racial-ethnic groups is that, due to cultural differences, the relevance of certain parenting behaviors may vary across groups. European Americans typically value independence, individualism, and personal achievement and it may benefit their self-conceptions when they perceive they are more successful or of higher status than another individual (McHale et al., 2005; Small, 2001). African cultures are traditionally more egalitarian than western cultures (Small, 2001), and among African Americans, valuing egalitarianism could mean that perceiving "better" parental treatment than one's sibling may not be as important or as relevant as it is among European Americans. Another relevant cultural difference is that African Americans, compared to European Americans, provide more frequent emotional and financial support to extended family members; African Americans are also more likely than European Americans to reside with extended family members (Taylor, 2000). This could mean that when parental differential treatment occurs, support from other family members could buffer its impact, making differential treatment have less of a negative impact on disfavored siblings.

Other ethnic groups, such as Hispanics, tend to value the well-being of the family as a whole more than they value the success of an individual within the family (Zinn & Wells, 2000). This may mean that siblings in these families are less focused on comparing themselves to their siblings or that it is not as harmful to them when they perceive their sibling gets better treatment (McHale et al., 2005). One study that did focus on the role of culture in parents' differential treatment found that associations between parents' differential treatment and adolescents' reports of adjustment, parental acceptance, and parental fairness were stronger among Mexican Americans that showed lower levels of familism; familism is embodied by having a sense of obligation to, and respect for, family members (McHale et al., 2005). The findings from this

study suggest that examining variability across diverse groups in the association between parents' differential treatment and siblings' outcomes is a viable focus for research.

Research Questions

This study will address whether parents' differential treatment is associated with siblings' academic outcomes and will also examine predictors of parents' differential treatment in involvement in education and educational expectations. In order to avoid statistical dependence issues, we focused on the outcomes of the older sibling from each sibling dyad; the older siblings will have had more of an opportunity than the younger siblings to start college, an outcome of interest in this study. The following research questions will be addressed, using data for both mothers and fathers.

1. Do older and younger siblings differ in their perception of their parents' degree of involvement in their education or in their perception of their parents' educational expectations?
2. Are family characteristics associated with the degree of parents' differential treatment that siblings experience? The following family characteristics will be examined: family income, primary parent education, racial-ethnic group, family structure, gender composition of the sibling dyad, siblings' degree of biological relatedness and the difference between siblings' academic aptitude.
3. Is the relative difference between older and younger siblings' perceptions of parental treatment associated with older siblings' academic outcomes? And are the associations stronger when fathers, as opposed to mothers, are the parental figure perceived to engage in the differential treatment? This study will focus on two measures of parents' differential treatment (involvement in education and educational expectations) and two

achievement outcomes (educational expectations during adolescence and odds of starting college during emerging adulthood).

4. Is the association between parents' differential treatment and older siblings' achievement outcomes moderated by racial-ethnic group?

METHODS

Participants

Overview

Data for this study came from the pairs sub-sample of the National Longitudinal Study of Adolescent Health (ADD Health) (see Bearman, Jones, & Udry, 1997 for details on the larger study; see Slomkowski et al., 2005 for a description of the pairs sub-sample). ADD Health is a national U.S. study of adolescents that have been followed into adulthood. Researchers collected data on a variety of domains (physical health, mental health, personality, education outcomes, etc.) in order to assess adolescents' health and to examine correlates of health compromising and enhancing behaviors. The study includes both parent and adolescent interviews. As part of the ADD Health study, data were collected on many specialized samples, including a sample of siblings that varied in genetic relatedness.

This study used three waves of the ADD Health data. At wave 1 in 1994, participants were in grades 7 through 12. Wave 2 was conducted in 1996, and wave 3 was conducted in 2000. For the present study, family background characteristics and parenting data came from wave 1 and educational outcome data came from waves 2 and 3.

Sample Selection Criteria

In drawing the sample for this study, there were several selection criteria. The pairs sub-sample of ADD Health included 3139 sibling dyads at wave 1. For the current study, 245 dyads were initially deleted for one or more of the following reasons: (a) youth did not have data at any of the three study waves, (b) siblings' birth order in the dyad and their ages could not be determined due to missing birth dates; (c) data for some youth were duplicated. From this

starting sample of 2894 sibling dyads, dyads were retained if the oldest sibling had participated in all three waves. This resulted in a sample of 2217 pairs.

Of these 2217 pairs, 472 were in families (n = 156) that had more than one sibling pair. Therefore, one study sibling pair was selected from each of these 156 families; we chose to select the oldest study sibling pair from each family that had members with consecutive birth orders. For example, in a family that initially had four study siblings (birth orders of 1, 2, 3 and 4) but had an oldest study sibling (birth order = 1) that did not have data from all three waves, the birth order 2/3 pair would be retained. This phase of the selection process allowed us to avoid statistical dependence issues and to select adolescents who had the most time to have started college. Consecutive birth order was used as a selection criterion because family conditions are probably the most similar for those closer in birth order. Birth order was randomly assigned for monozygotic (MZ) and dizygotic (DZ) twins. This selection criterion resulted in a sample of 1901 sibling dyads.

Pairs were then removed from the sample if parents reported that one or more of the adolescents in the pair was mentally retarded. In cases where parents did not indicate whether or not their child was mentally retarded (n = 480; 12.6% of sample), the pair was retained. After this selection step, the sample contained 1884 sibling dyads.

Families were then removed if one or both siblings did not report having both a mother and a father figure, given that these families would not have data for the maternal and paternal differential treatment variables and imputed values would be invalid. (If individuals are missing data because they legitimately do not have values on the missing variables, it is not acceptable to impute data for these individuals.) The remaining sample was 1192 dyads. Older siblings were then excluded if they had already started college by wave 2 (n = 184); the educational

expectations outcome, which focused on whether adolescents expected to attend college in the future, would not be meaningful for these individuals.

Finally, we examined whether older siblings had the opportunity to start college; if older siblings were 19 or younger at wave 3 and had not yet completed 1 year of college, they were considered as not having the opportunity to start college. Using this definition, only 10 older siblings in the sample (less than 1%) were determined to not have the opportunity to start. Therefore, these older siblings were retained and were counted among older siblings who had not yet started college by wave 3. The final sample was 1008 sibling dyads.

Sample Description

In the current sample, older siblings were an average of 16.2 (SD = 1.4) at wave 1, 17.1 at wave 2, and 22.5 at wave 3. Younger siblings were an average of 14.7 (SD = 1.5) at wave 1, 15.6 at wave 2 and 21.0 at wave 3. Sibling dyads have an average age-spacing of 1.5 years (SD = 1.4) and about 61% of the sample is comprised of same sex sibling dyads. The average 1995 family income among families with non-missing income data was 52.6 thousand dollars (SD = 46.8) and, based on families with non-missing parent education data, about 25% of the families had a primary parent with a college degree or higher. About 68% of the sibling dyads were reported to be in two-parent biological families at wave 1. Approximately 62% of the sibling dyads were white, 14% of the sibling dyads were black, and approximately 15% of the sibling dyads were Hispanic. The remaining 9% were either Asian, Native American/Pacific Islander, another less common ethnicity or the siblings in the dyad differed in their reported ethnicity. In addition, the sample contained 110 monozygotic (MZ) twin dyads, 194 dizygotic (DZ) twin dyads, 462 full sibling dyads, 91 half sibling dyads, 25 cousin dyads, 112 non-related siblings

dyads (e.g. step-siblings) and 14 indeterminate twin dyads (twins for which zygosity could not be determined).

Measures

Background Variables

Family income. The primary parent in each family reported the total family income in thousands of dollars for the year 1995. The primary parent was typically the adolescent's mother, but if the mother did not reside in the household, the interviewers were instructed to select the first person from the following list who did reside in the household: stepmother, other female guardian (e.g. grandmother), father, stepfather, other male guardian (e.g. grandfather). In this sample, about 85% of the primary parents were the older sibling's biological mother, about 5% were the stepmother, about 4% were the adoptive mother, about 3% were the biological father and the remaining primary parents were one of the following: foster mother, grandmother, aunt, other female relative, other female non-relative, or uncle. The natural log of family income was used for all analyses in this study because the distribution of this variable showed a positive skew.

Primary parent education. During the wave 1 parent interview, the primary parent in the family reported on how far he or she had gone in school. The original ADD Health response scale was altered for this study so that the responses were ordered from lowest to highest education level; the resulting response scale ranged from 0 to 7 (0 = "never went to school", 1 = "eighth grade or less", 2 = "more than eighth grade but not high school graduate", 3 = "went to business, trade, or vocational school instead of high school", 4 = "high school diploma", 5 = "some post high school education", 6 = "college graduate", 7 = "some professional training beyond college").

Family structure. Family structure is based on the target adolescents' report of the household roster at wave 1. Adolescents reported who currently lived in their household and specified how each person in the household was related to them. Family structure has two categories: two-parent biological family vs. other family structure. These categories were used because the specific family structure groups among non two-parent biological families are relatively small.

Older sibling's racial-ethnic group. At wave 1, adolescents selected which of the following categories best described their race: White, African American or Black, American Indian or Native American, Asian or Pacific Islander, Other. They were also asked whether or not they were Hispanic. Based on these questions, we formed three categories: white (non-Hispanic) (n = 629), black (non-Hispanic) (n = 137), and other. The "other" group contains Hispanics (n = 149), Asian/Pacific Islanders (n = 80), American Indians/Alaskan Natives (n = 11), and 2 older siblings of some other racial-ethnic group. The three-group categorization was chosen because black and white older siblings were the most different on key associations in this study and having more racial-ethnic groups would have resulted in small groupings. Based on the three category system, older and younger siblings' racial-ethnic group was the same in about 96% of the dyads, suggesting that in most cases older siblings' racial-ethnic group is probably also the family's racial-ethnic group.

Older sibling's academic aptitude. Older siblings' academic aptitude is measured using their score on the ADD Health Picture Vocabulary Test (AHPVT). At wave 1, adolescents completed a test based on the Peabody Picture Vocabulary Test-Revised (PPVT-R). The PPVT-R is used to measure receptive vocabulary. Because there is research showing that vocabulary is a good predictor of school achievement, a secondary use of the test is to estimate academic

aptitude (Dunn & Dunn, 1981). The PPVT-R has been found to correlate .78 ($p < .001$) with the Revised version of the Wechsler Intelligence Scale for Children (WISC-R), (Alpeter & Handel, 1986), .68 with the Peabody Individual Achievement Test, and .32 with the Metropolitan Achievement Tests (Dunn & Dunn, 1981). Split-half reliability coefficients for the PPVT-R have been found to range from .61 to .88 (Dunn & Dunn, 1981).

The ADD Health version of the PPVT-R contained 87 items. For each of the 87 items, the interviewer read a word aloud. The adolescent was then asked to select the picture (there were four choices) that best fit the meaning of each word. For example, the word "furry" had these pictures to choose from: parrot, dolphin, frog, and cat. Scores on the test were standardized by age and the resulting scores ranged from 13 to 146. The mean score for older siblings in this sample was 100.93 (SD = 13.76).

Biological relatedness. Each sibling dyad was assigned a genetic relatedness score that ranged from 0 to 1 and corresponded to the average proportion of genes that each biological relatedness type shares. Non-related siblings were assigned a score of 0, half siblings were assigned a score of .25, full siblings and DZ twins were assigned a score of .5 and MZ twins were assigned a score of 1. (Cousins and indeterminate twins were excluded from analyses that included this biological relatedness variable.)

Parenting Measures[1]

Maternal involvement in education. During wave 1, adolescents indicated which of the following they had done with their mother in the past four weeks: talked about school work or grades, worked on a project for school, talked about other things they were doing in school. Because the item regarding working on a project for school had less face validity than the other two items (the adolescent might not have had a school project, for example) and would have

lowered the alpha to about .58, this item was dropped. We created a sum of the remaining two items for individuals who answered both items. Scores ranged from zero (adolescents indicated that their mother did none of these things) to two (adolescents indicated that their mother did both). Chronbach's alpha for older siblings was .66 and the alpha for younger siblings was .62. The correlation between the two items for older siblings was $r = .50$ ($p < .05$) and the comparable correlation for younger siblings was $r = .45$ ($p < .05$).

Paternal involvement in education. This measure was based on adolescents' wave 1 report about their fathers and was constructed in a similar manner as the one above for mothers. Cronbach's alpha for older siblings was .70 and the alpha for younger siblings was .63.

Maternal college expectations. In wave 1, adolescents responded to one item regarding their mothers' expectations about their college attendance: "On a scale from 1 to 5, where 1 is low and 5 is high, how disappointed would she be if you did not graduate from college?".

Paternal college expectations. During wave 1, adolescents responded to a comparable item regarding their fathers' expectations about their college attendance.

Construction of Differential Treatment Variables

Directional measures. For each parenting measure, the younger sibling's score was subtracted from the older sibling's score to form directional measures of maternal and paternal differential treatment. For example, for maternal involvement in education, the value for the younger sibling's report of maternal involvement was subtracted from the value for the older sibling's report of maternal involvement. The majority of the analyses use the directional measures of differential treatment. The directional measures convey information about both the degree and the direction of differential treatment.

Absolute value measures. Maternal and paternal differential treatment for involvement in education and college expectations was also calculated by taking the absolute value of the difference between the younger and older siblings' scores in each sibling dyad. These measures convey information about the degree of differential treatment, but not the direction. These measures are used in the analyses that examine family correlates of differential treatment, given that it may be more logical for family demographic variables (e.g. income) to be associated with the extent to which differential treatment occurs in the family, rather than which sibling (older or younger) reports the higher levels of the parenting variables.

Outcome Measures[1]

Educational expectations. At wave 2, adolescents were asked to report on their expectations regarding college attendance in three different items (On a scale of 1 to 5 where 1 is low and 5 is high…"how much do you want to go to college?"; "how likely is it that you will go to college?"; "what are the chances that you will graduate from college?"). These three items showed high inter-correlations, ranging from $r = .62$ ($p < .05$) to $r = .75$ ($p < .05$), and were averaged to form a measure of the extent to which older siblings expect to attend college ($\alpha = .88$).

Educational attainment. At wave 3, participants were asked "What is the highest grade or year of regular school that you have completed?". Answers could range from 6, which corresponds to "sixth grade", to 22, which corresponds to "5 or more years of graduate school". Because older siblings in the sample represented a relatively broad age range (18 to 27) and because the number of years of education they had the opportunity to complete is dependent on age, educational attainment was coded as started college vs. did not start college. Older siblings

who reported a 13 (one year of college) or higher were assigned a score of 1; otherwise they were assigned a score of 0.

Treatment of Missing Data

The variables with the largest proportions of missing data were family income (192 cases; 19.0% missing), primary parent education (115 cases; 11.4% missing), and older siblings' academic aptitude (37 cases; 3.7%). There were also 7 cases missing for maternal differential treatment in educational expectations, 2 cases missing for maternal differential treatment in involvement in education, 6 cases missing for paternal differential treatment in educational expectations, 5 cases missing for paternal differential treatment in involvement in education, 2 cases missing for older siblings' college expectations and 1 case missing for older siblings' odds of starting college. Aside from the small amounts of missingness on younger and older siblings' individual reports of the parenting variables that contributed to the missingness on the differential treatment variables, no other variables in the study had missing cases.

Because there was a substantial loss of complete cases due to missing data when conducting the initial regression analyses for this study (typically about 252 or 253 cases), we investigated whether there were differences between cases missing in the regression models and those that were not missing. We first examined whether missing vs. non-missing cases differed in the association between the relative difference differential treatment variables and the two outcomes. Differences were then examined in the mean levels of the following variables: the relative difference differential treatment variables, the two outcome variables, age of older sibling, age of younger sibling, and Peabody picture vocabulary scores for older and younger siblings. We also examined differences between missing and non-missing cases in the proportion of the following variables: white older siblings, black older siblings, older siblings in

the "other" racial-ethnic group, two parent biological vs. other family structure, male vs. female younger siblings, male vs. female older siblings, and mixed sex vs. same sex sibling dyads. These analyses suggested that there may be a difference between missing (r = .16; p = .01) and non-missing (r = .04; p = .28) cases in the association between differential treatment in maternal educational expectations and older siblings' odds of starting college. There may also be a marginal difference between families with missing vs. non-missing data in older siblings' average level of educational expectations (missing = 3.95; non-missing = 4.09; t = 1.72; p < .10) and a difference in younger (missing = 97.81; non-missing = 100.4; t = 2.62; p < .01) and older siblings' (missing = 97.67; non-missing = 101.80; t = 3.91; p < .01) academic aptitude scores. There was also a difference in the proportion of older siblings who were in the "other" racial-ethnic category (missing = .33; non-missing = .21; p < .05) and who were in the "white" category (missing = .52; non-missing = .66; p < .05).

Because there were important differences between families who had missing data and those that did not, we used PROC MI in SAS to impute five data sets that were used for the analyses in this study. The natural log of family income was used in the multiple imputation procedure because the distribution for this variable had a positive skew. A Markov chain Monte Carlo (MCMC) method was used and we used a multiple chain method (see Schafer, 1997 for details) and full-data imputation. PROC MIANALYZE in SAS was used to combine the five sets of results.

RESULTS

The results are divided into three sections. The first section examines differences between older and younger siblings' reports of parental treatment and whether family characteristics are correlates of these differences. The second section examines associations between parents' differential treatment and older siblings' education outcomes. The final section examines whether these associations are moderated by older sibling's racial-ethnic group.

Family Correlates of Differential Treatment

Within-family comparisons showed that older (M = 1.21; SD = .84) and younger (M = 1.15; SD = .84) siblings reported similar levels of maternal involvement in education (t = 1.76; p = .08) and maternal educational expectations (M for older siblings = 3.97; SD = 1.24; M for younger siblings = 3.98; SD = 1.25; t = .25; p = .80). Older (M = .99; SD = .87) and younger (M = .99; SD = .85) siblings also reported similar levels of paternal involvement in education (t = .03; p = .98) and paternal educational expectations (M for older siblings = 3.92; SD = 1.30; M for younger siblings = 3.97; SD = 1.28; t = 1.00; p = .32; see Table 2.1).

The following were examined as potential correlates of the maternal and paternal differential treatment variables: family income, primary parent education, the difference between siblings' academic aptitude (both absolute value and relative difference), siblings' degree of biological relatedness, family structure (two parent biological vs. other), racial-ethnic group (white, black, other), and gender composition of the sibling dyad (older sibling male, younger sibling female; older sibling female, younger sibling male; both siblings male; both siblings female). Correlation analyses were conducted to examine associations between the continuous correlates and differential treatment and t-tests or ANOVAs (as appropriate) were used to examine whether the level of differential treatment varied across levels of the categorical

correlates. We initially examined associations between the correlates and both relative (older sibling report – younger sibling report) and absolute value differences between older and younger siblings' reports of parental treatment. Associations with the relative scores provide information about which sibling, if either, reports higher scores in certain family environments (e.g. higher or lower income) and associations with the absolute scores provide information about how the degree of differential treatment varies across levels of the correlates. In these initial analyses, the results suggested that only one of the correlates might be associated with a relative difference score. The ANOVA examining whether paternal differential treatment in educational expectations varied across gender composition groups was significant at trend level (F = 2.5; p = .06). Additional analyses suggested that paternal differential treatment in educational expectations differed between mixed sex (M = .10; SD = 1.62) and same sex dyads (M = -.14; SD = 1.49), such that in mixed sex dyads, older siblings reported higher paternal expectations than younger siblings and in same sex dyads younger siblings reported the higher expectations. The following correlates were associated with at least one of the absolute value differential treatment variables: family income, primary parent education, biological relatedness, and family structure. Results are only presented for these correlates.

Associations between the continuous correlates and the differential treatment variables (absolute value) are presented in Table 2.2 and means for each differential treatment variable by family structure are presented in Table 2.3. Sibling dyads were excluded from the analyses examining associations with degree of biological relatedness if their degree of biological relatedness was unknown (n = 39). A greater degree of biological relatedness was associated with a lesser degree of both maternal differential treatment in involvement in education (r = -.08; p < .05) and paternal differential treatment in educational expectations (r = -.10; p < .05). A

higher parental education level was associated with a lesser degree of both maternal (r = -.09; p < .05) and paternal (r = -.08; p < .05) differential treatment in educational expectations. Family income also showed negative associations with maternal (r = -.07; p < .05) and paternal (r = -.11; p < .05) differential treatment in educational expectations. Paternal differential treatment in educational expectations also varied by family structure, with the mean for non-two parent biological families (M = 1.19; SD = 1.26) indicating a greater degree of differential treatment than in two-parent biological families (M = .97; SD = 1.08) (t = 2.70; p < .01).

Association between Differential Treatment and Education Outcomes

For these analyses, differential treatment was formed by subtracting younger siblings' reports of parental treatment from older siblings' reports. As an initial step, Pearson's correlations were conducted to examine whether the differential treatment variables were associated with older siblings' outcomes. Maternal differential treatment in involvement in education (r = .07; p < .05) and maternal differential treatment in educational expectations (r = .17; p < .01) showed positive associations with older siblings' educational expectations. There was no association between paternal differential treatment in involvement in education and older siblings' educational expectations, but paternal differential treatment in educational expectations showed a positive association with older siblings' educational expectations (r = .14; p < .01) (see Table 2.4).

The only differential treatment variable that was associated with older siblings' odds of starting college was maternal differential treatment in educational expectations (r = .07; p < .05) (see Table 2.4). These results were confirmed in logistic regression models that used each differential treatment variable in a separate model to predict older siblings' odds of starting college (see Table 2.5).

We next examined whether the differential treatment variables were associated with older siblings' outcomes above and beyond older siblings' reports of their parents' educational expectations and degree of educational involvement. To do this, we estimated a set of ordinary least squares regression models to predict older siblings' educational expectations and a set of logistic regression models to predict older siblings' odds of starting college[2, 3, 4]. For each outcome, two regression models were estimated – one using the maternal differential treatment variables and one using the paternal variables. The following control variables were included in each model: family income, primary parent education, family structure (two parent biological family vs. other), older siblings' racial-ethnic group (two dummy variables to represent three groups: white, black, other), older siblings' age, older siblings' gender, and older siblings' academic aptitude.

In general, in these models, older siblings' reports of their parents' educational expectations and involvement in education were positively associated with their own educational expectations and their odds of starting college (see Tables 2.8 to 2.11). In the model using the paternal variables to predict odds of starting college, paternal differential treatment in educational expectations showed a negative association with the outcome (β = -.13; $p < .05$) (see Table 2.11). In the other three models, none of the differential treatment variables were associated with the outcomes, although, in the model predicting odds of starting college with the maternal variables, maternal differential treatment in educational expectations was significant at trend level (β = -.11; p = .08) (see Table 2.10). The regression coefficients for the differential treatment variables in the maternal models did not differ from the corresponding regression coefficients in the paternal models; the z-scores that resulted from comparing these regression coefficients ranged from an absolute value of .16 to .24 (n.s.) (see Paternoster et al., 1998).

Association between Differential Treatment and Education Outcomes by Racial-ethnic Group

As an initial step, Pearson's correlations were conducted to examine the associations between differential treatment and the outcomes by racial-ethnic group. Among families with a white older sibling, there were generally positive associations between the differential treatment variables and older siblings' outcomes and the associations between parents' differential treatment in educational expectations and older siblings' outcomes were generally stronger than those seen in the other two racial-ethnic groups and in the overall sample (see Tables 2.6 and 2.7). Maternal differential treatment in both involvement in education (r = .10; p < .05) and educational expectations (r = .26; p < .05) showed positive associations with older siblings' educational expectations, as did paternal differential treatment in educational expectations (r = .21; p < .05) (see Tables 2.6 and 2.7). Paternal differential treatment in involvement in education was not associated with older siblings' educational expectations (see Table 2.7).

Among families with white older siblings, maternal differential treatment in involvement in education was not associated with older siblings' odds of starting college, but there was a positive association between maternal differential treatment in educational expectations and older siblings' odds of starting college (r = .16; p < .05). The pattern of associations between the paternal differential treatment variables and older siblings' odds of starting college was similar to the pattern seen in the maternal variables (see Table 2.7).

Among families with black older siblings, there were generally negative associations between the differential treatment variables and older siblings' outcomes. None of these associations were statistically significant, but there was a trend level negative association between paternal differential treatment in involvement in education and older siblings' odds of

starting college (r = -.14; p < .10) (see Tables 2.6 and 2.7). Among older siblings in the "other" racial-ethnic group, the only statistically significant associations were positive associations between both maternal and paternal differential treatment in involvement in education and odds of starting college (r = .14 for maternal; p < .05; r = .14 for paternal; p < .05) (see Tables 2.6 and 2.7). It should be noted that there was less statistical power in the black and other groups than in the white group to detect associations among the variables, but comparing the strengths of associations among the groups may be informative.

To examine more formally whether the association between differential treatment and older siblings' outcomes depends on racial-ethnic group, we estimated regression models similar to those above, but this time also included interaction terms between each of the differential treatment variables and each of the two racial-ethnic indicator variables ("black" and "other") (see Tables 2.8 through 2.11). The differential treatment predictors in these models were centered at zero for both the main effect and interaction terms. In these models, "white" was the reference racial-ethnic group; consequently, the main effects for the differential treatment variables pertain to this group, and the interaction effects reflect how these main effects differ for the black or "other" groups relative to the "white" group.

In the model predicting older siblings' educational expectations with the maternal differential treatment variables (see Table 2.8), older sibling's report of both maternal educational expectations (β = .21; p < .05) and maternal involvement in education (β = .15; p < .05) showed positive associations with the outcome. The maternal differential treatment main effects (which represent whites) were not associated with the outcome, but maternal differential treatment in educational expectations did show a trend level small positive association with the outcome (β = .05; p = .09). The maternal differential treatment in educational expectations by

black term was statistically significant (β = -.16; p < .05), as was the maternal differential treatment in educational expectations by other term (β = -.10; p < .05). This suggests that the association between maternal differential treatment in educational expectations and older siblings' own educational expectations may depend on racial-ethnic group. The differential treatment main effect for blacks can be calculated by adding the "black" interaction coefficient in the model (β = -.16) to the main effect coefficient (β = .05); the resulting coefficient for blacks (β = -.11) suggests that, on average, an increase in differential treatment may be associated with a small decrease in older siblings' educational expectations; the coefficients suggest a similar, but weaker association, in the "other" racial-ethnic group (β = -.05). Maternal differential treatment in involvement in education and the interaction terms for maternal differential treatment in involvement were not statistically significant.

In the model using the paternal differential treatment variables to predict older siblings' educational expectations (see Table 9), older siblings' reports of both paternal educational expectations (β = .21; p < .01) and involvement in education (β = .09; p < .05) were positively associated with the outcome. Neither main effect for the differential treatment variables was significant, suggesting that, for white older siblings, paternal differential treatment was not associated with older siblings' educational expectations above and beyond their reports of the absolute level of parenting they perceive from fathers. None of the interaction terms were statistically significant but the paternal differential treatment in educational expectations by black interaction showed a trend level effect (β = -.12; p < .10).

In the model predicting older siblings' odds of starting college with the maternal variables (see Table 2.10), older siblings' reports of maternal educational expectations (β = .37; p < .05) and maternal involvement in education (β = .32; p < .05) were again positively associated

with the outcome. Neither of the main effects for the maternal differential treatment variables were significant, however. The maternal differential treatment in involvement by other racial-ethnic group interaction was significant (β = .47; p < .01). Adding together the relevant coefficients in the model suggests that, in the "other" racial-ethnic group, there is a positive association, on average, between maternal differential treatment in involvement in education and older siblings' odds of starting college (β = .33); the comparable coefficients in the white (β = -.14) and black groups (β = -.28) each suggest small negative associations. The maternal differential treatment in educational expectations by black interaction term showed a trend level effect (β = -.28; p = .08). Adding together the relevant coefficients suggests that, on average, for blacks, there may be a negative association between maternal differential treatment in educational expectations and older siblings' odds of starting college (β = -.32), in contrast to the almost zero coefficient seen among whites (β = -.01).

In the model predicting older siblings' odds of starting college with the paternal variables (see Table 2.11), older siblings' reports of paternal educational expectations (β = .39; p < .01) showed a positive association with the outcome and paternal involvement in education showed a trend level effect (β = .19; p = .09). Neither differential treatment main effect was associated with the outcome. The paternal differential treatment in involvement by black interaction term was significant (β = -.40; p < .05). Adding together the relevant coefficients in the model suggests that, for blacks, there is a negative association between paternal differential treatment in involvement and older siblings' odds of starting college (β = -.41). This is in contrast to the almost zero coefficient among white older siblings (β = -.01). The comparable coefficient for the "other" group is β = .24.

Table 2.1

Means (SD) for Siblings' Reports of Parental Treatment

Variable	Younger siblings		Older siblings	
	M	*SD*	*M*	*SD*
Maternal involvement in education	1.15	.84	1.21	.84
Maternal educational expectations	3.98	1.25	3.98	1.25
Paternal involvement in education	0.99	.85	.99	.87
Paternal educational expectations	3.97	1.28	3.92	1.30

Table 2.2

Correlations Between Family Characteristics and Parents' Differential Treatment

	Family income	Primary parent education	Biological relatedness of siblings
Maternal differential treatment in involvement in education	-.02	-.02	-.08*
Maternal differential treatment in educational expectations	-.07*	-.09*	-.02
Paternal differential treatment in involvement in education	-.01	-.05	-.05
Paternal differential treatment in educational expectations	-.11*	-.08*	-.10*

Note. Differential treatment was calculated by taking the absolute value of the difference between older and younger siblings' reports of parental treatment.

*$p < .05$.

Table 2.3

Means (SD) for Parents' Differential Treatment by Family Structure

	Non two-parent biological family	Two-parent biological family
Maternal differential treatment in involvement in education	.75 (.74)	.70 (.72)
Maternal differential treatment in educational expectations	1.04 (1.11)	1.03 (1.12)
Paternal differential treatment in involvement in education	.80 (.75)	.72 (.71)
Paternal differential treatment in educational expectations	1.19 (1.26)[a]	.97 (1.08)[a]

[a]Mean differences are statistically significant ($p < .05$)

Note. Differential treatment was calculated by taking the absolute value of the difference between older and younger siblings' reports of parental treatment.

Table 2.4

Pairwise Correlations Between Maternal/Paternal Differential Treatment (M/PDT) and Older Siblings' Outcomes

Variables	1	2	3	4	5
1. MDT in involvement in education					
2. MDT in educational expectations	.04				
3. PDT in involvement in education	.56**	.06*			
4. PDT in educational expectations	.02	.68**	.11**		
5. Older siblings' educational expectations	.07*	.17**	.04	.14**	
6. Older siblings' odds of starting college	.06	.07*	.05	.05	.46**

*$p < .05$

**$p < .01$

Table 2.5

Logistic Regression Models Using Each Maternal/Paternal Differential Treatment (M/PDT) Variable to Predict Older Siblings' Odds of Starting College

	Intercept		Predictor		
	B	*SE*	*B*	*SE*	*OR*
Model 1: MDT in involvement in education	.06	.06	.12	.06	1.12+
Model 2: MDT in educational expectations	.08	.06	.09	.04	1.10*
Model 3: PDT in involvement in education	.06	.06	.10	.06	1.11
Model 4: PDT in educational expectations	.08	.06	.07	.04	1.07

Note. Each differential treatment variable was entered into a separate model.

*$p < .05$

+$p < .10$

Table 2.6

Correlations between Maternal Parenting Variables and Older Siblings' Outcomes by Racial-ethnic Group

	White (n = 629)		Black (n = 137)		Other (n = 242)	
	Educational Expectations	Odds of Starting College	Educational Expectations	Odds of Starting College	Educational Expectations	Odds of Starting College
MDT in educational expectations (EE)[a]	.26**	.16**	-.02	-.08	.03	-.06
MDT in involvement in education (IE)[a]	.10*	.05	.03	-.04	.00	.14*
Older sibling report of maternal EE	.37**	.26**	.15	.15	.26**	.12
Older sibling report of maternal IE	.16**	.14**	.15	.05	.20**	.21**
Younger sibling report of maternal EE	.07	.08	.16	.23**	.17**	.17**
Younger sibling report of maternal IE	.05	.09*	.10	.10	.19**	.03

[a]MDT = Maternal differential treatment

*$p < .05$

+$p < .10$

Table 2.7

Correlations between Paternal Parenting Variables and Older Siblings' Outcomes by Racial-ethnic Group

	White (n = 629)		Black (n = 137)		Other (n = 242)	
	Educational Expectations	Odds of Starting College	Educational Expectations	Odds of Starting College	Educational Expectations	Odds of Starting College
PDT in educational expectations (EE)	.21**	.12**	-.04	-.06	.02	-.05
PDT in involvement in education (IE)	.05	.07	-.02	-.14	.06	.14*
Older sibling report of paternal EE	.36**	.27**	.15	.16	.21**	.10
Older sibling report of paternal IE	.15**	.16**	.04	-.04	.14*	.17**
Younger siblings report of paternal EE	.13**	.15**	.24**	.25**	.16*	.15*
Younger sibling report of paternal IE	.10*	.09*	.07	.15	.07	.02

[a]PDT = Paternal differential treatment

*$p < .05$

+$p < .10$

Table 2.8

Least Squares Regression Models Predicting Older Siblings' Educational Expectations: Maternal Models

	Main effects model[d]			Interaction model[e]		
	B	*SE B*	β	*B*	*SE B*	β
Intercept	2.11	.50		2.13	.50	
Family income (logged)	.11	.05	.08*	.11	.05	.08*
Primary parent education	.12	.02	.17*	.13	.02	.18*
Two parent biological family[a]	.19	.07	.08*	.18	.06	.08*
Black[b]	.18	.10	.06+	.18	.10	.06+
Other race[c]	.07	.08	.03	.08	.08	.03
Older sibling age (wave 2)	-.08	.02	-.11*	-.08	.02	-.11*
Older sibling sex (0 = M; 1 = F)	.15	.06	.07*	.13	.06	.06*
Older sibling academic aptitude	.01	.00	.15*	.01	.00	.14*
Maternal educational expectations	.21	.03	.24*	.21	.03	.24*
Maternal involvement in education	.16	.05	.12*	.15	.05	.12*
MDT in educational expectations	.00	.03	.01	.05	.03	.07+
MDT in involvement in education	-.02	.04	-.02	-.01	.04	-.01
MDT in educational expectations X black				-.16	.06	-.08*
MDT in educational expectations X other				-.10	.05	-.07*
MDT in involvement in education X black				-.05	.09	-.02
MDT in involvement in education X other				-.03	.07	-.01

[a]Two-parent biological family: 0 = *non two parent biological family*, 1 = *two-parent biological family*. [b]Black: 0 = *non-black*, 1 = *black*.

[c]Other race: 0 = *black or white*, 1 = *racial-ethnic group other than black or white*.

[d]R^2 = .24 [e]R^2 = .25

*$p < .05$. +$p < .10$.

Table 2.9

Least Squares Regression Models Predicting Older Siblings' Educational Expectations: Paternal Models

	Main effects model[d]			Interaction model[e]		
	B	*SE B*	β	*B*	*SE B*	β
Intercept	2.11	.50		2.15	.50	
Family income (logged)	.10	.05	.07+	.10	.05	.07+
Primary parent education	.13	.02	.18*	.13	.02	.18*
Two parent biological family[a]	.15	.07	.06*	.14	.07	.06*
Black[b]	.23	.10	.07*	.22	.10	.07*
Other race[c]	.10	.08	.04	.10	.08	.04
Older sibling age (wave 1)	-.08	.02	-.11*	-.08	.02	-.11*
Older sibling sex (0 = M; 1 = F)	.17	.06	.08*	.16	.06	.07*
Older sibling academic aptitude	.01	.00	.16*	.01	.00	.16*
Paternal educational expectations	.21	.03	.25*	.21	.03	.25*
Paternal involvement in education	.09	.05	.08*	.09	.05	.07*
PDT in educational expectations	-.01	.03	-.02	.02	.03	.02
PDT in involvement in education	-.03	.04	-.03	-.03	.04	-.03
PDT in educational expectations X black				-.12	.06	-.06+
PDT in educational expectations X other				-.05	.05	-.04
PDT in involvement in education X black				-.03	.08	-.01
PDT in involvement in education X other				.05	.07	.02

[a]Two-parent biological family: 0 = *non two parent biological family*, 1 = *two-parent biological family*. [b]Black: 0 = *non-black*, 1 = *black*.

[c]Other race: 0 = *black or white*, 1 = *racial-ethnic group other than black or white*.

[d]R^2 = .23 [e]R^2 = .24

*p < .05. +p < .10.

Table 2.10

Logistic Regression Models Predicting Older Siblings' Odds of Starting College: Maternal Models

	Main effects model			Interaction model		
	B	*SE*	*OR*	*B*	*SE*	*OR*
Intercept	-9.37	1.55	.00*	-9.62	1.57	
Family income (logged)	.45	.13	1.57*	.47	.13	1.60*
Primary parent education	.26	.06	1.30*	.28	.06	1.32*
Two parent biological family[a]	1.03	.16	2.80*	1.02	.16	2.77*
Black[b]	-.05	.24	.95	-.04	.24	.96
Other race[c]	.15	.20	1.16	.17	.20	1.22
Older sibling age (wave 3)	-.04	.05	.96	-.04	.05	.96
Older sibling sex (0 = M; 1 = F)	.30	.15	1.35*	.29	.15	1.34+
Older sibling academic aptitude	.05	.01	1.05*	.05	.01	1.05*
Maternal educational expectations	.39	.08	1.48*	.37	.08	1.45*
Maternal involvement in education	.32	.11	1.38*	.32	.11	1.38*
MDT in educational expectations	-.11	.06	.90+	-.01	.07	.99
MDT in involvement in education	-.04	.09	.96	-.14	.11	.87
MDT in educational expectations X black				-.28	.16	.76+
MDT in educational expectations X other				-.19	.12	.83
MDT in involvement in education X black				-.14	.23	.87
MDT in involvement in education X other				.47	.18	1.60*

[a]Two-parent biological family: 0 = *non two parent biological family*, 1 = *two-parent biological family*. [b]Black: 0 = *non-black*, 1 = *black*.

[c]Other race: 0 = *black or white*, 1 = *racial-ethnic group other than black or white*.

*$p < .05$. +$p < .10$.

Table 2.11

Logistic Regression Models Predicting Older Siblings' Odds of Starting College: Paternal Models

	Main effects model			Interaction model		
	B	*SE*	*OR*	*B*	*SE*	*OR*
Intercept	-9.11	1.53	.00*	-9.12	1.54	
Family income (logged)	.43	.13	1.54*	.43	.13	1.54*
Primary parent education	.27	.06	1.31*	.27	.06	1.31*
Two parent biological family[a]	.95	.16	2.59*	.94	.16	2.56*
Black[b]	.01	.23	1.01	.02	.24	1.02
Other race[c]	.18	.20	1.20	.19	.20	1.21
Older sibling age (wave 1)	-.04	.05	.96	-.05	.05	.95
Older sibling sex (0 = M; 1 = F)	.33	.15	1.39*	.33	.15	1.39*
Older sibling academic aptitude	.05	.01	1.05*	.05	.01	1.05*
Paternal educational expectations	.39	.08	1.48*	.39	.08	1.48*
Paternal involvement in education	.19	.11	1.21+	.19	.11	1.21+
PDT in educational expectations	-.13	.06	.88*	-.11	.07	.90
PDT in involvement in education	-.02	.09	.98	-.01	.11	.99
PDT in educational expectations X black				-.05	.16	.95
PDT in educational expectations X other				-.05	.12	.95
PDT in involvement in education X black				-.40	.20	.67*
PDT in involvement in education X other				.25	.18	1.28

[a]Two-parent biological family: 0 = *non two parent biological family*, 1 = *two-parent biological family*. [b]Black: 0 = *non-black*, 1 = *black*.

[c]Other race: 0 = *black or white*, 1 = *racial-ethnic group other than black or white*.

*$p < .05$. +$p < .10$.

DISCUSSION

Parents' differential treatment of their offspring has been shown to be associated with important adolescent outcomes (e.g. Conger & Conger, 1994). The current study was conducted to address a gap in the differential treatment literature by investigating whether differential treatment was associated with older siblings' academic outcomes. The first goal was to examine differences between siblings' reports of their parents' educational expectations and involvement in education. There were no mean differences between older and younger siblings' reports, suggesting that neither older nor younger siblings were systematically favored on these parenting aspects. In general, previous research has suggested that siblings in the same family do not view parental treatment in the same way and that parents do not interact the same way with different siblings (Brody et al., 1992; Conger & Conger, 1994; Daniels et al., 1985; Reiss et al., 1994). Shebloski and colleagues (2005) found that earlier-born siblings perceived that later-born siblings experienced less parental hostility and, in a sample of adolescent sibling dyads, McHale and colleagues (2000), found that second-born siblings reported more time spent with parents than did first-born siblings. The current study did not find similar effects of older siblings being disfavored or reporting less involvement in academics than younger siblings. Perhaps future research will examine whether other sibling characteristics (e.g. personality) besides age or birth order may more strongly predict differential treatment of siblings on parenting behaviors related to academics.

The next goal of the current study was to examine associations between family demographic characteristics and the absolute value measures of differential treatment. There was evidence that siblings' perceptions of parents' educational expectations may differ to a slightly lesser degree in families where there is more income and where the primary parent has a

higher education level. These results are consistent with research that suggests that parents in lower SES families are more likely than parents in higher SES families to experience stressors that make it challenging to show consistent parenting (e.g. McLoyd, 1998) and literature that suggests that lower SES is associated with higher levels of differential treatment.

The results also suggested that a greater degree of biological relatedness between siblings was associated with a small decrease in the difference between their reports of parenting, at least for two of the parenting variables (maternal involvement in education and paternal educational expectations). Previous research on maternal differential treatment in warmth and hostility suggests that siblings may receive more similar treatment when they are more similar in genetic make-up, gender and abilities (e.g. Shebloski et al., 2005). Our findings on biological relatedness are consistent with this previous work, but it is somewhat surprising that siblings' academic aptitude and gender composition did not emerge as correlates of differential treatment. However, the measure of siblings' academic aptitude was their score on a vocabulary test, which may be an indication of their academic abilities, but may not encompass the broader spectrum of abilities that parents' likely use to gauge siblings' academic potential. And perhaps differential treatment shows correlations with same vs. mixed sex siblings for parenting factors like warmth, but shows weaker associations with parenting factors related to academics.

There was also evidence that siblings' reports of fathers' educational expectations are more likely to be different in non two-parent biological families than in two-parent biological families. The non-two parent biological family group may include non-resident fathers, who may be less involved in siblings' lives than fathers in the two-parent biological group (Marsiglio, 1993). This may mean that some fathers in the non two-parent biological group have fewer opportunities to send a consistent message to siblings about their educational expectations.

Mothers, on the other hand, are usually involved in the rearing process, regardless of family structure, and so perhaps this is why siblings' reports of maternal treatment did not differ across family structures. The findings in this study could be consistent with literature showing that parents' differential treatment is more likely in single parent families (Jenkins, Rasbash, and O'Connor, 2003).

The next main goal of the study was to examine whether differential treatment was associated with older siblings' educational expectations and odds of starting college. Before controlling for any other factors, differential treatment generally showed small positive associations with older siblings' education outcomes; this suggests that as older siblings reported higher values than their siblings on the parenting variables, they reported higher educational expectations and had a greater likelihood of starting college. Differential treatment in educational expectations across both parents generally showed more consistent associations with older siblings' outcomes than did differential treatment in involvement in education. This may partially be because of greater variability in the parental educational expectations measure; the differential treatment in involvement measures had a range from -2 to 2 whereas the differential treatment in expectations measures had a range from -4 to 4. Also, parents' educational expectations may have more relevance for their offspring's educational expectations and college attendance than parents' involvement in education does. Overall, the raw correlations are consistent with previous research on nonacademic outcomes that suggests that siblings who are more favored have more advantageous outcomes (e.g. Conger & Conger, 1994).

However, in contrast to many previous studies that examined associations between differential treatment and sibling outcomes (e.g. Conger and Conger, 1994; Shebloski et al., 2005), this study controlled for the absolute level of parenting that older siblings' perceived.

After including controls for this and family background characteristics, differential treatment generally did not show associations with older siblings' outcomes in the overall sample. This suggests that siblings' experience of their parents' absolute level of parenting, at least in the overall sample, may account for more variance in academic outcomes than their experience of parents' differential treatment. Other studies that have controlled for the absolute level of parenting have generally found some small to modest correlations between parents' differential treatment and sibling outcomes (Coldwell et al., 2008; Feinberg & Hetherington, 2001; Scholte et al., 2007). It should be noted, however, that this literature had a different focus from the current one; the authors typically examined parenting aspects like warmth and negativity and sibling outcomes like antisocial behavior, delinquency, and maladjustment.

In contrast to previous literature that suggested that children may be more sensitive to paternal than to maternal differential treatment (Brody, Stoneman, & McCoy, 1994; Feinberg & Hetherington, 2001), results from the current study suggested that the correlations between differential treatment and the outcomes, both overall and by racial-ethnic group, were generally similar for mothers and fathers. Other research, which focused on differential treatment in both parental warmth and parent-child conflict, also found that the associations between differential treatment and outcomes were similar for mothers and fathers (Shanahan et al., 2008). Perhaps future research will clarify whether siblings are more sensitive to differential treatment from one parent as compared with the other.

The last goal was to examine whether the association between differential treatment and older siblings' academic outcomes varied across racial-ethnic groups. Initial correlations suggested that the associations between parents' differential treatment in educational expectations showed stronger associations with older siblings' education outcomes for white

older siblings than for black or "other" siblings. This may reflect that the associations between older siblings' reports of parents' educational expectations and the outcomes were generally stronger among white older siblings than among either black or "other" older siblings (see Tables 2.7 and 2.8). In the regression models, however, parents' differential treatment was not associated with white older siblings' outcomes above and beyond their reports of the absolute level of parenting that they received. The raw correlations and the regression models indicate an overall pattern among whites that younger siblings' reports of parenting may not show associations with older siblings' outcomes above and beyond their own perceptions of the parenting they receive.

A different pattern of results was seen among black older siblings. In the raw correlations, the associations between differential treatment and older siblings' outcomes generally showed weak, negative associations. In the regression models, negative associations between differential treatment and older siblings' outcomes were more likely among blacks than among the other racial-ethnic groups. This may be a reflection of the fact that, for black older siblings, their younger siblings' reports of parenting showed associations with their outcomes that were equal to, or, in some cases, greater than the associations between their own reports of parenting and their outcomes (see Tables 2.7 and 2.8). Given that the differential treatment variables in the regression models reflect whether younger siblings' perceptions of parenting are associated with older siblings outcomes above and beyond older siblings' own reports of parenting, the negative differential treatment coefficients may indicate that, for black older siblings, as their younger sibling reports lower parental educational expectations, older siblings' show lower educational expectations and a lower likelihood of starting college. And, as seen in Table 2.11, as younger siblings report lower levels of paternal involvement in education, black

older siblings are less likely to start college. These results could indicate an overall pattern of younger siblings' perceptions of parenting playing a somewhat larger role in older siblings' education outcomes among black older siblings than among white older siblings.

The pattern of results seen among "other" older siblings falls somewhere in between the pattern seen for whites and blacks. In the maternal regression models, there was a trend of negative associations between maternal educational expectations and "other" older siblings' outcomes, but the negative associations were somewhat weaker than those seen among black older siblings. One finding that was distinct for the "other" older siblings was that there was a positive association in this group between maternal differential treatment in involvement in education and older siblings' odds of starting college; this may indicate that older siblings' perceptions of maternal involvement in this group, both in absolute terms and relative to their younger sibling, are more strongly linked to their odds of starting college than in the other racial-ethnic groups.

The different pattern of results seen among black and white older siblings may have to do with group differences in family culture. Perhaps white families, on average, more strongly adopt Western ideals of individualism and personal achievement than do black families (Small, 2001). This may mean that older siblings in white families are oriented toward their own personal treatment from parents. Black siblings, on average, may show stronger tendencies than white families to be oriented toward the well-being and success of the family as a whole (Watson, 1998). For example, black families are more likely than white families to show a culture of interdependence and exchange of resources across extended family members (Taylor, 2000). Black older siblings may also be more likely than white older siblings to engage in more extensive care-taking of younger siblings (Watson, 1998). All of this may mean that black older

siblings are more focused on their younger siblings (and vice versa) than white siblings are, and that younger siblings' perceptions may therefore show stronger ties with older siblings' outcomes. It should be noted, however, that although there may be average group differences in family cultures between blacks and whites, there is likely to be much variability within each of these groups.

The current study has a few limitations. First, we did control for older siblings' academic aptitude, but the direction of association between parents' differential treatment and older siblings' outcomes still could not be completely determined. Second, the sample had some limitations. It contained an overrepresentation of twin pairs and may consequently not be representative of the U.S. population. Also, this study focused on one sibling dyad in the family; for families with more than two children, this study may not have fully captured the sibling and parent-child interactions that have implications for academic outcomes. Third, the parenting measures were somewhat limited in scope, were based on only a few questions and relied on adolescents' perceptions. These perceptions may not accurately reflect parents' actual behaviors, and they may be clouded by adolescents' own views of their academic capabilities and goals. Also, although other authors have taken an approach similar to the one used in this study (e.g. Shanahan et al., 2008), differential treatment can be measured more directly, either by asking siblings about differential treatment specifically or by observing to what extent parents interact differently with their offspring (Brody et al., 1992; McHale et al., 2000).

Overall, the results suggest that family demographic characteristics show some associations with the degree of differential treatment that occurs in the family. The results also support that the implications of parents' treatment of siblings for academic outcomes may vary by racial-ethnic group. Perhaps researchers should be careful to not assume that the extant

differential treatment literature, which primarily uses white samples, applies to diverse groups. This study is only a first step in examining the role that parents' differential treatment may play in academic outcomes; given the potential adulthood implications of having poor academic outcomes and low educational attainment, more research on this topic is needed.

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APPENDIX

[1]Means (SD) for Parenting and Outcome Variables

Variable	*M*	*SD*
Maternal educational expectations	3.97	1.24
Maternal involvement in education	1.21	.84
Maternal differential treatment in educational expectations	-.01	1.52
Maternal differential treatment in involvement in education	.06	1.02
Paternal educational expectations	3.92	1.30
Paternal involvement in education	.99	.87
Paternal differential treatment in educational expectations	-.05	1.54
Paternal differential treatment in involvement in education	.00	1.04
Older siblings' educational expectations	4.05	1.09
Older siblings' odds of starting college	.52	.50

[2]Pairwise Correlations Among the Independent Variables in Tables 2.8 through 2.11[a]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1															
2	.48*														
3	.01	.02													
4	-.11*	.03	-.04												
5	-.16*	-.25*	.05	-.22*											
6	-.08*	-.15*	-.13*	-.07*	.09*										
7	.03	.00	.00	-.04	-.02	-.03									
8	.27*	.38*	.07*	-.17*	-.25*	-.09*	-.03								
9	.11*	.14*	.03	.08*	.05	-.13*	.00	.03							
10	.09*	.05	-.03	.06*	.02	-.02	.06	.07*	.11*						
11	.00	.04	.03	.01	.05	-.04	.01	.01	.60*	.03					
12	.07	.03	-.00	-.01	.01	.00	.02	.02	.00	.61*	.04				
13	.13*	.11*	.06	.06	.06	-.14*	-.02	.01	.72*	.10*	.42*	.00			
14	.08*	.05	.06	.03	-.01	-.02	.01	.09*	.09*	.63*	.04	.34*	.17*		
15	.02	.01	.04	-.02	.02	.00	-.02	-.02	.40*	.01	.68*	.02	.61*	.06*	
16	.03	.03	.02	.00	-.01	.03	-.02	.03	.03	.35*	.06*	.56*	.07*	.62*	.11*

*$p < .05$.

[a]The numbers in the correlation table correspond to the following variables:

1. Family income (logged)
2. Primary parent education
3. Two parent biological family
4. Black
5. Other race
6. Older sibling age
7. Older sibling sex
8. Older sibling academic aptitude
9. Maternal educational expectations
10. Maternal involvement in education
11. Maternal differential treatment in educational expectations
12. Maternal differential treatment in involvement in education
13. Paternal educational expectations
14. Paternal involvement in education
15. Paternal differential treatment in educational expectations
16. Paternal differential treatment in involvement in education

[3]Analyses with all Available Mom Data

The focus of this study was on siblings who had both a mother and a father figure. We did, however, conduct analyses using a sample that required siblings to have a mother figure, but not a father figure (n = 1513), given that the requirement to have both parental figures substantially reduced the sample size and statistical power to detect associations between the maternal differential treatment variables and older siblings' outcomes. The sample used in these analyses was comparable on all other selection criteria to the one used for the full analyses presented in the "Results" section. The associations between the maternal differential treatment variables and older siblings' outcomes in this sample did not show marked differences in magnitude from the associations seen in the more restricted sample used in the full analyses, either in the raw correlations (compare Table 2.4 on p. 46 to the table below) or in regression models that included the same controls as those included in Tables 2.8 (p. 50) and 2.10 (p. 52). Comparisons between the regression coefficients from the models that only required siblings to

have a mother figure and the corresponding regression coefficients in Tables 2.8 and 2.10 (see Paternoster et. al., 1998) yielded z-scores that ranged from .32 to .63 (n.s.).

Correlations between Maternal Differential Treatment (MDT) and Older Siblings' Outcomes (*n* = 1513)

	Older siblings' educational Expectations	Older siblings' odds of starting college
MDT in involvement in education	.07*	.08*
MDT in educational expectations	.14*	.06*

*$p < .05$

[4]Analyses by Biological Relatedness

The sample contains siblings that vary in biological relatedness. Given that these groups differ in ways (e.g. age-spacing) that may have implications for the interpretation of our analyses, we examined whether the biological relatedness groups differed in mean levels or frequencies of key variables in this study. We also examined whether the associations between the differential treatment variables and the outcome variables differed across biological relatedness groups. Cousins (*n* = 25) and indeterminate twins (*n* = 14) were removed before conducting these analyses to avoid small cell sizes.

To examine whether there were mean differences, we conducted five ANOVAs, one for each of the following variables: maternal differential treatment in involvement in education, maternal differential treatment in educational expectations, paternal differential treatment in involvement in education, paternal differential treatment in educational expectations, and older siblings' educational expectations. Each ANOVA had five categories: monozygotic (MZ) twins (*n* = 110), dizygotic (DZ) twins (*n* = 194), full siblings (*n* = 462), half siblings (*n* = 91), and

nonrelated siblings (n = 112). We conducted a chi-square to examine whether there was an association between biological relatedness group and older siblings' frequency of starting college.

The analyses did not show mean differences in any of the differential treatment variables. The analyses did show mean differences in older siblings' educational expectations (F = 2.74; df = 4, 962; $p < .05$); pairwise comparisons between each set of means that controlled for the Type I error rate revealed that older siblings in half sibling pairs (M = 3.84; SD = 1.10) had lower educational expectations than those in dizygotic twin pairs (M = 4.23; SD = .99) (see table of means below). A t-test that grouped the other four biological relatedness groups together and compared them to half siblings also showed a trend toward half siblings showing lower educational expectations than the other biological relatedness groups (t = 1.96; p = .05). Chi-square analyses showed that there was an association between biological relatedness group and older siblings' frequency of starting college (X^2 = 35.76; df = 4; $p < .05$; see table below) and suggested that the frequency of half siblings starting college was lower than expected (standardized Pearson's residual = -7.97).

Because half siblings differed from the other biological relatedness groups in the levels of the outcome variables, the main effects regression models in Tables 2.8 through 2.11 were re-estimated after excluding half siblings. The inferences in these models regarding whether the differential treatment variables were associated with the outcomes did not differ from the inferences in the models presented in Tables 2.8 through 2.11.

Means (SD) for Older Siblings' Educational Expectations by Biological Relatedness

Type of relatedness	*M*	*SD*
Monozygotic twins	4.17	.98
Dizygotic twins	4.23[a]	.99
Full siblings	4.01	1.14
Half siblings	3.84[a]	1.10
Non-related siblings	4.00	1.07

[a]These means are significantly different ($p < .05$).

Frequency of Older Siblings Starting College by Biological Relatedness

	Older sibling does not start	Older sibling starts
Monozygotic twins	54	56
Dizygotic twins	79	114
Full siblings	207	255
Half siblings	69	22
Non-related siblings	61	51

To examine the associations between the differential treatment variables and the two outcome variables by biological relatedness group, we first estimated Pearson's correlations by biological relatedness (see table below). We then estimated each of the main effects models in Tables 2.8 through 2.11 for each of the five main biological relatedness groups and examined whether the regression coefficients for the differential treatment variables in each model differed between the biological relatedness groups. Our method of comparing the regression coefficients

was based on the work of Paternoster and colleagues (1998). In total, we examined 80 coefficient comparisons (10 regression coefficient comparisons in each model X 2 differential treatment variables in each model X 4 models). These comparisons all yielded z-scores that were below the critical value of 1.96; the z-scores ranged from an absolute value of .02 to 1.92 (n.s.) and suggested that none of the biological relatedness groups differed from any of the other biological relatedness groups in the associations between the differential treatment variables and the outcomes.

Correlations between Maternal/Paternal Differential Treatment (M/PDT) and Older Siblings' Outcomes by Biological Relatedness

	Monozygotic twins		Dizygotic twins		Full siblings		Half siblings		Non-related siblings	
	EE	SC	EE	SC	EE	SC	EE	SC	EE	SC
MDT in educational expectations	.23*	.12	.17*	.01	.21*	.06	.11	.10	.08	.14
MDT in involvement in education	-.10	.03	.12	.12	.11*	.04	.16	.10	-.12	-.03
PDT in educational expectations	.19	.08	.12	-.03	.18*	.03	.03	.07	.08	.11
PDT in involvement in education	.02	.00	.05	.01	.07	.05	.15	.24*	-.10	-.03

Note. EE = Older siblings' educational expectations; SC = Older siblings' odds of starting college.

*$p < .05$

REFERENCES

Paternoster, R., Brame, R., Mazerolle, P., & Piquero, A. (1998). Using the correct statistical test for the equality of regression coefficients. *Criminology, 36*, 859-866.

CHAPTER 3

THE ASSOCIATION BETWEEN MATERNAL DIFFERENTIAL TREATMENT OF DAUGHTERS AND SONS DURING ADOLESCENCE AND THEIR ODDS OF STARTING COLLEGE DURING EMERGING ADULTHOOD

ABSTRACT

This study was motivated by national data showing that females are now more likely than males to attend college. This study used 565 mixed sex sibling dyads to examine differences between sisters' and brothers' odds of starting college and whether maternal differential treatment during adolescence could be associated with sisters' and brothers' differential odds of starting college during emerging adulthood. After controlling for other demographic variables, the gender gap favoring sisters was larger in black families than in other racial-ethnic groups and was larger in two parent biological family structures than in other family structures. A multinomial logistic regression model that controlled for family background factors and differences between siblings' academic achievement suggested that maternal differential treatment in educational expectations was associated with the odds of just sisters vs. just brothers in the family starting college. Differences between brothers' and sisters' reports of their mothers' involvement in their education showed a similar association that was significant at trend level. Overall, the findings suggested that differences in academic achievement may be more strongly linked than parents' differential treatment to sisters' and brothers' differential odds of starting college, but suggest the possibility that parenting factors could play a small role.

THE ASSOCIATION BETWEEN MATERNAL DIFFERENTIAL TREATMENT OF DAUGHTERS AND SONS DURING ADOLESCENCE AND THEIR ODDS OF STARTING COLLEGE DURING EMERGING ADULTHOOD

In 1970, about 59% of undergraduates were male (U.S. Department of Education, 2006a). Since that time, however, females' enrollment has increased faster than males' and females began to surpass males in college attendance during the 1980s. In 2007, 57% of individuals enrolled in post-secondary education were female (U.S. Department of Education, 2008). This trend is expected to continue throughout the next decade and, according to some estimates, 60% of undergraduates will be female by the year 2015 (U.S. Department of Education, 2006a).

The female advantage is not limited to enrollment, but also extends to educational attainment; in 2006, about 32% of females aged 25-29 had earned a bachelor's degree, compared to about 25% of males (U.S. Department of Education, 2007a). The gender gap in educational attainment is even more striking among racial-ethnic minorities. During the 2004-2005 academic year, females obtained about 57% of bachelor's degrees granted to whites, 61% of bachelor's degrees granted to Hispanics, and 66% of bachelor's degrees granted to blacks (U.S. Department of Education, 2006b). Some research also suggests that the gender gap may be greater in low SES than in high SES families (Buchmann & DiPrete, 2006; Goldin, Katz, & Kuziemko, 2006).

It is also interesting to consider national data on the percentage of students who enroll in college during the fall immediately after they complete high school. From 1997 to 2007, females were more likely to start college than males, with the gap between the percentage of total females starting and the percentage of total males starting ranging from about .3% to 10%. The percentages showed the largest gap in 2004 (10.1%) and the smallest gaps in 2006 (.3%) and

2007 (2.2%) (Forum on Child and Family Statistics, 2009). In 2007, for example, about 68% of females who had just completed high school started college; the comparable statistic for males was about 66% (Forum on Child and Family Statistics, 2009). Therefore, while statistics on total post-secondary enrollment increasingly favored females from 1997 to 2007, it may be that the gender gap in initial college enrollment is starting to narrow somewhat. The next few years of national data will illuminate whether or not this is, in fact, the case. Overall, though, the above statistics suggest that females start and finish college at higher rates than males.

These statistics are intriguing and also have important implications for the development of both males and females. College graduates in the U.S. have greater earnings and lower unemployment rates than non college graduates (United States Census, 2002). Census data indicate that in 1999, individuals who had a bachelor's degree and worked full time earned an average of about $53,000 per year; comparable workers with only a high school degree earned about $30,500 per year (United States Census, 2002). This suggests that males may be at a disadvantage compared to females with regard to adult earnings. It is still true, however, that among men and women with comparable education levels, men typically have greater earnings (United States Census, 2002).

The gender gap in higher education may also have implications for family formation behaviors. With fewer males than females having a college degree, women may be more likely than previously to select a mate with lower education, delay marriage in order to continue searching for a mate with higher education, or forgo marriage altogether (Lewis & Oppenheimer, 2000). These behaviors, in turn, may show associations with rates of childbearing and divorce. For example, spouses who are more dissimilar in educational level are more likely to divorce (e.g. Teachman, 2002).

Despite the potentially important implications of more females than males attending post secondary institutions, research has just begun to examine factors related to this gender gap. Indeed, most research on gender gaps in education has focused on aspects where males outnumber females, such as the underrepresentation of females in math and science (Jacobs, 1996). Much of the existing literature on gender differences in educational outcomes is also based on data that was collected in the 1970s or 1980s and may not represent current societal conditions; there have been fairly substantial shifts since that time in gender differences in education and employment. The few studies that have focused on the gender gap in college attendance have suggested that both societal factors and average individual differences between males and females have contributed to females now outnumbering males in post-secondary institutions (Buchmann & DiPrete, 2006; Goldin et al., 2006).

The current study will examine family patterns of siblings starting college to examine whether family processes are associated with the gender gap in starting college. To do this, we will use a sample of mixed sex sibling dyads from a contemporary data set, the National Longitudinal Study of Adolescent Health (ADD Health). This study will not examine historical trends in gender gaps across time, but rather will focus on any current within family gender gaps. Specifically, this study will first investigate the difference between sisters' and brothers' likelihood of starting college. The next goal will be to examine whether there are differences between sisters' and brothers' reports of maternal involvement in education, maternal educational expectations and grades in school, given that these may be important correlates of differences between siblings' odds of starting college. Finally, we will examine whether differential maternal treatment of sisters and brothers is associated with sisters vs. brothers' odds of starting college, after controlling for differences between them in their grades in school; to do

this, this study will focus mainly on families in which only one study sibling started college (either just the sister or just the brother), given that these families contribute the most to the overall gender gap. To my knowledge, this is the first study to examine the role of family processes in within-family gender gaps in educational attainment.

Using siblings for this study has two advantages over using one child from each family. First, a focus on siblings allows for direct examination of whether parents treat their sons and daughters differently; using one child from each family would involve inferring whether differential treatment occurs by comparing a group of parents with a daughter to a different group of parents with a son (Teachman, 1997). Second, a focus on siblings has the advantage of allowing each family to serve as its own control. When studying one child from each family, families with sons may not be equivalent to families with daughters. Despite including controls for family background characteristics (e.g. family income), families may differ in other unmeasured factors (e.g. educational support from extended family) that affect the estimate of male-female differences in academic outcomes and parenting (Teachman, 1995).

Factors Associated With the Reversal of the Gender Gap

Compared to males, females show a greater degree of effortful control, are less likely to have behavior problems in school, and have lower rates of ADHD and learning disabilities (Downey & Yuan, 2005; Else-Quest et al., 2006; U.S. Department of Education, 2007b). This may help explain why females earn higher grades in school and also why more women than men currently complete college degrees (Buchmann & DiPrete, 2006; Downey & Yuan, 2005; Jacob, 2002). In a sample of individuals who graduated from high school in 1992, Goldin and colleagues (2006) found that gender differences in test scores, grades, and behavioral factors were important predictors in explaining the female advantage in college completion. However,

these gender differences cannot completely explain the reversal of the gender gap during the past few decades; historically, females have long outperformed males in grades and in rates of high school graduation (Buchmann & DiPrete, 2006; Jacobs, 1996).

In addition to temperament factors, there may be societal changes that are related to the reversal of the gender gap. U.S. society adopts more egalitarian gender attitudes today than it did in the past, with one result being that women now perceive fewer barriers to seeking higher education (Amato & Booth, 1997; Brewster & Padavic, 2000). Access to reliable contraceptives may also be related to women delaying marriage and spending more years in school than they did prior to the 1960s (Goldin & Katz, 2002). There is also speculation that the current divorce rate means that women perceive an increased likelihood that they will have significant financial responsibility for their families (Goldin et al., 2006). Furthermore, some research provides evidence that the standard of living advantage obtained because of attaining higher education may have risen faster for women than for men in recent decades (DiPrete & Buchmann, 2006; Dougherty, 2005; Goldin et al., 2006).

Family background characteristics may also be associated with the gender gap in higher education, as evidenced by Buchmann and DiPrete (2006). These authors used data from white participants in the General Social Survey. In the 1938-1965 birth cohort, males had a higher likelihood than females of college completion in families where the father was absent or had low education (a high school degree or less). In the 1966-1977 birth cohort, however, females had the higher likelihood of college completion in these types of families. This finding is interesting in light of the fact that the number of single mother families has increased during the past few decades (Amato & Booth, 1997). In summary, gender differences in temperament may have

some relation to the current gender gap in college attendance, but these gender differences may have combined with recent societal changes to produce the reversal of the gender gap.

Parenting and Education Outcomes

Given that the gender gap in college attendance may be larger in some types of families (e.g. lower SES) than others, and that some research suggests that parents treat their sons and daughters differently (e.g. Carter & Wojtkiewicz, 2000), it seems reasonable to examine whether family processes are associated with gender differences in college attendance. Research using one child per family suggests that parents' involvement in education and parents' educational expectations may be two parenting aspects that have associations with education outcomes (e.g. Gill & Reynolds, 1999; Grolnick & Slowiaczek, 1994).

Parental Involvement in Education

The studies that have examined the association between parental involvement in education and education outcomes have employed diverse samples and have used a variety of measures for parental involvement. These measures have mainly focused on involvement on the school grounds (e.g. attending PTO meetings; e.g. Stevenson & Baker, 1987), knowledge of adolescents' school performance (e.g. Grolnick & Slowiaczek, 1994), or involvement in educational activities at home (e.g. helping with homework; e.g. Hill & Craft, 2003). This body of literature generally suggests that parental involvement in education is positively associated with children and adolescents' academic performance, motivation, and engagement (Grolnick & Slowiaczek, 1994; Eccles & Harold, 1993; Hill & Craft, 2003; Steinberg et al., 1992; Stevenson & Baker, 1987; but see Desimone, 1999 for an exception). Parents' involvement in education may also be positively associated with their offspring's educational attainment (Flouri, 2006;

Trusty, Plata, & Salazar, 2003). Flouri (2006) found that parents' interest in their child's education at age 10 was positively associated with educational attainment at age 26.

Parents' Educational Expectations

Parents' expectations regarding adolescents' educational attainment may be another important factor associated with academic outcomes. Some research finds correlations as high as .45 between parents' and adolescents' educational expectations, which could partially reflect that adolescents may internalize their parents' expectations for educational attainment (Carpenter & Fleishman, 1987; Gill & Reynolds, 1999; Hossler & Stage, 1992; Jodl et al., 2001; Trusty & Pirtle, 1998; Trusty, Plata, & Salazar, 2003). Greater parental educational expectations may also be associated with higher educational attainment (Carpenter & Fleishman, 1987; Eccles, Vida, & Barber, 2004; Sewell, Haller, & Ohlendorf, 1970; Thompson et al., 2006). Eccles and colleagues (2004) found that higher maternal college expectations when adolescents were in sixth grade were associated with a higher likelihood of those adolescents attending college two years after high school.

Parental Treatment of Daughters vs. Sons

Research on parental involvement in education and parents' educational expectations may also provide some insight into whether it's possible that daughters and sons are treated differently by their parents. It should be noted, however, that this literature typically uses samples that include one child per family and does not directly measure parents' differential treatment. This body of literature has not yielded consistent findings. Some research on parental involvement in education shows that parents show similar degrees of involvement for their daughters and sons (Grolnick et al., 1997; Lytton & Romney, 1991; Stevenson & Baker, 1987), some finds that parents show more involvement on behalf of daughters (Bogenschneider, 1997;

Carter & Wojtkiewicz, 2000; Freese & Powell, 1999), and one study implies that mothers may remain more involved on behalf of sons than on behalf of daughters during middle school (Grolnick et al., 2000). Looking across these studies, it seems that whether parents are more involved on behalf of daughters or sons depends on the type of involvement in question. Parents may attend more school events for daughters and may talk more with them than with sons about school-related issues. However, parents may communicate more with the school and may check homework more often for sons than for daughters (Carter & Wojtkiewicz, 2000; Manz, Fantuzzo, & Power, 2004; Muller, 1998; Sui-Chu & Willms, 1996). This may reflect that daughters generally communicate more with mothers than sons do during adolescence (Leaper, Anderson, & Sanders, 1998). Also, sons may exhibit more behavioral problems in school than daughters and may not be as on task when it comes to completing their homework (Downey & Yuan, 2005).

Research on parents' educational expectations for daughters vs. sons shows a similarly inconsistent pattern of findings and is based mainly on data collected in previous decades. Some research suggests that parents expect male children to perform better in math and science than female children (Eccles, Jacobs, & Harold, 1990; Marini & Brinton, 1984) and that parents expect sons to complete more years of education than daughters (Eccles & Hoffman, 1984; Marini & Brinton, 1984). Consistent with these findings, Freese and Powell (1999), who used data collected in 1988, found that parents typically had more money saved for boys' than for girls' education. These findings may reflect that, historically, men obtained more years of education and higher occupational status than women (Eccles & Hoffman, 1984; Jacobs, 1996; Marini & Brinton, 1984; U.S. Department of Education, 2007a). Parents may well have been

wise to invest more in sons' than daughters' education due to a greater financial return for investing in males' education (Freese & Powell, 1999).

The research on this topic, however, does not consistently suggest that parents have higher educational expectations for males. Using data on eighth grade students from the 1988 wave of the National Education Longitudinal Study (NELS), Carter and Wojtkiewicz (2000) found that parents expected daughters to have higher educational attainment than sons. This finding emerged even after controlling for adolescents' academic performance and aspirations, suggesting that it is not totally due to the fact that females generally have higher grades than males (Carter & Wojtkiewicz, 2000). Some authors suggest that, as the age at first marriage and divorce rates have increased, parents have become wary of relying on a future husband to support their daughters and have begun to communicate higher educational expectations to girls (Freese & Powell, 1999). In summary, the literature on parents' educational expectations does not consistently suggest that one gender is favored over the other. Furthermore, much of the available data is from the late 1980s or prior, and may not reflect current societal conditions.

Parental Treatment of Daughters vs. Sons by Demographic Groups

Because the gender gap in attending college is greater among some demographic groups (U.S. Department of Education, 2006b), it would be interesting to examine whether the degree of parents' differential treatment of sons vs. daughters also varies by demographic characteristics. Given that familial stress may be associated with a greater degree of parents' differential treatment (McHale, Kim, & Whiteman, 2006), and that low SES, ethnic minority and non two-parent biological families may, on average, face more challenges, it may be that parents treat their daughters and sons more differently in these families. Few studies provide direct insight on this topic, given that most of the relevant research is either based on sons and daughters from

different families or is based on data collected in previous decades. Relevant findings also tend to be inconsistent. However, literature related to this topic is reviewed below.

Some between-family findings suggest that parents of lower SES are more likely than parents of higher SES to have higher educational expectations and to show more educational involvement for sons than for daughters (Eccles & Hoffman, 1984; Freese & Powell, 1999). Other research, however, implies that mothers in lower SES families have higher occupational ambitions and show more educational involvement for daughters than for sons (Grolnick et al., 1997; Newson & Newson, 1987; Stevenson & Baker, 1987). Within-family research has not typically had a specific focus on mixed sex sibling dyads, but some of this research suggests that lower SES is associated with greater differential treatment (Jenkins, Rasbash, & O'Connor, 2003), while another study did not find associations between parents' education or income and patterns of differential treatment in the family (Crouter, McHale, & Tucker, 1999). This same study did find, however, that among families where the majority of members reported an above average level of differential treatment, there was also an above average level of perceived economic pressure (Crouter et al., 1999).

With regard to racial-ethnic group, research has not typically focused on whether the likelihood of differential treatment of sons and daughters varies between minority and majority families. Some between-family research, however, suggests that girls may be more protected and restricted than boys in Latino and African American families and may perceive greater family support for academic achievement (Cauce & Domenech-Rodriguez, 2002; Lopez, 1995; Sanders & Herting, 2000). For example, in a sample of urban African American eighth grade students, females reported greater parental encouragement than males did regarding school-related activities (Sanders & Herting, 2000). Other findings, however, suggest that Latino boys

are encouraged more than Latino girls to attend college and that male Mexican American college students receive more parental support for their educational goals (Cauce & Domenech-Rodriguez, 2002; Chacon et al., 1983; Lopez, 1995).

With regard to family structure, some research suggests that single-mother and two-parent families show similar levels of differential treatment (Atzaba-Poria & Pike, 2008), but other literature suggests that being a single parent is a risk factor for greater parental differential treatment in negativity (Jenkins et al., 2003). One study also found that there was a greater difference among siblings in parent-child relationship quality in stepmother families than in other family types (two-parent biological, single-mother, or stepfather families) (O'Connor et al., 2006). Marital dissatisfaction and conflict, which may lead to divorce and either single parent or stepfamily status, may also be risk factors for showing greater levels of parental differential treatment. Also, marital dissatisfaction may have a stronger link with parents' differential negativity among mixed sex dyads than among same-sex dyads (Crouter et al., 1999; Deal, 1996; Jenkins et al., 2003). Although this research does not indicate whether certain family structures show greater differential treatment of daughters and sons, it suggests that family structure may be associated with parents' differential treatment in general, which is likely applicable to cases of mixed sex sibling dyads.

Research Questions

This study will examine the association between family processes and the gender gap in college attendance in a sample of mixed sex sibling dyads. We will focus on four family outcome patterns: both the sister and the brother start college, neither the sister nor the brother starts college, the sister in the family starts but the brother does not, and the brother starts but the sister does not. Of these outcome patterns, the ones that involve only one sibling (either just the

brother or just the sister) starting college will have the greatest impact on the overall gender gap in starting college. Therefore, the main focus of this study will be on these two patterns and the relative odds of just sisters vs. just brothers in the family starting college.

This study will have three main goals. The first is to examine whether differences between sisters' and brothers' odds of starting college reflect the male-female differences seen in national data. We will first examine this in the overall sample and then examine whether the following demographic variables are related to the extent to which there are differences between sisters' and brothers' likelihood of starting college: family income, primary parent education level, family racial-ethnic group, and family structure. The second goal is to examine differences between sisters' and brothers' reports of maternal involvement in education, maternal educational expectations and grades in school, both overall and by level of demographic group. Finally, this study will examine whether differences between sisters' and brothers' reports of maternal involvement in education and maternal educational expectations are associated with the odds of just sisters vs. just brothers starting college.

METHODS

Participants

Overview

Data for this study will come from the pairs sub-sample of the National Longitudinal Study of Adolescent Health (ADD Health) (see Bearman, Jones, & Udry, 1997 for details on the larger study; see Slomkowski et al., 2005 for a description of the pairs sub-sample). At wave 1 in 1994-1995, participants were in grades 7 through 12; wave 2 was conducted in 1995-1996 and wave 3 was conducted in 2001-2002. For the present study, family background characteristics, parenting data and grades in school will come from wave 1 and the outcome variable (started college vs. did not) will come from wave 3.

Sample Selection Criteria

There were several criteria used to select sibling pairs for this study. The pairs sub-sample of ADD Health included 3139 sibling dyads at Wave 1. For the current study, 245 dyads were initially deleted for one or more of the following reasons: (a) youth did not have data at any of the three study waves, (b) siblings' ages could not be determined due to missing birth dates, (c) data for some youth were duplicated. From this starting sample of 2894 sibling dyads, sibling pairs were retained if both members had participated in waves 1 and 3 (n = 2124 pairs). We then selected only the mixed sex sibling dyads (dyads with one female and one male) (n = 817 pairs).

Next, for families that had more than one mixed sex sibling pair, we selected the oldest mixed sex sibling pair that had members that most closely approximated consecutive birth orders. To do this, a "choice" value was assigned to each sibling dyad that came from a family with more than one mixed sex sibling dyad; if the older member's birth order was 1 and the

younger member's birth order was 2, the sibling dyad would be assigned a choice value of 1. Other choice values were assigned as follows: 2 = birth order 2, 3 pair; 3 = birth order 3, 4 pair; 4 = birth order 1, 3 pair; 5 = birth order 2, 4 pair; "6" = birth order 1, 4 pair; and "7" = birth order 2, 5 pair. (Birth order was randomly assigned for dizygotic (DZ) twins.) After selecting the pair with the lowest choice value, the sample contained 719 sibling dyads. Selecting one mixed sex sibling pair from each family helps avoid statistical dependence issues and selecting the older sibling pair allows the sample to include the adolescents who are the most likely to have had the opportunity to start college by wave 3. Consecutive birth order was used as a selection criterion because the parenting environment should be more similar for siblings who are closer in age, helping to minimize the possibility that other characteristics besides gender might contribute to within-family differences on the variables of interest.

Pairs were then removed from the sample if parents reported that one or more of the adolescents in a mixed sex pair were mentally retarded, which resulted in a sample of 711 sibling dyads. Pairs were retained if parents did not indicate whether or not their child was mentally retarded (n = 158; about 11% of sample).

We then selected sibling pairs where both members had the opportunity to start college by wave 3. Siblings' ages at this wave ranged from 18 to 27, meaning that some individuals may not yet have been old enough to start college. Individuals were only included in the sample if they were at least 20 years old at wave 3 or if they were less than 20 years of age, but reported completing 13 or more years of education. From the resulting sample of 636 dyads, families were next selected if both siblings had the opportunity to have data for their wave 1 grades in school, a key control variable in this study; families were included if both siblings were in school during the 1994 to 1995 school year (the year wave 1 was administered) (n = 606). Finally,

families were selected if both siblings reported having a mother figure, given that maternal treatment data was an important component of this study. The final sample contained 565 sibling dyads.

Sample Description

Female siblings were an average of 15.57 years old (SD = 1.60) at wave 1 and an average of 21.92 (SD = 1.62) at wave 3. Male siblings were an average of 15.82 (SD = 1.67) at wave 1 and an average of 22.20 (SD = 1.67) at wave 3. Sibling dyads had an average age-spacing of 1.66 years (SD = 1.24). The median 1994 family income was $38,000 and about 49% of the sibling dyads were in two parent biological families at wave 1. Approximately 51% of the sibling dyads were white, 23% of the sibling dyads were black, and 12% of the sibling dyads were Hispanic. The remaining 14% were either Asian/Pacific Islander, American Indian/Alaskan Native, another less common racial-ethnic group or the siblings in the dyad differed in their reported racial-ethnic group. The siblings in the sample also vary in genetic relatedness; there are 112 dizygotic twin dyads, 285 full sibling dyads, 80 half sibling dyads, 24 cousin dyads, and 64 non-related sibling dyads (e.g. step-siblings). Including dizygotic twin dyads who had their birth orders randomly assigned, males were the older sibling in about 54% of the cases.

Given that the ADD Health pairs sample was designed to be genetically informative and that twins were oversampled, the current sample is not representative of the general U.S. population of mixed sex sibling dyads. Also, studies that report national trends regarding gender differences in college attendance include families with varying gender dyad compositions whereas this study only includes mixed sex dyads; this means that the within-family gender differences that this study will examine do not directly correspond to reported national trends.

Nevertheless, our sample of mixed sex dyads does allow us to learn about potential differences between sisters and brothers in starting college.

Measures

Demographic Variables

Family income. The primary parent in each family reported the total family income in thousands of dollars for the year 1994. The primary parent was typically the adolescent's mother, but if the mother did not reside in the household, the interviewers selected the first person from the following list who resided in the household: stepmother, other female guardian (e.g. grandmother), father, stepfather, other male guardian (e.g. grandfather). In my sample, for brothers, about 86% of the primary parents were the biological mother, 4% were the stepmother, 2.5% were the adoptive mother, 2.5% were the aunt, 2% were the biological father and the remaining primary parents were one of the following: foster mother, grandmother, other female relative, other female non-relative, adoptive father. For sisters, about 88% of the primary parents were the biological mother, 3% were the stepmother, 2% were the adoptive mother, 2% were the grandmother, 2% were the biological father and the remaining primary parents were one of the following: foster mother, aunt, or adoptive father. (Note that the actual person reporting as the primary parent can be the same across siblings without the type of parent-child relationship being the same across siblings. For example, in a family where one sibling has been adopted, the primary parent may be the biological mother for one sibling, but the adoptive mother for the other.) Because the distribution of this variable showed a positive skew, the natural log of family income was used in this study.

Primary parent education. During wave 1, the primary parent in the family reported on how far he or she had gone in school. The original ADD Health response scale was altered for

this study so that the responses were ordered from lowest to highest education level; the resulting response scale ranged from 0 to 7 (0 = "never went to school", 1 = "eighth grade or less", 2 = "more than eighth grade but not high school graduate", 3 = "went to business, trade, or vocational school instead of high school", 4 = "high school diploma", 5 = "some post high school education", 6 = "college graduate", 7 = "some professional training beyond college").

Family structure. Family structure is based on the adolescents' report of the household roster at wave 1. Adolescents reported who currently lived in their household and specified how each person in the household was related to them. Family structure will have two categories: two-parent biological family vs. other.

Family racial-ethnic group. At wave 1, adolescents selected which of the following categories best described their race: White, African American or Black, American Indian or Native American, Asian or Pacific Islander, Other. They were also asked whether or not they were Hispanic. Based on adolescents' answers to these questions, we formed three racial-ethnic groups: both siblings white (non-Hispanic), both siblings black (non-Hispanic), and other. The "other" group contained Asian/Pacific Islanders, American Indian/Alaskan Natives, dyads who reported another less common racial-ethnic group and families in which the siblings differed in their reported racial-ethnic group.

Age-spacing between siblings. Age-spacing between siblings refers to the absolute value of the difference, in years, between siblings' ages.

Parenting Measures

Maternal involvement in education. During wave 1, adolescents were asked to indicate which of the following they had done with their mother in the past four weeks: talked about school work or grades, worked on a project for school, talked about other things they were doing

in school. Because the item regarding working on a project for school had less face validity than the other two items (the adolescent might not have had a school project, for example) and would have dropped the alpha down to about .59, this item was dropped. To form a measure of maternal involvement, we created a sum of the two remaining items for individuals who had answered both of the items. Scores ranged from zero (adolescents indicated that their mother did none of these things) to two (adolescents indicated that their mother did both). Chronbach's alpha for males was .65 and the alpha for females was .68. The correlation between the two items was $r = .52$ ($p < .01$) for females and $r = .48$ ($p < .01$) for males

Maternal educational expectations. At wave 1, adolescents responded to one item regarding their mothers' expectations about their college attendance: "On a scale from 1 to 5, where 1 is low and 5 is high, how disappointed would she be if you did not graduate from college?".

Individual Achievement Variables

Grades. During wave 1, adolescents self-reported their grades (A, B, C, D or lower) for the most recent marking quarter for each of four academic subjects: history/ social studies, science, math and English/language arts. These grades were averaged to form a measure of academic achievement if individuals had reported grades for at least 2 of these subjects.

Educational attainment. During wave 3, participants were asked "What is the highest grade or year of regular school that you have completed?". (Answers range from 6, which corresponds to "sixth grade", to 22 which corresponds to "5 or more years of graduate school"). In most sibling pairs, one sibling was older than the other and would have had more of a chance to obtain more years of education. However, given that all individuals in the sample had the opportunity to complete at least the first year of college (see sample selection criteria above),

educational attainment was operationalized as starting vs. not starting college. Siblings who reported a 13 (one year of college) or higher were assigned a score of 1 to indicate that they had started college; otherwise, they were assigned a score of 0.

Construction of Difference Score Variables

The maternal differential treatment variables (involvement in education and educational expectations) will each be formed by subtracting the brothers' reports of maternal treatment from the sisters' reports. This same method will be used to construct the difference between siblings' grades in school, a control variable in this study.

Missing Data

The variable with the largest proportion of missing data was family income (98 cases missing; about 17% of the sample). Primary parent education had 56 cases missing (about 10%), and the difference between siblings' grades in school had 17 cases missing (about 3%). None of the other variables had missing cases. Because these missing data created a loss of up to 120 complete cases in the multinomial logistic regression models (see "Results"), we examined differences between cases that were missing in the Table 9 model and those who were not, focusing on comparisons that could affect key inferences in this study. Differences were examined in the following associations: between the differential treatment variables and the odds of just sisters vs. just brothers starting college, between the race and differential treatment variables, between the difference in siblings' grades and the differential treatment variables, and between the race variables and the difference in siblings' grades. Differences between missing and non-missing cases were also examined in sisters' and brothers' frequency of starting college, in the proportion of sisters who started college, in the proportion of brothers who started college, in the proportion of white families, in the proportion of black families, in the proportion of

families in the "other" racial-ethnic category, in the proportion of two-parent biological families, and in the mean levels of both the differential treatment variables and the difference between siblings' grades in school. Families with complete data did not show differences from families with incomplete data, with the exception of the proportion of white families (40% in families with incomplete data; 54% in families with complete data). However, being in a white family (vs. a family of another racial-ethnic group) was not associated with the differential treatment variables or with the odds of just sisters vs. just brothers starting college. Overall, these analyses suggested that there were few differences between families with complete vs. incomplete data and that missingness would not bias the results.

RESULTS

The results are divided into three sections. The first section examines differences between sisters' and brothers' frequency of starting college by wave 3, both overall and by levels of demographic groups. (Siblings' ages at wave 3 range from 18 to 27.) In the second section, we examine differences between sisters' and brothers' reports of maternal treatment and their grades in school. The third section focuses on whether maternal differential treatment is a predictor of the odds of just sisters vs. just brothers starting college, after controlling for the difference between sisters' and brothers' grades in school.

Research Goal 1

Differences between Sisters' and Brothers' Frequency of Starting College

Sisters and brothers differ in their frequency of starting college by wave 3 (McNemar's test: $Z^2 = 14.21$; $df = 1$; $p < .01$), with sisters having a 9% higher probability than their brothers of starting college[1,2] (see Table 1). The main contributor to this gender gap is the relative odds of just sisters vs. just brothers in the family starting college; Table 1 suggests that it is 1.8 times more likely that just sisters, rather than just brothers, start college.

We next examined whether the difference between sisters' and brothers' frequency of starting college varied by level of primary parent education (less than a college degree vs. college degree or higher), level of family income (quartiles: $20,000 or less; between $20,500 and $37,750; between $37,900 and $59,500; $60,000 to 999,000), family structure (two parent biological vs. other) and family racial-ethnic group (both siblings white, both siblings black, other). (Primary parent education was collapsed into two categories to avoid small cell sizes.) The frequency of brothers and sisters starting college differs in families where the primary parent has less than a college degree ($Z^2 = 12.27$; $df = 1$; $p < .01$), with sisters having an 11% higher

probability than their brothers of starting college and sisters being 1.9 times more likely than their brothers to be the only study sibling in the family to start college. There is no difference in the frequency of brothers and sisters starting college in families where the primary parent has a college degree or higher (Z^2 =.5; df = 1; p = .48; see Table 2).

The frequency of brothers and sisters starting college differs in families at the lowest income level (Z^2 = 6.10; df = 1; p < .05); sisters in this group have about a 14% higher probability than their brothers of starting college and they are 2.2 times more likely than their brothers to be the only study sibling in the family that starts college. The frequency of brothers and sisters starting college does not differ at the three higher income levels (see Table 3). Sisters in both non-two-parent-biological families (Z^2 = 4.28; df = 1; p < .05) and two-parent biological families (Z^2 = 11.25; df = 1; p < .01) showed a higher probability than their brothers of starting college. In non two parent biological families, they had about a 7% higher probability of starting college and were 1.5 times more likely than their brothers to be the only study sibling in the family to start college. In two parent biological families, they had about an 11% higher probability and were 2.5 times as likely to be the only study sibling in the family to start college (see Table 4). For family racial-ethnic group, there were no statistically significant differences between brothers' and sisters' frequency of starting college in the "white" or "other" families. In black families, however, sisters were about 16% more likely than their brothers to start college (Z^2 = 9.8; df = 1; p < .01), partially because they were 2.8 times as likely as their brothers to be the only study sibling in the family to start college (see Table 5).

I next estimated a multinomial logistic regression model to examine whether the difference between sisters' and brothers' odds of starting college varies by levels of family demographic variables after controlling for confounds among the demographic variables (see

Table 6). In this model, the odds of being in each of three family outcome categories (neither sibling started college, just sister started, both siblings started) were compared to the odds of being in the baseline category (just brother started). Using this baseline-category model created the opportunity to examine the odds of just sisters starting college relative to the odds of just brothers starting. The following were included as predictors: age difference in years between sisters and brothers at wave 3, family income (continuous variable), primary parent education (continuous variable), two dummy-coded family race variables ("black" and "other"), and family structure.

Of the three sets of odds ratios produced by the model, the set pertaining to the odds of just sisters vs. just brothers starting college was of primary interest. Controlling for all other family background characteristics, it is more likely in black families than it is in families of other racial-ethnic groups that just sisters, rather than just brothers, will start college ($B = 1.00$; $p < .05$). The odds ratio indicates that the odds are 2.71 times higher in black families, than they are among other racial-ethnic groups, that just the sister, rather than just the brother, will start college. It is also more likely in two-parent biological families than it is in other family structures that just sisters, rather than just brothers, will start college ($B = .80$; $p < .05$). The odds ratio indicates that the odds are 2.23 times higher in two parent biological families than they are in other families that just the sister, rather than just the brother, will start college.

The model contained other effects, as well. Controlling for all other family background characteristics, as primary parent education increases, it becomes more likely that both siblings start college than that just brothers start ($B = .56$; $p < .05$). It is more likely in black families than it is in other families that neither sibling starting college shows a higher likelihood than just brothers starting ($B = .43$; $p < .05$). It is also more likely in black families than in other families

that both siblings starting shows a higher likelihood than just brothers starting (B = 1.13; p < .05). In families other than black or white, it is more likely that both siblings starting college shows a higher likelihood than just brothers starting (B = .96; p < .05). It is also more likely in two parent-biological families than it is in other family structures that both siblings starting college is a more likely outcome that just brothers starting (B = 1.13; p < .05).

Research Goal 2

Sisters' vs. Brothers' Reports of Maternal Involvement in Education, Maternal Educational Expectations, and Grades in School

Within-family comparisons suggested that sisters and brothers reported similar levels of maternal involvement in education (M for sisters= 1.21; SD = .85; M for brothers = 1.21; SD = .84) and maternal educational expectations (M for sisters = 3.98; SD = 1.27; M for brothers = 3.92; SD = 1.30). Sisters (M = 2.87; SD = .77) reported higher grades than brothers (M = 2.62; SD = .75; t = 6.50; p < .01), even after controlling for age (mean difference = .24; t = 6.08; p < .01), which showed a negative correlation with grades (r = -.11; p < .05 for sisters; r = -.12; p < .01 for brothers)[3].

I next examined whether differences between sisters' and brothers' reports of maternal treatment or grades depended on the level of primary parent education (less than a college degree vs. college degree or higher), the level of family income (quartiles: $20,000 or less; between $20,500 and $37,750; between $37,900 and $59,500; $60,000 to 999,000), family structure (two parent biological vs. other) or family racial-ethnic group (both siblings white, both siblings black, other) (see Table 7 for means). To do this, three sets of repeated measures ANOVAs were conducted, one for each of the two maternal treatment variables and one for grades in school. In

each ANOVA, sibling was the repeated factor and the demographic variable was entered as a between-family factor.

The difference between sisters' and brothers' reports of maternal involvement in education did not vary by family income or family structure. The difference between their reports may vary by parent education, however (F (1, 507) = 5.95, $p < .05$); in families in which the primary parent received less than a college degree, brothers (M = 1.22) and sisters (M = 1.15) reported roughly equal maternal involvement in education, but in families in which the primary parent had a college degree or higher, sisters reported a greater degree of maternal involvement in their education (M = 1.43) than their brothers did (M = 1.23). In the repeated measure ANOVA for racial-ethnic group, the interaction term between siblings' reports of maternal involvement in education and family race was significant at a trend level (F (2, 562) = 2.50, p = .08) and the means by race suggested that the sister-brother difference in black families could differ in direction from the difference in families of other race groups. A follow-up repeated measures ANOVA with a black family vs. other race grouping suggested that the sister-brother difference in reports of maternal involvement in education may, in fact, differ in black families when compared to families of other races (F (1, 563) = 5.00; $p < .05$). Sisters (M = 1.21) and brothers (M = 1.15) from the other race groups reported roughly equal degrees of maternal involvement in education; in black families, however, the mean for brothers (M = 1.38) may be higher than that of sisters (M = 1.20). Differences between sisters' and brothers' reports of maternal educational expectations and grades did not vary by family income, primary parent education, family racial-ethnic group, or family structure.

Research Goal 3

Maternal Differential Treatment as a Predictor of the Odds of Just Sisters vs. Just Brothers Starting College

As an initial step toward examining associations between key predictors and the odds of just sisters vs. just brothers starting college, each of the following was entered into a separate multinomial logistic regression model: the average of sisters' and brothers' grades, the difference between sisters' and brothers' grades, the average of sisters' and brothers' reports of maternal educational expectations, maternal differential treatment in educational expectations, the average of sisters' and brothers' reports of maternal involvement in education, and maternal differential treatment in involvement in education (see Table 8)[4]. "Just brother starts college" was again used as the baseline outcome in these models, and the three comparison outcomes were the same ones that were used in the multinomial logistic regression model discussed above. These models suggest that increases in the following variables are all associated with increases in the odds just sisters, rather than just brothers, starting college: the maternal differential treatment variables, the average of sisters' and brothers' grades, and the difference between sisters' and brothers' grades. (See Table 8 for other statistically significant effects.) The average maternal treatment variables were not associated with the odds of just sisters vs. just brothers starting college.

I next estimated a multinomial logistic regression model to examine whether the maternal differential treatment variables were associated with the odds of just sisters vs. just brothers starting college, this time including the following controls: family demographic variables, the difference between sisters' and brothers' grades, the average of sisters' and brothers' grades, the average of sisters' and brothers' reports of maternal involvement in education and the average of their reports of maternal educational expectations (see Table 9)[5]. As the average of sisters' and

brothers' grades increases, it becomes more likely that just the sister starts college than that just the brother starts (B = 1.00; p < .05). The odds ratio increases by a factor of 2.72 with each unit increase in the average of sisters' and brothers' grades. As the difference between sisters' and brothers' grades increases, it becomes more likely that just the sister starts college than that just the brother starts (B = 1.01; p < .05). As maternal differential treatment in educational expectations increases, it becomes more likely that just the sister starts college than that just the brother starts (B = .31; p < .01). The odds ratio increases by a factor of 1.36 with each unit increase in the difference between sisters' and brothers' reports of maternal educational expectations. As the difference in maternal involvement in education increases, there is a trend toward it becoming more likely that just the sister starts college than that just the brother starts (B = .31; p < .10).

The model contains other effects, as well, that were less central to the focus of this paper. As the overall level of grades in the family increases, it is more likely that both siblings start college than it is that just brothers start (B = 1.53; p < .05). As sister-brother differences in grades increases, it becomes more likely that neither sibling starts (B = .53; p < .05) than that just brothers start. (This effect may be more logical if viewed this way: as sister-brother differences in grades decreases and tilts toward brothers having higher grades than sisters, it becomes more likely that just brothers start college than it is that neither sibling starts college.) It is also more likely that both siblings start than it is that just brothers start (B = .62; p < .05). In families where the average of siblings' maternal educational expectations is higher, it is less likely that neither sibling starts college than it is that just brothers start (B = -.43; p < .05). As the difference between sisters' and brothers' perception of maternal involvement in education increases, it is also more likely that neither sibling starts than it is that just brothers start (B = .38; p < .05).

(This effect can also be viewed in terms of decreases in this difference being associated with an increase in the likelihood that just brothers start, rather than that neither siblings starts.) As the difference between sisters' and brothers' perception of maternal involvement in education increases, there is also a trend toward it being more likely that both siblings start than that just brothers start ($B = .31$; $p < .10$).

The association in Table 9 between maternal differential treatment in educational expectations and the odds of just sisters vs. just brothers starting college suggests that as one sibling perceives higher maternal educational expectations than the other sibling, that sibling's odds of being the one in the family to start college increases. It suggests that maternal differential treatment in educational expectations could play a small role in the overall gender gap seen in the larger sample; this could be the case, for example, if being the sibling to report the higher maternal educational expectations benefited sisters' more than brothers' relative odds of starting college (or vice versa). A follow-up table was generated to investigate this possibility. Table 10 shows only families where one sibling started college and shows a cross-tabulation of the sibling that starts ("just sister" or "just brother") by a categorical version of maternal differential treatment in educational expectations ("brothers report higher expectations", "siblings report equal expectations", or "sisters report higher expectations").

In this subsample, sisters are the sibling to start in about 64% of the cases and they are about 1.8 times more likely overall than brothers to be the one to start. The table suggests that, in this subsample, reporting the greater maternal expectations relative to one's sibling, rather than reporting the same expectations, is associated with more of an increase in brothers' overall odds of starting college than in sisters' overall odds. However, in this group where brothers report higher expectations than sisters, they do not gain a relative advantage over sisters; sisters

are about 1.1 times as likely as brothers to be the one to start college in this group. This group also represents only about 26% of the subsample in Table 10, and comprises only about 8% of the overall sample. Overall, this group may have a limited impact on the overall gender gap in the larger sample.

In the group where sisters and brothers report the same level of expectations and in the group where sisters report the higher expectations, sisters are about twice as likely as brothers to be the sibling to start college. Given that sisters show an increase in their relative odds of starting college from being in the "equal" or "sister higher" group, rather than in the "brother higher" group, and that these two groups comprise about 74% of this subsample (and about 24% of the overall sample), it is possible that differential treatment in maternal educational expectations is associated with a slight increase in the overall gender gap that favors sisters in the larger sample. It should be noted, however, that siblings' reports of maternal educational expectations may be partially reflective of individual factors (e.g. academic achievement) rather than purely reflecting parenting behavior; this could mean that the relative odds in Table 10 partially reflect these other individual factors.

Table 3.1

Sisters' vs. Brothers' Frequency of Starting College by Wave 3

	Sister does not start college	Sister starts college	Total
Brother does not start college	156	117	273 (48%)
Brother starts college	66	226	292 (52%)
Total	222 (39%)	343 (61%)	565

Z^2= 14.21; *df* = 1; $p < .01$

Table 3.2

Sisters' vs. Brothers' Frequency of Starting College by Level of Primary Parent Education

College degree or higher (Z^2 = .5; *df* = 1; *p* =.48)			
	Sister does not start	Sister starts	Total
Brother does not start	7	18	25 (20%)
Brother starts	14	89	103 (80%)
Total	21 (16%)	107 (84%)	128
Less than a college degree (Z^2 = 12.27; *df* = 1; *p* < .01)			
Brother does not start	134	89	223 (59%)
Brother starts	48	110	158 (41%)
Total	182 (48%)	199 (52%)	381

Table 3.3

Sisters' vs. Brothers' Frequency of Starting College by Level of 1994 Family Income

	$20,000 or less ($Z^2 = 6.10$; $df = 1$; $p < .05$)		
	Sister does not start	Sister starts	Total
Brother does not start	49	29	78 (67%)
Brother starts	13	25	38 (33%)
Total	62 (53%)	54 (47%)	116
	Between $20,500 and $37,750 ($Z^2 = 2.95$; $df = 1$; $p = .09$)		
Brother does not start	43	26	69 (59%)
Brother starts	15	33	48 (41%)
Total	58 (50%)	59 (50%)	117
	Between $37,900 and $59,500 ($Z^2 = 2.31$; $df = 1$; $p = .13$)		
Brother does not start	22	22	44 (38%)
Brother starts	13	60	73 (62%)
Total	35 (30%)	82 (70%)	117
	$60,000 to $999,000 ($Z^2 = 1.13$; $df = 1$; $p = .29$)		
Brother does not start	12	19	31 (26%)
Brother starts	13	73	86 (74%)
Total	25 (21%)	92 (79%)	117

Table 3.4

Sisters' vs. Brothers' Frequency of Starting College by Family Structure

Non two-parent biological families ($Z^2 = 4.28$; $df = 1$; $p < .05$)			
	Sister does not start	Sister starts	Total
Brother does not start	104	62	166 (58%)
Brother starts	41	80	121 (42%)
Total	145 (51%)	142 (49%)	287
Two parent biological families ($Z^2 = 11.25$; $df = 1$; $p < .01$)			
Brother does not start	52	55	107 (38%)
Brother starts	25	146	171 (62%)
Total	77 (28%)	201 (72%)	278

Table 3.5

Sisters' vs. Brothers' Frequency of Starting College by Family Racial-Ethnic Group

	Sister does not start	Sister starts	Total
White families ($Z^2 = 3.65$; $df = 1$; $p = .06$)			
Brother does not start	66	59	125 (43%)
Brother starts	40	125	165 (57%)
Total	106 (37%)	184 (63%)	290
Black families ($Z^2 = 9.80$; $df = 1$; $p < .01$)			
Brother does not start	39	33	72 (55%)
Brother starts	12	47	59 (45%)
Total	51 (39%)	80 (61%)	131
Other families ($Z^2 = 3.10$; $df = 1$; $p = .08$)			
Brother does not start	51	25	76 (53%)
Brother starts	14	54	68 (47%)
Total	65(45%)	79 (55%)	144

Table 3.6

Multinomial Logistic Regression Model Predicting Siblings' Odds of Starting College with Family Background Characteristics

	B	*SE*	*OR*	*B*	*SE*	*OR*	*B*	*SE*	*OR*
Baseline: *Just brother*	**Comparison:** *Neither sibling*			**Comparison:** *Just sister*			**Comparison:** *Both siblings*		
Intercept	2.03	.87	7.61*	.18	.93	1.20	-3.22	.95	.04*
Wave 3 age difference	-.06	.08	.95	-.02	.08	.99	.05	.08	1.05
Family income (logged)	-.37	.24	0.69	-.21	.25	.81	.23	.25	1.26
Parent education	-.07	.12	0.93	.10	.13	1.11	.56	.13	1.75*
Black[a]	.43	.48	1.54*	1.00	.49	2.71*	1.13	.48	3.10*
Other race[b]	1.06	.46	2.89*	.54	.50	1.71	.96	.46	2.60*
Two-parent biological family[c]	.01	.36	1.01	.80	.37	2.23*	1.13	.35	3.10*

[a]Black: 0 = *non-black*, 1 = *black family*. [b]Other race: 0 = *black or white family*, 1 = *family race other than black or white*.

[c]Two-parent biological family: 0 = *non two-parent biological family*, 1 = *two-parent biological family*.

*p<.05.

G^2 = 1024.78; *df* = 1308

Table 3.7

Means (SD) for Sisters' and Brothers' Reports of Maternal Treatment and Grades by Demographic Variables

	Maternal involvement in education		Maternal educational expectations		Grades	
	Sisters	Brothers	Sisters	Brothers	Sisters	Brothers
Annual family income						
20K or less	1.25 (.84)	1.22 (.84)	4.06 (1.25)	3.78 (1.39)	2.73 (.76)	2.35 (.73)
21 to 37.5K	1.21 (.87)	1.25 (.83)	3.84 (1.35)	3.73 (1.36)	2.81 (.73)	2.57 (.68)
38 to 59K	1.25 (.81)	1.18 (.86)	4.02 (1.21)	4.24 (1.04)	2.92 (.78)	2.73 (.77)
60 to 999K	1.30 (.82)	1.26 (.83)	4.14 (1.10)	4.03 (1.22)	3.08 (.70)	2.83 (.75)
Primary parent education						
Less than college degree	**1.15 (.86)**	**1.22 (.84)**	3.88 (1.31)	3.81 (1.33)	2.76 (.74)	2.49 (.72)
College degree or higher	**1.43 (.76)**	**1.23 (.83)**	4.26 (1.02)	4.30 (1.10)	3.16 (.73)	2.93 (.75)
Family structure						
Non-two-parent biological family	1.24 (.87)	1.27 (.81)	3.94 (1.33)	3.79 (1.35)	2.71 (.76)	2.49 (.73)
Two-parent biological family	1.17 (.83)	1.14 (.87)	4.01 (1.21)	4.06 (1.23)	3.04 (.75)	2.75 (.75)
Family race						
White	1.21 (.84)	1.15 (.88)	3.87 (1.30)	3.81 (1.32)	2.96 (.75)	2.74 (.76)
Black	1.20 (.88)	1.38 (.77)	4.18 (1.16)	4.02 (1.32)	2.76 (.72)	2.38 (.62)
Other	1.21 (.85)	1.16 (.82)	4.01 (1.30)	4.07 (1.22)	2.79 (.85)	2.59 (.79)

Note. Bold numbers indicate that interaction term in ANOVA was statistically significant.

Table 3.8

Preliminary Multinomial Logistic Regression Models Predicting Siblings' Odds of Starting College

Model[a]		*B*	*SE*	*OR*	*B*	*SE*	*OR*	*B*	*SE*	*OR*
	Baseline: *Just brother*	**Comparison:** *Neither sibling*			**Comparison:** *Just sister*			**Comparison:** *Both siblings*		
1	Grades[b]	-.60	.28	.55*	.80	.29	2.22*	1.67	.28	5.33*
2	Difference in grades	.48	.17	1.62*	.95	.18	2.58*	.52	.16	1.68*
3	Maternal educational expectations[b]	-.40	.15	.67*	-.15	.16	.86	.20	.15	1.23
4	MDT in educational expectations[c]	.13	.09	1.14	.31	.10	1.36*	.13	.09	1.14
5	Maternal educational involvement[b]	-.38	.23	.68	-.09	.24	.92	.01	.22	1.01
6	MDT in educational involvement[c]	.30	.14	1.36*	.29	.14	1.34*	.29	.13	1.34*

[a]Each predictor was entered into a separate model.

[b]Average of sisters' and brothers' reports.

[c]MDT = Maternal differential treatment (sister report – brother report)

*p<.05.

Table 3.9

Multinomial Logistic Regression Model Predicting Siblings' Odds of Starting College with Maternal Differential Treatment (MDT)

	B	*SE*	*OR*	*B*	*SE*	*OR*	*B*	*SE*	*OR*
Baseline: *Just brother*	**Comparison:** *Neither sibling*			**Comparison:** *Just sister*			**Comparison:** *Both siblings*		
Intercept	4.64	1.42	103.54*	-.99	1.51	.37	-6.14	1.52	.00*
Wave 3 age difference	.00	.09	1.00	.05	.09	1.05	.10	.09	1.11
Family income (logged)	-.36	.25	.69	-.33	.27	.72	.18	.27	1.19
Parent education	.01	.13	1.02	.14	.15	1.15	.54	.15	1.72*
Black[a]	.77	.52	2.15	1.19	.54	3.27*	1.52	.53	4.56*
Other race[b]	1.32	.49	3.74*	.92	.54	2.51	1.32	.50	3.74*
Two-parent biological family[c]	.15	.39	1.17	1.09	.42	2.97*	1.21	.39	3.36*
Grades[d]	-.28	.35	.76	1.00	.36	2.72*	1.53	.35	4.62*
Difference in grades	.50	.20	1.65*	.96	.22	2.61*	.57	.21	1.76*
Maternal educational expectations[d]	-.43	.20	.65*	-.32	.21	.73	-.17	.20	.84
MDT in educational expectations	.10	.11	1.11	.31	.12	1.36*	.24	.12	1.27
Maternal educational involvement[d]	-.59	.30	.56	-.22	.32	.80	-.27	.30	.76
MDT in educational involvement	.38	.17	1.46*	.31	.18	1.36	.31	.17	1.36

[a]Black: 0 = *non-black*, 1 = *black family*. [b]Other race: 0 = *black or white family*, 1 = *family race other than black or white*.

[c]Two-parent biological family: 0 = *non two-parent biological family*, 1 = *two-parent biological family*.

[d]Average of sisters' and brothers' reports.

*p<.05. G^2 = 909.31; *df* = 1296

Table 3.10

Cross-tabulation of Just Sister vs. Just Brother Starting College and Maternal Differential Treatment in Educational Expectations (*n* = 183)

	Just brothers start	Just sisters start
Brothers report higher MEE than sisters[a]	22 (47%)	25 (53%)
Brothers and sisters report equal MEE[a]	24 (32%)	50 (68%)
Sisters report higher MEE than brothers[a]	20 (32%)	42 (68%)
Total	66 (36%)	117 (64%)

[a]MEE = Maternal educational expectations.

DISCUSSION

The first goal of this study was to examine the difference between sisters' and brothers' frequency of starting college by wave 3 of the ADD Health study. In this sample, 52% of brothers had started college, compared to 61% of sisters. Sisters were also almost twice as likely as brothers to start college in families where only one study sibling started. This suggests that mixed sex siblings, who often share similar genetic make-up and who are raised in the same family, show markedly different odds of starting college. These results are consistent with national data, but show a somewhat wider gender gap. National statistics show that in the fall of 2000 (which is approximately the year when wave 3 Add Health data was collected), among individuals who had just finished high school, the difference between the proportion of males and females starting college was about 6%; in 2001, the gap was about 3.5% (Forum on Child and Family Statistics, 2009). Although it is interesting to compare findings from this study to national data, the current sample was a small subset of U.S. families and didn't include same sex dyads or one-child families.

In these data, the sister advantage was especially striking in black families; 61% of sisters started college in these families, compared to only 45% of brothers, a gap that results largely from the fact that sisters were substantially more likely than their brothers to be the only study sibling in the family to start college. This is consistent with national data, which shows a larger female advantage in black families than in other racial-ethnic groups (U.S. Department of Education, 2006b). There was evidence of the gender gap being larger in black families even after controlling for factors like family income and education, suggesting that the wider gap is not simply due to blacks being overrepresented among low SES families. The gender gap may be wider among blacks for a number of reasons; one is that black males seem to be at an especial

disadvantage in the U.S. school system (Skiba, 2001). Previous literature has noted that black males lag behind their female counterparts to a greater extent than do white males when it comes to academic achievement in adolescence (Garibaldi, 1992). Perhaps this is partially because black males are often the victim of negative stereotypes that result in less support and more negative treatment from teachers (e.g. Noguera, 2003). For example, black males are overrepresented among students who are suspended from school (Skiba, 2001). There is also evidence that during adolescence black males may value qualities such as toughness over studiousness and may admire low-achieving peers more so than black females (Rodkin et al., 2000; Taylor & Graham, 2007). This value system may hinder these males from showing high academic achievement. It is also the case that African American men have relatively high rates of incarceration, which could have a bearing on the gender gap (Taylor, 2000).

The sister advantage was also greater in two parent biological families than in other family structures, after controlling for other family background characteristics. Table 4 suggests that this may be the case because the proportion of families where just the sister starts college is about the same for both family structure groups (20% in two parent biological families; 22% in non-two parent biological families), but the proportion of families where just brothers start is smaller in two parent biological families (9%) than in non two parent biological families (14%). The reason for this effect is not entirely clear and it seems inconsistent with the general trend of the gender gap favoring females to be more prominent in families that face more challenges (e.g. minority and lower SES families). But maybe the pattern of sisters not starting when their brothers do is less likely in two parent biological families because two factors work together to decrease the probability that sisters don't start: 1) sisters are overall more likely than brothers to start college across family types and 2) all individuals, including sisters, have an increased

chance of starting college in two parent biological families. In other words, both of these factors decrease the odds that sisters won't start, while only the second factor decreases the odds that brothers won't start. Again, however, reasons for the effect are not entirely clear.

There was also evidence that the sister advantage for starting college was greater in lower income than in higher income families and greater among families where the primary parent had less than a college degree. The effect may have been due to the greater likelihood of college attendance in the higher SES groups, which leaves less of an opportunity than in the lower SES groups for a large gender gap. In the highest income group, both sisters and brothers started college in about 62% of the families and in the group where the primary parent had attended college, both siblings started college in about 70% of the families. Perhaps in families where parent education and income are lower, the effect of males' lower grades and higher likelihood for behavioral problems becomes compounded, thus having a greater chance to lower their odds of starting college. It should be noted that the larger gender gaps among the lower income and lower education groups were not evident after controlling for other family demographic factors; this suggests that they may have each partially stemmed from other family factors, given that race, family income, and parent education are typically all correlated.

We next examined mean differences between sisters and brothers in three factors, both overall and by demographic group: grades in school, maternal involvement in education and maternal educational expectations. Sisters reported higher grades than brothers, a finding that is consistent with other research that shows that females typically earn higher grades than males (e.g. Downey & Yuan, 2005). There were no mean differences between sisters' and brothers' reports of the two maternal treatment variables, suggesting that there is not a tendency for one gender to consistently perceive more maternal involvement or higher maternal educational

expectations than the other. There were, of course, families in which sisters and brothers reported different levels of the maternal variables. Brothers reported higher maternal educational expectations than sisters in about 30% of families and a similar percentage of families had sisters who reported higher maternal educational expectations than brothers. Brothers reported greater maternal involvement than sisters in about 27% of families and sisters reported greater maternal involvement in about 28% of families. Overall, it is not clear whether the findings are consistent with between-family research on gender differences in maternal involvement in education (e.g. Carter & Wojtkiewicz, 2000) or maternal educational expectations (e.g. Eccles, Jacobs, & Harold, 1990), given that the results have been inconsistent across studies; some of the findings suggest greater involvement or higher expectations for sons, some findings suggest the opposite, and other findings do not show gender differences (Bogenschneider, 1997; Carter & Wojtkiewicz, 2000; Eccles & Hoffman, 1984; Grolnick et al., 1997; Grolnick et al., 2000).

Overall, the findings do not provide evidence that sisters are more likely than brothers to attend college because they perceive more educational involvement or higher educational expectations from mothers. It does remain a possibility that maternal involvement in education could be experienced differently by daughters and sons or that daughters and sons internalize maternal educational expectations differently. Furthermore, it may be the case that sisters are more likely than in the past to perceive either higher maternal educational expectations than brothers or expectations that are equivalent to brothers, given recent societal shifts toward greater encouragement of female attendance at higher institutions. Data collected across the past few decades on maternal differential treatment would be needed to more thoroughly address this issue.

With regard to mean differences between sisters' and brothers' reports of maternal treatment by level of demographic group, my hypothesis, based on past research (McHale et al., 2006) was that differential treatment might be greater in families that typically experience greater degrees of stress, including minority, low income and non two-parent biological families. Overall, the results did not support this idea. Only two of the demographic variables showed evidence of differences between sisters' and brothers' reports of treatment and one of these was not in a direction consistent with the idea that demographic groups that stereotypically experience more stress also show greater differential treatment. Perhaps family demographic status (e.g. low income) may represent "stress" in terms of a disadvantageous access to resources and it is true that parents from these types of families have been found, on average, to engage in more inconsistent parenting (McLoyd, 1998). However, perhaps measures that captured parents' perception of emotional stress would be needed in addition to data on demographic status in order to detect these kinds of mean differences.

One of the mean differences detected was that in families where the primary parent had a college degree or higher, sisters reported more maternal involvement in education than brothers. Perhaps these "primary parents", who are predominantly mothers, are particularly education-oriented and are especially invested in their daughters' education. Mothers and daughters may talk more during adolescence than mothers and sons (Leaper et al., 1998), and if the mother is more educated, perhaps conversations between mothers and daughters are more likely to center around education issues than in families where the mother has a lower education level.

There was also evidence in these data that in black families, compared to families of other racial-ethnic groups, brothers reported a greater degree of maternal involvement in education than sisters. This finding may be inconsistent with between-family literature that

suggests that girls in black families perceive more family support for academics than boys (Sanders & Herting, 2000). However, it may make some sense. Perhaps mothers are responding to the fact that black males seem to be at an especial academic disadvantage by talking to their sons about academics and monitoring their performance. They may feel that their daughters need less constant attention given that they are, on average, better students and less susceptible to negative stereotypes (Garibaldi, 1992; Noguera, 2003).

Results also suggested that maternal differential treatment in educational expectations was associated with the odds of just sisters vs. just brothers starting college. As noted previously, this association suggests that the sibling who perceives the higher maternal educational expectations has the higher likelihood of being the sibling in the family to start college. Maternal differential treatment in educational involvement showed a similar direction of association and was significant at trend level. These findings are consistent with other research on parents' differential treatment that suggest that the favored sibling may have more advantageous outcomes (e.g. Conger & Conger, 1994) and also suggest, in conjunction with the cross-tabulation in Table 10, that maternal differential treatment in educational expectations has the potential to play a small role in the gap between sisters' and brothers' odds of starting college.

It is noteworthy that the association between maternal differential treatment in educational expectations and sisters' vs. brothers' odds of starting college emerged after controlling for sister-brother differences in grades. This suggests that the effect is not solely a result of mothers responding to sisters' and brothers' different levels of academic achievement, but that maternal differential treatment in educational expectations may explain differences between sisters' and brothers' odds of starting college above and beyond the typical achievement

differences seen between males and females. Both maternal differential treatment variables were correlated with differences between sisters and brothers in grades, however, and our data leave room for the possibility that differences between sisters' and brothers' academic achievement could fuel differential treatment and vice versa. Furthermore, the results in this study suggest that differences between sisters' and brothers' grades may be more strongly linked than parents' differential treatment is to their differential odds of starting college.

This study has some limitations. First, maternal differential treatment was measured by taking the difference between sisters' and brothers' perceptions of their parents. These perceptions may be clouded by how adolescents view their own academic capabilities and goals; that is, the perceptions they report may be based on other factors besides parents' actual behaviors and attitudes. Also, other authors have used a similar approach to the one taken in this study (e.g. Shanahan et al., 2008), but some research has used observational measures, or parents' reports to create measures of differential treatment (e.g. Brody et al., 1992; Feinberg & Hetherington, 2001); these approaches may measure differential treatment more directly. Additionally, it may be that the meaning siblings attach to parents' differential treatment may be more predictive of outcomes than the actual level of differential treatment in the family. For this reason, some research has asked siblings directly about whether they perceive differential treatment in the family is fair (McHale et al., 2000). Another limitation was that this study was not able to fully tease apart the direction of the association between maternal differential treatment and the odds of starting college. Maternal differential treatment was used as a predictor in this study, but it is also likely that parents treat siblings differently based on their unique personalities and abilities. In addition, the sample contained an overrepresentation of

dizygotic twins and did not contain same sex dyads or one-child families; therefore, it may not be representative of the U.S. population.

These limitations aside, the current study suggests there is merit in continuing to examine whether family processes, in conjunction with individual factors, play a role in gender differences in achievement outcomes. The results suggested that parents' differential treatment of their daughters and sons is associated with the educational paths that they choose to pursue and that differential treatment could play a small role in the gender gap in college attendance. Part of that role may stem from the fact that educational expectations for daughters and sons may now be more equivalent than in the past; parenting may be one mechanism through which societal shifts have produced greater female college attendance. The larger gender gaps in college attendance in certain groups (e.g. ethnic minorities) remain a topic for future research. The overall lack of mean differences in parents' differential treatment by level of demographic groups suggests that the larger gender gaps in these groups may not result from a greater degree of differential treatment, at least in terms of the particular variables measured in this study. Other family processes, as well as variability across demographic groups in other male vs. female factors (e.g. peer influences, achievement motivation) remain candidates for trying to explain the larger gender gaps in these groups. Given the substantial shifts in gender roles that have taken place across recent decades, contemporary research may only have begun to shed light on current family dynamics that influence the achievement outcomes of daughters and sons.

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APPENDIX

[1]A paired t-test showed that brothers were .28 years (*SD* = 2.09) older than sisters at wave 3 (*t* = 3.18; *df* = 564; *p* < .01). This age difference, however, does not seem to impact estimations of the difference between sisters' and brothers' frequency of starting college. Age at wave 3 was not associated with either brothers' (*r* = -.07; *p* = .08) or sisters' (*r* = -.04; *p* = .41) likelihood of starting college and the difference (sister – brother) between sisters' and brothers' age at wave 3 was not associated with the difference (sister – brother) between them in their likelihood of starting college (*r* = -.02; *p* = .70).

[2]This sample contains pairs in which the brother is older than the sister (*n* = 253), the sister is older than the brother (*n* = 193), and the brother and sister are the same age (*n* = 119). We conducted McNemar's test separately for each of these three birth order groups. The difference between sisters' and brothers' frequency of starting college was larger in the "same age" birth order group than in the other two groups (see table below). We excluded the "same age" group and re-estimated McNemar's test; the results showed that there was still a significant difference between sisters' and brothers' frequency of starting college (Z^2 = 6.72; *df* = 1; *p* < .01).

Sisters' vs. Brothers' Frequency of Starting College by Birth Order

	Sister does not start	Sister starts	Total
Brother older ($Z^2 = 3.05$; $df = 1$; $p = .08$)			
Brother does not start	77	50	127 (50%)
Brother starts	34	92	126 (50%)
Total	111 (44%)	142 (56%)	253
Sister older ($Z^2 = 3.81$; $df = 1$; $p = .05$)			
Brother does not start	49	37	86 (45%)
Brother starts	22	85	107 (55%)
Total	71 (37%)	122 (63%)	193
Same age ($Z^2 = 10.00$; $df = 1$; $p < .01$)			
Brother does not start	30	30	60 (50%)
Brother starts	10	49	59 (50%)
Total	40 (34%)	79 (66%)	119

[3] We conducted three repeated measures ANOVAs to examine whether the mean differences between sisters' and brothers' reports of grades, maternal educational expectations, and maternal involvement in education were equivalent across the three birth order groups contained in the sample (see table below). In each ANOVA, sibling was the within-family factor with two levels (brothers and sisters) and birth order group was the between-family factor with three levels (brother older, sister older, and same age). We examined whether the interaction term between "sibling" and "birth order group" was statistically significant to determine whether

the mean differences between sisters and brothers depended on birth order. The difference between sisters' and brothers' reports of grades depended on birth order ($F = 4.68$; $df = 2, 545$; $p < .05$), with the "same age" group showing the largest mean difference and the "female older" group showing the smallest mean difference. The interaction terms for the remaining two repeated measures ANOVAS were not significant.

Means (SD) for Sisters' and Brothers' Reports of Grades and Maternal Treatment by Birth Order

	Grades		Maternal involvement in education		Maternal educational expectations	
	Brothers	Sisters	Brothers	Sisters	Brothers	Sisters
Brother older	**2.60 (.74)**	**2.87 (.77)**	1.20 (.85)	1.12 (.86)	3.89 (1.34)	3.97 (1.32)
Sister older	**2.70 (.78)**	**2.82 (.78)**	1.28 (.81)	1.33 (.81)	3.98 (1.26)	4.00 (1.25)
Same age	**2.53 (.73)**	**2.97 (.77)**	1.10 (.86)	1.20 (.88)	3.90 (1.27)	3.94 (1.22)

Note. Bold numbers indicate that the ANOVA interaction term was statistically significant.

[4] We also estimated the multinomial logistic regression models for each of the following variables separately by birth order group: the difference between sisters' and brothers' grades, maternal differential treatment in educational expectations, and maternal differential treatment in involvement in education (see below). We then compared the regression coefficients from these models that pertained to the odds of just sisters vs. just brothers starting college to examine whether the coefficients differed by birth order. Using a method based on Paternoster and colleagues (1998), we conducted a total of nine comparisons (three comparisons – brother older vs. sister older, brother older vs. same age, sister older vs. same age - for each of the three predictor variables); these comparisons yielded z-scores that ranged from .39 to 1.83 (n.s.) and suggested that the regression coefficients did not differ by birth order group.

Multinomial Logistic Regression Models Predicting Siblings' Odds of Starting College: Coefficients by Birth Order for the Just Sister vs. Just Brother Comparison

		Brother older			Sister older			Same age		
Model[a]		*B*	*SE*	*OR*	*B*	*SE*	*OR*	*B*	*SE*	*OR*
	Baseline: *Just brother*	**Comparison:** *Just sister*			**Comparison:** *Just sister*			**Comparison:** *Just sister*		
1	Difference in grades	.58	.27	1.78*	1.25	.33	3.49*	1.61	.49	4.99*
2	MDT in educational expectations[b]	.44	.15	1.56*	.34	.18	1.40	.03	.24	1.03
3	MDT in educational involvement[b]	.44	.20	1.56*	.21	.26	1.23	.03	.36	1.03

[a]Each predictor was entered into a separate model and each model was estimated three times, once for each birth order group.

[b]MDT = Maternal differential treatment (sister report – brother report)

*p<.05.

[5]Because the "same age" birth order group showed some differences from the other two birth order groups in brother vs. sister means and frequencies (see notes 2 and 3 above), we re-estimated the regression model in Table 3.9 after excluding the "same age" group. We then compared regression coefficients for the following predictors in the model to the coefficients in Table 3.9 (see Paternoster et al., 1998), focusing on the coefficients for the just sister vs. just brother comparison: the difference between sisters' and brothers' grades, maternal differential treatment in educational expectations, and maternal differential treatment in involvement in education. The z-score for differences in grades was .17 (n.s), the z-score for maternal differential treatment in educational expectations was .50 (n.s), and the z-score for maternal differential treatment in involvement in education was .19 (n.s). The results suggest that the coefficients from the model excluding same-aged pairs do not differ from the coefficients in Table 3.9.

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