Ordered Delinquency: The "Effects" of Birth Order On Delinquency

Patrick R. Cundiff[*]
The Pennsylvania State University

Abstract

Juvenile delinquency has long been associated with birth order in popular culture. While images of the middle child acting out for attention or the rebellious youngest child readily spring to mind, little research has attempted to explain why. Drawing from Adlerian birth order theory and Sulloway's born to rebel hypothesis I examine the relationship between birth order and a variety of delinquent outcomes during adolescence. Following some recent research on birth order and intelligence, I use new methods that allow for the examination of both between-individual and within-family differences to better address the potential spurious relationship. My findings suggest that contrary to popular belief the relationship between birth order and delinquency is spurious. Specifically, I find that birth order effects on delinquency are spurious and largely products of the analytic methods used in previous tests of the relationship. The implications of this finding are discussed.

Keywords

Birth Order; Problem Behavior; Born to Rebel Hypothesis; Within-Family Effects

Introduction

Social scientists have long shown the effects of birth order and family size on outcomes such as intelligence and educational achievement, but little attention has been paid to these effects on deviance and delinquency. This research tests competing hypotheses of the effects of birth order on delinquency and other problem behaviors in adolescence derived primarily from Adler's birth order theory and Sulloway's born to rebel hypothesis. As I review in more detail below, birth order theory, as proposed by Adler (1928), suggests a curvilinear relationship in which firstborns or single children[1] would score the lowest on a delinquency scale, middleborns would score the highest, and the youngest children should score somewhere between firstborns and middleborns. More recently, Sulloway (1996), building upon Adler's work, has argued that laterborns[2] are more likely to rebel than firstborns. While Sulloway's historical analysis specifically looked at participation in scientific

[*]Contact information: Patrick R. Cundiff, The Pennsylvania State University, 211 Oswald Tower, University Park, PA 16802, phone: 814-865-4565, fax: 814-863-7216, patrickrcundiff@gmail.com.

[1]In an effort to avoid confusion in reading the term "single child" will be used when discussing children with no siblings, otherwise known as only children.
[2]Laterborns is a term used to describe children in the family that were not firstborn.

revolution, more recent research has examined his hypothesis using outcomes of participation in protests and marijuana use (see also Zeigenhaft, 2002; Zweigenhaft & Von Ammon, 2000)

I use data from the National Longitudinal Study of Adolescent Health (Add Health) to examine the effects of birth order on delinquency. Unlike previous research, I use a large nationally representative dataset to better identify and parse out the effects, if any, of birth order on delinquency, as well as the underlying mechanisms for these associations. Furthermore, I examine both between-individual and within-family differences in the effects of birth order on delinquency to better address potential spurious relationships. I begin with a review of Adler's and Sulloway's theoretical perspectives.

Theoretical Perspectives

Adler's (1928) seminal work "Characteristics of the First, Second, Third Child" provided the basis of birth order theory. Adler argued that the first child has one of two paths: the "path of the single child" or the "path to dethronement." For example, if a first born child remains a single child, he or she will more than likely remain the center of attention. The constant attention from parents generates expedited development, which in turn makes the child self-confident. However, the child is also prone to developing a "spoiled" or entitled attitude. On the other hand, the arrival of a sibling can be a traumatic experience for a first born as the child suffers dethronement, so that the child is no longer the center of attention. The path to dethronement causes the first child to determinedly attempt to reclaim the center of attention, which results in conformity to conventional goals and values. Moreover, the younger child thrives in his or her ordinal position as desires and ambitions are nurtured and cultivated by the parents. This nourishment leads the second child to become "more charming and likeable than their older sibling" (Adler, 1928: 24). Nevertheless, the younger child is not without trials as he or she is constantly in competition with a larger and more intelligent rival.

According to Adler, the arrival of the third sibling, however, does not dramatically shift the balance of power. The third child receives similar treatment to the second child, but the youngest child is generally more apt to overcome the competition between siblings and to establish his or her importance in the family. If the third child is unable to compete, he or she will seek the center of attention through maintaining a prince or princess mentality. Adler argued that this mentality will lead to laziness, shirking of responsibilities, and generating elaborate excuses. Sibling rivalries tend to be fueled by the competition over parental resources, this competition can become strain inducing, causing jealousy among the sibship.

Since the inception of Adler's birth order theory, a sizable body of research has found varying and contradictory evidence regarding the effects of birth order on adolescent adjustment. Most of this research has centered on achievement (Adams, 1972; Adams & Phillips, 1972; Altus, 1966; Black, Devereux, & Salvanes, 2005; Booth & Kee 2009; Forer, 1976; Kessler, 1991), intelligence (Black et al., 2007), creativity (Runco & Bahleda, 1987), conformity (Becker & Carroll, 1962; Bragg & Allen, 1970; Sampson, 1962), and risk taking

(Eisenman, 1987; Nisbett, 1968; Sulloway & Zweigenhaft, 2010). Although empirical tests of birth order theory have generally produced mixed results, several consistent personality profiles have been built around each ordinal position. Forer (1969, 1976), for instance, provided personality profiles and tendencies for a variety of ordinal positions and sibship[3] sex distributions.[4]

Overall, Forer's (1976) descriptions focused primarily on single children, firstborns, middleborns, and youngest children.[5] Firstborns have a tendency to be more conservative and are also likely to be concerned with dealing with the pressures of upholding the family mores and attitudes. Baskett (1984) found that firstborns were more likely than other ordinal positions to receive negative responses from parents and other siblings following misconduct or failure. When a sibling is added, the firstborn may react with jealousy and anxiety following dethronement. As earlier noted, firstborn children tend crave and need parental approval, thus they can be prone to succumbing to parental pressure. Because the middleborn position stimulates maximum sibling competition; the stress and strain from the middle ordinal position can either lead to great success in life or constant failure. Moreover, due to the divided parental attention, middle children may have difficulties in adjustment and role identification. Thus, middleborns would be theorized to have the highest likelihood of having social problems with peers and figures of authority. Forer's personality profiles tend to indicate that middleborn children are the most prone to difficulties in conventional achievement. Research conducted by Blau and Duncan (1967) found that children occupying polar ordinal positions tended to have more successful careers than middleborn children. Research by Tygart (1991) proposed that a curvilinear relationship between birth order and delinquency could be a result of middle children lacking parental attention or supervision, thus forcing middle children to seek attention or approval from their peer group. Through a process of social learning within the peer group, middle children utilize delinquency to gain attention and approval. The youngest child typically is recognized as the baby of the family regardless of maturation, and this role is both advantageous and disadvantageous. While the youngest child is characterized as more extroverted than older siblings, youngest children generally tend to have low acceptance of responsibility.

More recently, Sulloway (1996) found a significant birth order effect upon the propensity to rebel. In *Born to Rebel*, he found that laterborns were more likely than firstborns to engage in rebellious activities, based upon his analysis of thousands of historical figures. Sulloway's findings have since garnered support by several more contemporary studies (Healey & Ellis, 2007; Paulhus et al., 1999; Salmon & Daly, 1998; Zweigenhaft, 2002; Zweigenhaft & Von Ammon, 2000). Sulloway's theory begins with the assumption that siblings who are raised together typically have markedly different personalities, and these differences are

---

[3]Sibship is a term that refers to all siblings within one family.
[4]This paper focuses on examining the link between biological birth order and delinquency. Thus, personality profiles of step children and adopted children will not be discussed at length. However, it is theorized (Toman 1993) that step children will typically keep the role they filled in their biological family with the possibility of playing multiple roles; adopted children will typically accept the role associated with their ordinal position in terms of the rest of the siblings, most problems in role assumption arise if the adopted child has already had significant socialization.
[5]Twins are not mentioned at exceptional length within this study as it has been theorized (Wilson 1981, Toman 1993) that twins will typically adopt the same birth order role aside from the role of an only child; thus the possibility exists that you may have multiple firstborns, middleborns, and youngest children.

comparable to differences observed between individuals not from the same family. Sulloway contends that these differences are shaped by competition over family resources, such as parental affection and parental resources. This competition creates rivalries among the siblings, as each child vies for the family's resources. The born to rebel hypothesis emphasizes the impact birth order plays upon family niches. Sulloway's findings point to rebelliousness as a possible mechanism behind the effects of birth order. Sulloway's construction of rebellion emphasized risk-taking and openness to radical change. Laterborns are seen as more open to risk-taking and radical change because these behaviors favor them in the competition for parental resources as it upsets the tradition associated with investment in the firstborn. While Sulloway does not speak directly about delinquency, it would follow that those open to radical change and those more willing to take risks may also be open to delinquency as a method of radical change.

The rebirth of interest into the effects of birth order has generated a considerable amount of literature in the fields of psychology and sociology, yet few studies have looked to reexamine the effects of birth order on delinquency. Using a sample of youth from Israel, Rahav (1980) found a curvilinear relationship between ordinal position and delinquency rates in which middle children scored the highest and oldest and youngest children scored lower. However, like other research on birth order effects, Rahav did not adequately address the potential spurious relationships between birth order and delinquency. Similarly, Argys et al. (2006) found evidence that middleborns and lastborns were more likely to use substances and engage in risky adolescent behavior (sexual activity). While Argys et al.'s findings were more robust than Rahav's (1980), they still neglect issues plaguing much of birth order research. Using a French representative sample, Bègue and Roché (2005) observed a relationship between birth order and delinquency. The relationship was then largely mediated by the introduction of sibship size and parental supervision into the statistical model. Bègue and Roché (2005) concluded that birth order plays a moderate role in delinquency and that the effect is in part a product of differential parental supervision.

Within birth order research there has been a growing body of literature (Capra & Dittes, 1962; Edwards & Klemmack, 1973; Ernst & Angst, 1983; Freese et al., 1999; Hauser & Sewell, 1985; Kammeyer, 1967; Schooler, 1972; Schooler, 1973; Seff et al., 2005; Steelman & Powell, 1985; Townsend, 2000) that suggests that the effects of birth order are artificial or negligible at best. This area of research has often focused on attempting to prove that observed effects of birth order are in fact spurious. Spuriousness results when the observed effects of a predictor variable are found to be the product of some other variable. Additional studies (Capra & Dittes, 1962; Kammeyer, 1968) have also identified potential pitfalls when using birth order as a variable. Capra and Dittes (1962) identified severe sample biases associated with prior research on birth order. While findings from Kammeyer's (1968) study suggested that previous research attempted to utilize ordinal position beyond its capabilities and future research should attempt to extract the true effects of birth order by better controlling for possible confounding variables.

Birth order theory's strongest criticisms (Ernst & Angst, 1983; Schooler, 1972; Steelman, 1985), however, have focused on methodology flaws and whether the effects of birth order are in fact causal. For instance, Schooler (1972) conducted a meta-analysis on birth order

effects from previously published and unpublished studies and found that results from prior research reveal no reliable evidence of birth order effects. Schooler made note of several variables that should be accounted for: density of sibling spacing, sex of siblings, family size, and social class trends. Steelman and Powell (1985) found no significant relationship between birth order and academic performance and the conclusions lead them to believe that any observed birth order effects may be artificial.

Ernst and Angst (1983) delivered perhaps the most extensive analysis of birth order. Ernst and Angst tested birth order effects on all available fields (including: intelligence, school achievement, occupational status, personality, socialization, and mental illness) and their subsequent findings diminished the credibility of previous research. Their analysis found that in regards to school achievement and substance use (cigarettes and alcohol), birth order had negligible effects. Furthermore, birth order had no significant effects on intelligence or personality. Ernst and Angst further tested relationships between birth order and variables related to personality while controlling for structural and individual variables and found that birth order effects disappeared. Additionally, Ernst and Angst identified that general differences in scores were between subjects, not between siblings. While these criticisms focused on early works using birth order theory, few criticisms have focused specifically on Sulloway's (1996) "born to rebel" hypothesis. Recent analyses (Freese et al., 1999; Zweigenhaft, 2002; Zweigenhaft & Von Ammon, 2000) have yielded mixed results. Both studies conducted by Zweigenhaft focused on rebellious activities (such as civil disobedience, participating in protests or demonstrations, and marijuana use) and found support for Sulloway's work, while Freese et al. failed to find the same support. Freese et al.'s (1999) analysis focused on examining Sulloway's contention that firstborns display more conservative attitudes, tough mindedness, and supportive attitudes towards authority. The analysis found no significant effects for Sulloway's contention, even stating that the nonsignificant coefficients were in the wrong direction.

In addition to tests of Sulloway's *born to rebel hypothesis*, many researchers (Retherford & Sewell, 1991; Rodgers, 2001; Rodgers et al., 2000; Wichman et al., 2006; Wichman et al., 2007) have criticized previous literature's failure to examine within-family, or between siblings, differences when examining the effects of birth order and family size on intelligence (see Sulloway, 2007 and Kanazawa, 2012 for a full review of the previous literature on birth order and intelligence). Retherford and Sewell's work (1991) demonstrated that the use of within-family analyses provide a strikingly different result from works that focused on between-individual differences. In line with the work of Retherford and Sewell (1991), Rodgers (2001) and Rodgers et al.'s (2000) work provided evidence suggesting that any birth order effects are a product of differences between families, not within. More recently, Wichman et al. (2006) utilized a multilevel approach in their examination of the effect of birth order on intelligence. They found that when controlling for maternal age, the effects of birth order on intelligence become negligible and statistically non-significant. Wichman et al. (2006) noted that "the fundamental cause of supposed birth order effects lies between, not within, families" (p. 125). In defense of birth order, Zajonc and Sulloway (2007) questioned the Wichman et al.'s study design and analyses. Zajonc and Sulloway provided analyses demonstrating that the effects of birth order are both a between

individual and within family phenomenon. In reply to Zajonc and Sulloway's (2007) work, Wichman et al. (2007) contended that the research design by Zajonc and Sulloway failed to appropriately control for influences on intelligence that vary across families.

In summary, the evidence is mixed on whether the effects of birth order observed in previous studies are indeed causal. The greatest issue in evaluating the effects of birth order is the level of evaluation. Much of the recent criticisms have debated whether birth order should be evaluated between individuals or within families, and in line with this debate I test the effects of birth order at both of these levels. While I test the effect of birth order at each of these evaluation levels, the within-family evaluation models make more sense theoretically. Both Adlerian birth order theory and Sulloway's born to rebel hypothesis are inherently within family based. When an individual is a firstborn, or a middleborn, or a lastborn that ordinal position is relative to their own family, and their own sibship. The effects of birth order are thought by both perspectives to develop out of competition with siblings, thus testing the effects only between-individuals is in direct contrast to the theoretical underpinnings of both theoretical perspectives.

Current Study

This study examines the relationship between birth order and delinquency. Research examining the link between birth order and delinquency has become dated and there exists a growing body of literature focused on testing hypotheses generated by Sulloway's *born to rebel hypothesis*. The primary goal of this study is to sort out the influence, if any, that birth order has upon delinquency. If a relationship between birth order and delinquency exists, this study will then seek to clarify the mechanism(s) at work.

The following hypotheses are derived from the above theoretical perspectives of Adler's birth order theory and Sulloway's *born to rebel hypothesis*.

Hypothesis 1: Middleborn children will be more likely to engage in delinquency than either firstborn or lastborn children

If hypothesis 1 is confirmed, the results will lend support to birth order theory; which suggests that low achievement explains why middleborn children are more delinquent than firstborn and laterborn children.

Hypothesis 2: Firstborn children will be less likely to engage in delinquency than laterborn children

If hypothesis 2 is confirmed and hypothesis 1 is not confirmed, the results will lend support to Sulloway's born to rebel hypothesis. Recall that Sulloway argues that laterborns are the most likely to engage in delinquency because they have a tendency toward rebellion.

Hypothesis 3: The relationship between birth order and delinquency is spurious and a product of analytic method

Finally, if hypothesis 3 is confirmed, the results would lend support for studies that have questioned whether the effects of birth order are causal and the level of analysis.

Methods

Data

These hypotheses will be tested using data from the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a longitudinal study of a nationally representative sample of adolescents in grades 7 to 12. From 1994 to 2008, the study has collected four waves of data from the sample of adolescents, with additional surveys administered to parents, siblings, and school administrators. Since the effects of birth order are theorized to be established prior to adolescence, I do not use the follow-up data. Thus, this analysis focuses on only the wave 1 in-home survey data. Additionally, wave 1 has the largest sample size giving the analyses greater statistical power to detect even small effects of birth order on delinquency. Harris et al. (2008) sampled 80 high schools and 52 middle schools from the US with unequal probability of selection. Incorporating systematic sampling methods and implicit stratification into the Add Health study design ensured that this sample is representative of US schools with respect to region of country, urbanicity, school size, school type, and ethnicity. An in-school survey was administered during one 45-60 minute class period to all available students in each of the sampled schools; in-home interviews were then conducted approximately six months after the in-school survey to approximately 200 adolescents randomly selected from each school. Interviews lasted 90 minutes and were completed confidentially through the use of laptop computers and headphones. The respondent's parent(s) were also interviewed. Add Health yielded a response rate of 79 percent for wave 1. One of the strengths of this dataset is its sampling of sibling pairs. Sibling data was obtained purposefully if adolescents were found to have siblings within the study's age and grade ranges. The survey attempted to sample as many siblings as possible. The large number of sibships represented within the Add Health data provides me with a large number observations that can be used for the within family analytic models.

To maximize the amount of useable data I utilize multiple imputation methods to deal with missing data using Stata's ICE command. Using multiple imputation allows me to maximize my sample size as well as provide a more representative and powerful sample. Multiple imputation uses data as a placeholder, it fills in the many holes within a dataset that are attributable to missing data as well as adds variation to each hole filled (see Johnson & Young, 2011; Royston, 2005 for more information on multiple imputation). The sample following the use of multiple imputation methods contains approximately 14,884 adolescents in the between family sample and 3,802 adolescents in the within family sample. Comparisons between imputed and non-imputed data do not provide evidence of any significant statistical differences.

Measures

Outcome Variable—For the purposes of this study, I combine several measures of delinquency to create a problem behavior composite measure that indicates whether the adolescent engaged in marijuana use in the past 30 days or non-violent crime and binge drinking in the past year. The problem behavior composite measure has a Cronbach's alpha coefficient of 0.77 indicating that the components of the composite measure held together

well. The problem behavior composite measure is composed of three general components marijuana use, non-violent crime and binge drinking. A list of the questions used for each of the items included in the problem behavior composite measure is included in the Appendix table. Responses to the questions were dichotomized to create each of the components of the composite measure. The problem behavior composite score was created by combining the responses of the three components and then dichotomizing the sum, where engagement in any of the problem behavior components was coded as "1" (and coded "0" if the adolescent had not engaged in any of the problem behavior components).

Predictor Variable—Birth order is the key predictor variable utilized in this study. Birth order information was obtained through the use of the following questions "Which child are you—the first, the second, or what?" and "How many children have your biological parents had together?" Responses to both questions ranged from 1-15. Based upon the responses to both questions, respondents were then coded into one of four categories: single child, firstborn, middleborn, or lastborn. From this variable two additional variables were also created, both of which excluded single children. Note that this exclusion is based upon the contention that single children and firstborn children generally have negligible differences (Falbo 1984, Polit and Falbo 1987). The birth order variable places adolescents into one of the three following categories: firstborn, middleborn, or lastborn. As the Add Health data contains adolescents that come from families that range in sibship size from 2-15 I utilize a categorization matrix to group adolescents into the three categories of the birth order variable. I present the birth order categorization matrix in Figure 1. While I choose to focus on biological ordinal position previous research has noted functional ordinal position may also play a role in the relationship (see Sulloway, 1996). Often times biological and functional birth order are the same, however, in situations involving large age gaps between children, mortality, adoption, and remarriage these birth order constructs will differ. In the case of my study I excluded adolescents who were adopted and controlled for the effect of intact family to better attempt to control for the effect of functional order[6].

Potential Mediator Variables—Both Adlerian birth order theory and Sulloway's born to rebel hypothesis note that birth order effects originate from competition among siblings for parental resources. The competition for parental resources, then, offers potential mediators of parental presence and parental closeness. Competition among siblings for parental resources can often take place in an academic setting, in which siblings have a defined metric for success (i.e. GPA). Thus, I include measures of academic achievement and ability tap into this arena of competition for parental resources among siblings. In addition to the inclusion of these mediators being motivated by birth order theory, these potential mediators have also been linked to delinquency in previous research (see Barnes et al., 2006 and Katsiyannis et al., 2008 for full reviews). To address the hypothesized underlying mechanisms of birth order and delinquency, predictor variables indicating academic achievement, intellectual ability, parental monitoring, and parental closeness will be

---

[6]I am limited by the data in my ability to assess the age gaps from sibling to sibling if not all siblings were sampled. Given the exclusion of adolescents who were adopted, the likely limited effect of mortality in my sample, and my control for intact family, I feel that the effect of differences between biological and functional birth order would be quite limited and would not substantively alter my findings.

included in the analyses. The academic achievement measure is based upon grade point averages (GPA) constructed from self-reported grades in the following subjects: English, Mathematics, History or Social Sciences, and Science. The construction of the GPA variable is done through calculating the GPA for all courses in which each participant was enrolled. Thus, if a survey participant was enrolled in only two of the four subjects, his/her GPA score would reflect only those two courses. My calculation of GPA allows for GPA to range from 1.0 (D) to 4.0 (A). The picture vocabulary test (PVT) administered during the survey will serve as a measure of intellectual ability. Scores on the PVT ranged from 13 to 146. I standardized the PVT score by creating z-scores to give more meaning to the score.

The parental presence measure is based upon adolescent responses regarding the general presence of parents before they leave for school, when they return from school in the afternoon, when they eat dinner and when they go to bed in the evening. The responses ranged for presence before school, when they return from school, and when they go to bed ranged from always (coded as "5") to never (coded as "1"). The max score between parents for each time point (morning, afternoon, and evening) was used in the calculation of parental presence. The responses for the frequency with which the adolescents ate dinner with at least one parent over the past seven days ranged from 0 to 7. The final parental presence measure was calculated by summing the max parental presence scores for morning, afternoon, and evening presences with the score from the frequency of eating dinner together in the past seven days; creating a distribution that ranged from 0 (indicating no parental presence) to 22 (indicating constant presence). The parental closeness measure is based upon responses to questions regarding how close a respondent feels to each parent and activities (shopping, sport, religious event, talked about problem, talked about social life, went to entertainment, talked about school, worked on school project, and talked about other school things) the individual has recently (within the past four weeks) done with a parent. The responses to the closeness and sum of activities done were summed together; the max parental closeness score (mother or father) is used for each adolescent. I include these mediating variables to explore the robustness of the effect of birth order on engagement in problem behavior.

Control Variables—The following variables will be used to control for possible confounding influences: sibship size, twin status, sex, race, family stability, parental education, family income and age. Sibship size was obtained using the following: "How many children have your biological parents had together?" Controlling for sibship size will help to reduce the effect of variance between subjects by limiting the effect that coming from a large or small family will have upon the outcome variables. While one could expect sibship size and birth order to be strongly correlated as adolescents from larger families necessarily have a greater chance of being classified as a middleborn, the correlation between the two variables is minute (r =0.07). The variable twin status was obtained through asking "Are you a twin?" It is necessary to control for the effects of twins due to the oversampling of twins conducted by Add Health. Intact family is determined by responses to questions regarding residences of parents; adolescents were coded for intact family as "1" if both biological parents were still residing with child, and "0" if either the biological mother or father were not residing with the child. Parental education was generated by using the maximum score of educational attainment score between the two parents; the scores ranged

from 0 (no education) to 5 (professional degree). Family income information was gathered from the parent survey. The income question on the parent survey asked for total household income in the past year. Responses ranged from $0-$999,000, these responses were then grouped into income quintiles based on income quintiles observed in the US Census. Demographic variables of sex (coded as a dummy variable where a code of "1" indicates that the individual is female), race/ethnicity (coded as a series of dummy variables), and age will also be utilized to control for birth order effects upon delinquency. Table 1 provides descriptive statistics for both outcome and predictor variables used in this study (with the exclusion of single children). The table provides descriptive statistics for both the between family and within family samples. Comparisons of the descriptive statistics for the two samples reveal no statistically significant differences in the outcome variables between the two samples. Statistically significant differences did emerge between the samples for the twins variable, sibship size, and the proportions of firstborns, middleborns, and lastborns. These significant differences are a product of the more focused within-families sample design as twins were purposefully oversampled, and adolescents with more siblings had a greater chance of having another sibling be included in the AddHealth sample. While the differences are statistically significant, these differences do not appear to be substantively meaningful.

Analytic Strategy

The analytic strategy consists of examining the effects of birth order utilizing both between-individual and within-family analyses to assess genuine impacts of birth order on delinquency as well as the underlying mechanisms. First, I estimate a logistic regression examining the effects of birth order on the problem behavior composite measure. Logistic regression is better suited for cases involving a dichotomous outcome variable than OLS regression. The results of the logistic regression provide useful interpretations in that one unit changes in independent variables correspond to changes in the likelihood of an event. In the case of this study, I am interested in the effect of one unit changes in birth order on the probability of delinquency (for a full review of logistic regression techniques and logic see Pampel, 2000). These cross-sectional analyses capture any between-individual differences in the effects of birth order on delinquency. The cross-sectional analyses are consistent with much of the previous literature that have found significant birth order effects. Finally, in line with more recent research, I used fixed effects models to further analyze the significant relationship (if any) between birth order and the problem behavior composite measure. As birth order is conceptualized to be a within family process, it is necessary to examine the effects of birth order using a methodology that is able to control for family characteristics. Using a fixed effects analytic framework allows for the control of observed and unobserved family-stable characteristics (i.e. family income, parents' education, neighborhood, discipline style, etc…) that may be correlated with the problem behavior composite measure. Where previous research is lacking is in their control of family specific characteristics, observed and unobserved. Failure to control for these characteristics leaves the possibility of the effects of birth order being spurious open. Utilizing family-specific fixed effects allows for focus on within-family differences. The fixed effects methodology allows researchers to test causal claims with non-experimental data as each member of the

sibship serves as a reference point to all other siblings (for a full review of fixed effects regression see Allison 2009).

The logistic regression fixed effects equation is presented below:

$$\log(y_{iz}) = \beta_0 + \sum_{k=1}^{K} \beta_k x_{izk} + \sum_{n=1}^{N-1} d_{in} + \varepsilon_u, \varepsilon_u \sim N(0, \sigma^2)$$

in which K is the number of family varying covariates, N is the total number of individuals, β_0 is the constant, y_{iz} is a problem behavior for person i in family z, $\beta_k x_{izk}$ is an observed value on the kth family-varying covariate, such as age or parental closeness, and ε_u is the unobserved error. The equation was adapted from the standard fixed effects regression equation to study within family differences rather than within individual differences. The logistic regression fixed effects model was conducted in Stata using the XTLOGIT command. To insure the appropriateness of the use of fixed effects over random effects, Hausman tests were conducted (Hausman 1978). Note that, for all outcomes examined in this thesis, the Hausman tests were found to be statistically significant. This indicates that the fixed effects models were more appropriate.

Results

Examining the Effects of Birth Order on Delinquency: Between-Individual Analyses

Table 2 provides the results of the logistic regression testing the effects of birth order on the problem behavior composite measure. Model 1 indicates that both middleborns and lastborns are significantly more likely to have engaged in problem behaviors in the past 12 months than firstborns net of controls (odds ratios of 1.33 and 1.20, respectively). Odds ratios offer comparable effect sizes for each variable included within the analyses controlling for all other variables included in the model or controlled for within the analytic framework. An odds ratio above one is interpreted as an increase in the likelihood of an event occurring. Thus middleborns were found to be 33 percent more likely than firstborns to engage in problem behavior net of controls and lastborns were 20 percent more likely than firstborns to engage in problem behavior net of controls. Model 2 provides the results of the mediation analysis. The mediating variables[7] were not able to account for much of the observed differences between firstborns and middleborns or firstborns and lastborns; however, a reduction in the magnitude of each difference was observed (reductions of 11 percent and 33 percent respectively), though the effects of birth order remained statistically significant. Intact family, race dummy variables (black), GPA, parental presence, and parental closeness were found to significantly decrease the likelihood of problem behavior, while family income, age, gender (male), and PVT were found to significantly increase the likelihood of problem behavior.

---

[7]In analyses not presented birth order variables were shown to be significantly related to each of the potentially mediating variables. Where both middleborns and laterborns were found to lower levels of each of the mediating variables (i.e. parental presence, parental closeness, GPA, and PVT score).

Examining the Effects of Birth Order on Delinquency: Within-Family Analyses

Despite the findings shown above of significant relationships between birth order and delinquency, the question remains whether these associations are indeed causal or spurious (or artifacts of the between-individual analyses). To address these concerns, Table 3 provides the results of the logistic regression fixed effects model examining within-family effects of birth order on problem behavior. Model 1 indicates that within families, engagement in problem behavior is not significantly affected by birth order. Both of the previously significant effects of middleborns and lastborns were found to be non-significant. Moreover, the effect size of middleborns was reduced by 50 percent (non-significant odds ratio of 1.14) and the effect of lastborns changed directions. Only the effect of gender remained a statistically significant predictor of engagement in problem behavior. In Model 2 the potential mediators are added to the model. Only the measure of GPA and parental closeness were found to be statistically significant, with both predicting a lower likelihood of engagement in problem behavior. Important to note in the logistic regression fixed effect model is the absence of any variable that would be stable across all members of the sibship, as these measures are controlled for within the analytic framework. This means variables such as family income, family education, intact family, and sibship size are excluded from the analytic model, but their effects are controlled for within the fixed effects methodology. Additionally, it is important to note that other variables that would be stable across all members of the sibship that were not measured including location of home, parental discipline style, and unmeasured family resources are also controlled for in the fixed effects methodology.

In summary, significant effects for birth order on delinquency exist when controlling for individual and family characteristics at the between-individual level. However, when analyzing the effects of birth order at the within-family level the effects of birth order on delinquency become non-significant.

Discussion

Research concerning the effects of birth order has a long and storied past, complete with peaks of popularity (1950's, 1960's, and 1990's) and valleys of disfavor (1970's and 1980's). A relatively recent re-imagination of birth order theory by Sulloway (1996) has served to reignite debate surrounding the true effects of birth order. Given this rebirth of interest into the effects of birth order (especially concerning intelligence), criticisms have re-emerged questioning previous studies' use of between-individual designs (Retherford & Sewell, 1991; Rodgers, 2001; Rodgers et al., 2000; Wichman, 2006). Adler's birth order theory and Sulloway's born to rebel hypothesis both hypothesize that the effects of birth order lie within-families; yet, the majority of studies designed to test this very hypothesis rely on a between-individual comparisons. This research sought to build upon this body of work, especially the research of Rahav (1980) and Argys et al. (2006), in determining the effects of birth order upon delinquency utilizing both between-individual and within-family designs.

The results from the between-individual analyses of problem behavior provide support for both *Hypothesis 1* and *Hypothesis 2*. While both hypotheses are supported, *Hypothesis 2* derived from Sulloway's born to rebel hypothesis was found to have greater support as

curvilinearity in the effect of birth order was not observed. While firstborns were significantly less likely to engage in problem behavior than middleborn or lastborns, lastborns did not significantly differ in their likelihood of engagement in problem behavior from middleborns. The lack of a significant difference between middleborns and lastborns thus provides greater support for Sulloway's conceptualization of birth order as a dichotomy (firstborns and lastborns). Additionally, the significant effects observed for birth order were observed even in the most conservative statistical model (i.e. the mediation model).

Nonetheless, given the recent criticisms regarding between-individual study designs, I utilized a fixed effects methodology and re-analyzed the statistically significant outcomes. The results of the within-family analyses provide strong and consistent support for the null hypothesis. The significant outcomes observed in the between-individual analyses, were found to be non-significant when examined under a within families design. It is important to note that due to data restrictions, the within-family models utilize a smaller sample than the between-individual models. While the sample size is significantly lower, power analyses using Stata's POWERLOG command indicate that to observe the effects observed in the between-individual study design approximately 450 observations are needed. The within-family sample contains over 3,800 observations and the analysis included approximately 1,500 observations and 655 family groups. In light of the power analysis the within-family sample contains more than enough observations and family groups necessary to detect the same effect observed in the between-individual analysis. Given the lack of significance within-families, the effects of birth order observed between-individuals seem to indicate that some unobserved family characteristic is driving the relationship between birth order and delinquency. This finding adds to a growing literature criticizing the continued study of birth order without adequately considering possible unobserved or spurious influences.

This research improves upon previous research with its use of sophisticated statistical procedures, a large nationally representative sample, and examination of both between-individuals and within-family differences. The combination of the methods and data yield more reliable and convincing results, especially when compared to previous analyses that have had difficulty in controlling for potentially confounding variables and selection effects. Along with its advancements, this research also has some limitations. First, the explanatory variables utilized might not reflect difficult to measure concepts such as rebellion. Though I use a variety of components in my problem behavior composite, I still might not be able to capture the "rebelliousness" (or openness to radical change) that Sulloway found in his historical analysis. Recall that Sulloway's original conception of rebellion was a historical analysis of participants in scientific controversies. Sulloway's original measurement of "rebellion" attempted to utilize Eysenck's conservatism-radicalism scale. A fair criticism of Sulloway's hypothesis is that what he is calling rebellion may be overstated. Individuals were considered to be rebellious if they went against or attempted to upset the status quo. Eysenck's conservatism-radicalism scale specifically taps into attitudes about punishment, government, and war. While my outcome measure differs from that of Sulloway's, I argue that they are in line with Sulloway's basic premise that laterborns strive to upset the status quo to enable more equal competition. In the case of the problem behaviors discussed in the paper, then, laterborns should be more likely than firstborns to engage in these behaviors in an effort to gain a greater share of parental resources (i.e. parental time and attention).

Second, the within-family analyses utilize a far smaller sample than the between-individual analyses. The use of the smaller sample could potentially be underestimating the significance of the effects of birth order. Nonetheless, as I have noted above, results of power analyses indicate that my within-families sample has more than enough observations to reliably detect the same effect observed in the between-individual analyses. In addition to potentially underestimating the significance of effects of birth order there is also potential for selection bias in the within-family sample. I test for the potential effect of selection by presenting and comparing descriptive statistics for both the between-individual and within-family samples. Comparisons of the descriptive statistics reveal no significant differences in the variables used in analyses between the two analytic samples.

Finally, while my findings suggest an unobserved family factor driving the relationship between birth order and delinquency, the analyses do not necessarily provide a clear picture of what the unobserved factor could be. Based upon prior research examining the link between families and crime, as well as siblings and crime, I can only speculate as to the possible unobserved factors. First, while my analyses include measures of parental closeness and parental monitoring, my analyses do not control for the quality of parenting that can fluctuate from family to family. Research by Larzelere and Patterson (1990) provided evidence that family management practices (specifically discipline and supervision) are strong predictors of delinquency. The impact of parental discipline in the relationship between birth order and delinquency would in theory restrict juveniles' opportunity structures to commit delinquent acts as well as serve as a deterrent to repeated offenses. Second, based upon research by Haynie (2001, 2002) and Haynie and Osgood (2005), the significant differences observed in the between-individual analyses may be a product of delinquent peers or delinquent peer networks. My analyses are focused specifically on variables related to families, thus neglecting other potentially influential factors such as peers. Finally, research by Widmer (1997), Conger (1999), Slomkowski et al. (2001), and Conger et al. (2003) suggests that older siblings are influential in shaping the behaviors and norms adopted by younger siblings. Therefore, adolescents with older siblings who exhibit deviant behavior will be more likely to mimic this behavior at an earlier age. Given differences in sibling spacing or density, one could explain the between-individual results as an example of younger siblings mimicking the behavior of older siblings not included in this study. However, in the within-family analyses cases in which there existed no variation among siblings in the problem behavior composite (either all delinquent or all non-delinquent) were excluded. The number of exclusion sibships excluded from the analyses due to non-variation on the outcome measure may provide some evidence of the influence of older siblings on younger siblings.

Conclusion

In conclusion, the results of these analyses suggest that birth order provides a rather negligible role in shaping adolescents' delinquent behavior when the analyses take into account within-family characteristics. As demonstrated in this research, birth order research which continues to utilize a between-individuals design is capable of observing significant effects in even the most conservative of statistical models; however, when the more appropriate within-family design is utilized the effects become non-significant suggesting

that the observed effects are the product of some family-level characteristic not captured in the between-individuals analyses. While birth order theories, as evidenced by the results, are not necessary in delinquency research, the analyses point to other family mechanisms (intact family, family education, parental supervision, and parental closeness) that offer consistent predictions in regards to delinquent outcomes. Examination of the direct effect of birth order may be misplacing the focus of what matters more, i.e. family-level social processes. While direct effects were not observed it may be in haste to neglect the study of the indirect effects of birth order that may condition reporting of certain family mechanisms (parental closeness, and parental supervision). Further research is necessary to test for the effects of the family mechanisms discussed above, as well as analyze the influence of the sibling relationship in regards to delinquent or problem behavior outcomes.

Appendix: Problem Behavior Composite Measure Components

Variable	Question(s)
Marijuana Use	
	During the past 30 days, how many times did you use marijuana?
Non-Violent Crime[*]	
	In the past 12 months…
	How often did you take something from a store without paying for it?
	How often did you drive a car without the owner's permission?
	How often did you steal something worth more the $50?
	How often did you go into a house or building to steal something?
	How often did you steal something worth less than $50?
Binge Drinking	
	Over the past 12 months, on how many days did you drink five or more drinks in a row?

[*] Cronbach's alpha equaled 0.75

References

Adams BN. Birth order: A critical review. Sociometry. 1972; 35(3):411–439. [PubMed: 4563818]

Adams RL, Phillips BN. Motivational and achievement differences among children of various ordinal birth positions. Child Development. 1972; 43:155–164. [PubMed: 5027662]

Adler A. Characteristics of the first, second, third child. Children. 1928; 3:24, 52.

Allison, PD. Fixed effects regression models. Thousand Oaks, CA: Sage Publications; 2009.

Altus WD. Birth order and its sequelae. Science. 1966; 151:44–49. [PubMed: 5908962]

Argys LM, Rees DI, Averett SL, Witoonchart B. Birth order and risky adolescent behavior. Economic Inquiry. 2006; 44(2):215–233.

Barnes GM, Hoffman JH, Welte JW, Farrell MP, Dintcheff BA. Effects of parental monitoring and peer deviance on substance use and delinquency. Journal of Marriage and Family. 2006; 68(4): 1084–1104.

Baskett LM. Ordinal position differences in children's family interactions. Developmental Psychology. 1984; 20(6):1026–1031.

Becker SW, Carroll J. Ordinal position and conformity. Journal of Abnormal and Social Psychology. 1962; 65(2):129–131.

Bègue L, Roché S. Birth order and youth delinquent behavior testing the differential parental control hypotheses in a French representative sample. Psychology, Crime & Law. 2005; 11(1):73–85.

Black SE, Devereux PJ, Salvanes KG. The more the merrier? The effect of family size and birth order on children's education. The Quarterly Journal of Economics. 2005; 120(2):669–700.

Black SE, Devereux PJ, Salvanes KG. Older and wiser? Birth order and IQ of young men. NBER Working Paper Series. 2007; 13237:1–25.

Blau, PM.; Duncan, OD. The American occupational structure. New York: Wiley; 1967.

Booth AL, Kee HJ. Birth order matters: The effect of family size and birth order on educational attainment. Journal of Population Economics. 2009; 22(2):367–397.

Bragg BW, Allen VL. Ordinal position and conformity: A role theory analysis. Sociometry. 1970; 33(4):371–381. [PubMed: 5483946]

Capra PC, Dittes JE. Birth order as a selective factor among volunteer subjects. Journal of Abnormal and Social Psychology. 1962; 64(4):302. [PubMed: 13876374]

Conger, KJ. Older siblings' influence on girls' antisocial behavior: Does gender matter?. Paper presented at biennial meeting of Sociology for Research in Child Development; Albuquerque, NM. 1999.

Conger KJ, Heylen E, Slomkowski C, Rende R. Adolescent girls' problem behaviors: Evaluating the influence of older siblings. 2003 Manuscript in preparation.

Edwards JN, Klemmack DL. Birth order and the conservators of tradition hypothesis. Journal of Marriage and the Family. 1973 Nov.:619–626.

Ernst, C.; Angst, J. Birth order: Its influence on personality. Berlin: Springer-Verlag; 1983.

Eisenman R. Creativity, birth order, and risk taking. Bulletin of the Psychonomic Society. 1987; 25(2): 87–88.

Falbo, T. The single-child family. New York: Guilford Press; 1984.

Forer, LK. Birth order and life roles. Springfield: Charles C Thomas; 1969.

Forer, LK.; Still, H. Birth order factor: How your personality is influenced by your place in the family. New York: David McKay Company, Inc; 1976.

Freese J, Powell B, Steelman LC. Rebel without a cause or effect: Birth order and social attitudes. American Sociological Review. 1999; 64(2):207–231.

Harris, KM. The National Longitudinal Study of Adolescent Health (Add Health), Waves I & II, 1994–1996 Wave III, 2001–2002. Chapel Hill, NC: Carolina Population Center, University of North Carolina at Chapel Hill; 2008. machine-readable data file and documentation

Harris, KM.; Halpern, CT.; Entzel, P.; Tabor, J.; Bearman, PS.; Udry, JR. The National Longitudinal Study of Adolescent Health: Research design. 2008. [WWW document]. URL: http://www.cpc.unc.edu/projects/addhealth/design

Hauser RM, Sewell WH. Birth order and educational attainment in full sibships. American Educational Research Journal. 1985; 22:1–23.

Hausman JA. Specification tests in econometrics. Econometrica. 1978; 46(6):1251–1271.

Haynie DL. Delinquent peers revisited: Does network structure matter. American Journal of Sociology. 2001; 106(4):1013–1057.

Haynie DL. Friendship networks and delinquency: The relative nature of peer delinquency. Journal of Quantitative Criminology. 2002; 18(2):99–134.

Haynie DL, Osgood DW. Reconsidering peers and delinquency: How do peers matter? Social Forces. 2005; 84(2):1109–1130.

Healey MD, Ellis BJ. Birth order, conscientiousness, and openness to experience: Tests of the family-niche model of personality using a within-family methodology. Evolution and Human Behavior. 2007; 28:55–59.

Hirschi, TC. Causes of delinquency. Berkeley: University of California Press; 1969.

Johnson DR, Young R. Toward best practices in analyzing datasets with missing data: Comparisons and recommendations. Journal of Marriage and Family. 2011; 73:926–945.

Kammeyer K. Birth order as a research variable. Social Forces. 1967; 46:71–80.

Kanazawa S. Intelligence, birth order, and family size. Personality and Social Psychology Bulletin. 2012; 38(9):1157–1164. [PubMed: 22581677]

Katsiyannis A, Ryan JB, Zhang D, Spann A. Juvenile delinquency and recidivism: The impact of academic achievement. Reading & Writing Quarterly. 2008; 24(2):177–196.

Kessler D. Birth order, family size, and achievement: Family structure and wage determination. Journal of Labor Economics. 1991; 9(4):413–426. [PubMed: 12317089]

Larzelere RE, Patterson GR. Parental management: Mediator of the effect of socioeconomic status on early delinquency. Criminology. 1990; 28(2):301–324.

Nisbett RE. Birth order and participation in dangerous sports. Journal of Personality and Social Psychology. 1968; 8(4):351–353. [PubMed: 5645595]

Pampel, FC. Logistic regression: A primer. Thousand Oaks, CA: Sage Publications; 2000.

Paulhus DL, Trapnell PD, Chen D. Birth order effects on personality and achievement within families. Psychological Science. 1999; 10(6):482–488.

Polit DF, Falbo T. Only children and personality development: A quantitative review. Journal of Marriage and the Family. 1987; 49:309–325.

Rahav G. Birth order and delinquency. British Journal of Criminology. 1980; 20(4):385–395.

Retherford RD, Sewell WH. Birth order and intelligence: Further tests of the confluence model. American Sociological Review. 1991; 56:141–158.

Rodgers JL, Cleveland HH, van den Oord E, Rowe DC. Resolving the debate over birth order, family size, and intelligence. American Psychologist. 2000; 55:599–612. [PubMed: 10892201]

Rodgers JL. What causes birth order-intelligence patterns? The admixture hypothesis, revived. American Psychologist. 2001; 56:505–510. [PubMed: 11413874]

Royston P. Multiple imputation of missing values: Update. The Stata Journal. 2005; 5(2):1–14.

Runco MA, Bahleda MD. Birth-order and divergent thinking. Journal of Genetic Psychology. 1987; 148(1):119–125.

Salmon CA, Daly M. Birth order and familial sentiment: Middleborns are different. Evolution and Human Behavior. 1998; 19:299–312.

Sampson EE. Birth order, need achievement, and conformity. Journal of Abnormal and Social Psychology. 1962; 64(2):155–159. [PubMed: 14496664]

Sampson RJ, Groves WB. Community structure and crime: Testing social-disorganization theory. American Journal of Sociology. 1989; 94(4):774–802.

Sampson RJ, Laub JH. Crime and deviance over the life course: The salience of adult social bonds. American Sociological Review. 1990; 55:609–627.

Schooler C. Birth order effects: Not here, not now! Psychological Bulletin. 1972; 78(3):161–175. [PubMed: 4560785]

Seff MA, Grecas V, Frey JH. Birth order, self-concept and participation in dangerous sports. The Journal of Psychology. 1993; 127(2):221–232. [PubMed: 8336297]

Slomkowski C, Rende R, Conger KJ, Simons RL, Conger RD. Sisters, brothers, and delinquency: Evaluating social influence during early and middle adolescence. Child Development. 2001; 72:271–283. [PubMed: 11280484]

Steelman LC, Powell B. The social and academic consequences of birth order: Real, artifactual, or both? Journal of Marriage and the Family, February. 1985:117–124.

Steelman LC, Powell B, Werum R, Carter S. Reconsidering the effects of sibling configuration: Recent advances and challenges. Annual Review of Sociology. 2002; 28:243–269.

Sulloway, FJ. Born to rebel: Birth order, family dynamics, and creative lives. New York: Pantheon Books; 1996.

Sulloway FJ. Birth order and intelligence. Science. 2007; 317:1711–1712. [PubMed: 17885127]

Sulloway FJ, Zweigenhaft RL. Birth order and risk taking in athletics: A meta-analysis and study of major league baseball. Personality and Social Psychology Review. 2010; 14(4):402–416. [PubMed: 20435800]

Toman, W. Family constellation: Its effects on personality and social behavior. New York: Springer Publishing Company; 1993.

Townsend F. Birth order and rebelliousness: Reconstructing the research in. Born to Rebel Politics and the Life Sciences. 2000; 19(2):135–156.

Tygart CE. Juvenile delinquency and number of children in a family: Some empirical and theoretical updates. Youth and Society. 1991; 22(4):525–536.

Wichman AL, Rodgers JL, MacCallum RC. A multilevel approach to the relationship between birth order and intelligence. Personality and Social Psychology Bulletin. 2006; 32(1):117–127. [PubMed: 16317193]

Wichman AL, Rodgers JL, MacCallum RC. Birth order has no effect on intelligence: A reply and extension of previous findings. Personality and Social Psychology Bulletin. 2007; 33:1195–1200. [PubMed: 17933740]

Widmer ED. Influence of older siblings on initiation of sexual intercourse. Journal of Marriage and the Family. 1997; 59:928–938.

Zajonc RB, Sulloway FJ. The confluence model: Birth order as a within-family or between-family dynamic? Personality and Social Psychology Bulletin. 2007; 33:1187–1194. [PubMed: 17586733]

Zweigenhaft RL. Birth order effects and rebelliousness: Political activism and involvement with marijuana. Political Psychology. 2002; 23(2):219–233.

Zweigenhaft RL, Von Ammon J. Birth order and civil disobedience: A test of Sulloway's "Born to Rebel" hypothesis. The Journal of Social Psychology. 2000; 140(5):624–627. [PubMed: 11059208]
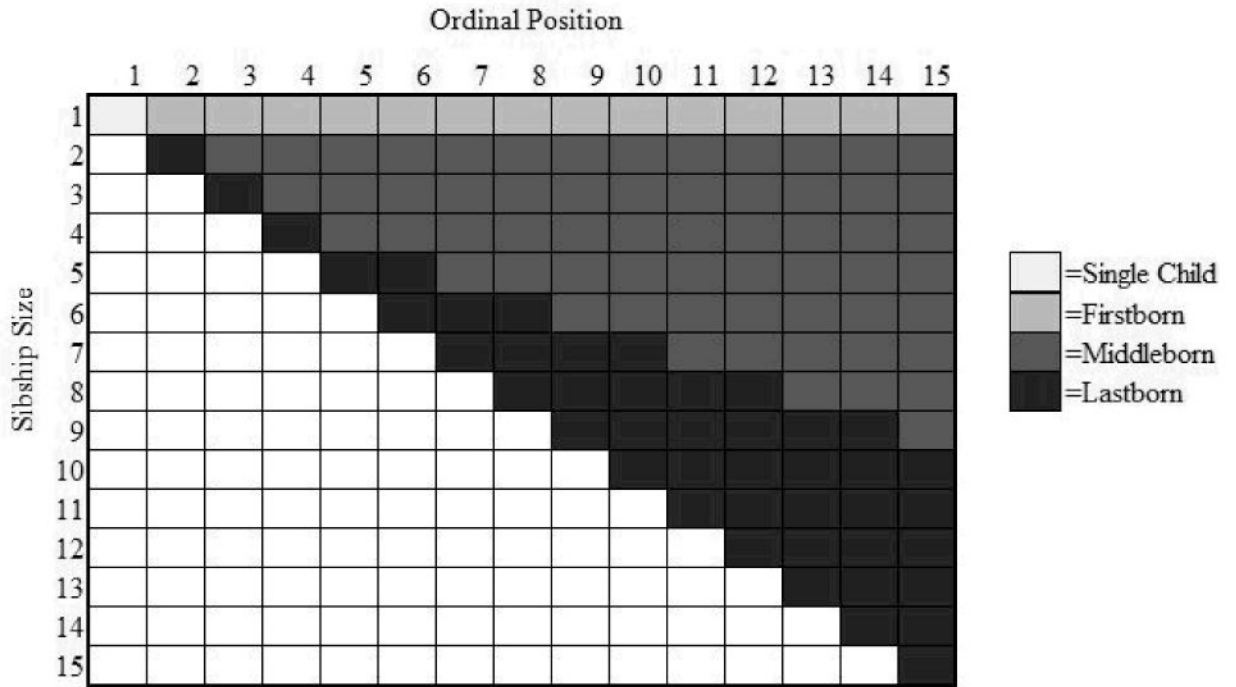
Figure 1. Birth Order Categorization Matrix

Table 1

Descriptive Statistics for Between-Individual (N=14,884) and Within-Family Samples (N=3,802)

Variables	Between-Individual Sample				Within-Family Sample			
	Mean(%N)	SD	Min	Max	Mean(%N)	SD	Min	Max
Predictors								
Firstborn	(37.14%)	~	~	~	(29.14%)	~	~	~
Middleborn	(23.87%)	~	~	~	(37.43%)	~	~	~
Lastborn	(38.99%)	~	~	~	(33.43%)	~	~	~
Outcomes								
Problem Behavior Composite	0.52	0.50	0	1	0.52	0.50	0	1
Controls								
Sibship Size	3.05	1.40	2	15	3.35	1.53	2	14
Family Education	3.02	1.20	1	7	3.05	1.19	1	6
Intact Family	0.58	0.49	0	1	0.61	0.49	0	1
Family Income	3.20	1.42	1	5	3.22	1.39	1	5
Age	15.66	1.74	11	21	15.63	1.69	11	21
Male	(49.94%)	0.50	0	1	(50.10%)	0.50	0	1
White	(51.44%)	~	~	~	(54.81%)	~	~	~
Black	(18.87%)	~	~	~	(18.25%)	~	~	~
American Indian	(0.50%)	~	~	~	(0.37%)	~	~	~
Asian	(7.32%)	~	~	~	(7.22%)	~	~	~
Hispanic	(8.57%)	~	~	~	(6.72%)	~	~	~
Other Race	(13.31%)	~	~	~	(12.63%)	~	~	~
Twins	(8.86%)	0.28	0	1	(35.66%)	0.48	0	1
Mediating Variables								
Standardized PVT	0.00	0.99	-5.71	3.40	-0.02	0.96	-5.71	3.05
GPA	2.67	0.84	1	4	2.72	0.85	1	4
Parental Presence	17.70	3.39	3	22	17.73	3.28	3	22
Parental Closeness	8.29	2.00	1	13	8.32	1.97	2	13

Table 2

Logistic Regression Predicting Problem Behavior Composite (N=14,884)

Variable	Model 1				Model 2			
	b	SE	OR	95% Confidence Interval	b	SE	OR	95% Confidence Interval
Middleborn	0.28 ***	0.07	1.33	1.16-1.52	0.25 ***	0.07	1.28	1.11-1.47
Lastborn	0.18 ***	0.05	1.20	1.08-1.33	0.12 *	0.05	1.13	1.01-1.26
Sibship Size	-0.04 *	0.02	0.96	0.92-1.00	-0.03	0.02	0.97	0.93-1.01
Family Education	-0.01	0.03	0.99	0.94-1.05	0.02	0.03	1.02	0.96-1.08
Intact Family	-0.43 ***	0.05	0.65	0.59-0.72	-0.33 ***	0.06	0.72	0.64-0.81
Family Income	0.06 *	0.02	1.06	1.01-1.11	0.06 *	0.02	1.06	1.02-1.11
Age	0.16 ***	0.02	1.17	1.13-1.21	0.11 ***	0.02	1.12	1.08-1.16
Male	0.51 ***	0.05	1.67	1.52-1.83	0.43 ***	0.05	1.53	1.39-1.69
Black	-0.41 ***	0.08	0.67	0.57-0.79	-0.49 ***	0.08	0.62	0.53-0.72
American Indian	0.69 *	0.26	1.99	1.18-3.33	0.58 *	0.25	1.78	1.07-2.95
Asian	-0.16	0.15	0.85	0.64-1.13	-0.01	0.14	0.99	0.75-1.30
Hispanic	0.00	0.11	1.00	0.81-1.24	0.02	0.11	1.02	0.83-1.26
Other Race	0.23 **	0.08	1.26	1.07-1.49	0.24 **	0.08	1.28	1.08-1.50
Twins	-0.19	0.12	0.83	0.65-1.06	-0.14	0.13	0.87	0.68-1.12
PVT					0.14 ***	0.03	1.14	1.07-1.22
GPA					-0.47 ***	0.04	0.62	0.58-0.67
Parental Presence					-0.09 ***	0.01	0.92	0.90-0.93
Parental Closeness					-0.03 *	0.01	0.97	0.94-0.99
Constant	-2.36 ***	0.30			1.28 ***	0.38		

*
  p<.05

**
  p<.01

***
  p<.001

Table 3

Fixed Effects Logistic Regression Predicting Problem Behavior Composite (N=1,508 Adolescents from 655 Families)

Variable	Model 1				Model 2			
	b	SE	OR	95% Confidence Interval	b	SE	OR	95% Confidence Interval
Middleborn	0.13	0.14	1.14	0.86-1.50	0.13	0.15	1.14	0.86-1.52
Lastborn	-0.17	0.15	0.85	0.63-1.14	-0.22	0.16	0.80	0.58-1.10
Age	0.05	0.05	1.06	0.95-1.17	0.04	0.05	1.04	0.93-1.15
Male	0.86 ***	0.13	2.36	1.82-3.05	0.80 ***	0.14	2.24	1.71-2.92
Twins	0.36	0.27	1.44	0.85-2.45	0.39	0.28	1.48	0.86-2.54
PVT					-0.06	0.09	0.94	0.78-1.13
GPA					-0.36 ***	0.09	0.70	0.59-0.83
Parental Presence					-0.04	0.02	0.96	0.92-1.01
Parental Closeness					-0.08 *	0.03	0.92	0.86-0.99

*
p<.05

**
p<.01

***
p<.001

Note: 1,121 Families or 2,294 Adolescents were dropped from the analyses due to lack of variation among siblings