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Maternal Age, Early Childhood Temperament, and Youth Outcomes

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ABSTRACT Demographers and family researchers have long debated whether early childbearing has negative consequences on the offspring, but few have considered that the benefits of delayed childbearing (or the lack thereof) may not be universal. Using sibling data from the National Longitudinal Survey of Youth 1979 Children and Young Adults, we investigate how the relevance of mothers' age at childbirth to youth outcomes (academic performance, years of education completed, and psychological distress) may differ for youth whose early-childhood behavioral disposition (i.e., temperament) indicated varying degrees of insecure attachment. Results from family fixed-effects models, which take into account much of the unobserved heterogeneity among families, show that having an older mother is associated with improved educational and psychological outcomes for youth with a rather insecure early temperament. In contrast, mothers' age at childbirth hardly matters for children with a secure disposition. Further analysis indicates that the moderating effect of maternal age cannot be explained by the mother's first-birth timing, education, work status, income, or family stability. Older mothers' higher likelihood of prior child-rearing experience explains part of the older-mother advantage for temperamentally insecure children. However, the aging process, which equips older mothers with enhanced maturity, more calmness, and therefore greater capacity to overcome adversities, seems to account for the smaller detrimental effects of an insecure disposition on their children.

KEYWORDS Age at childbirth • Temperament • Youth education • Youth distress • Sibling differences

Introduction

Demographers and family scholars have long been interested in how women's childbearing timing shapes their children's outcomes (Duncan et al. 2018; Kalmijn and Kraaykamp 2005; Levine et al. 2007; Levine et al. 2001; Powell et al. 2006). Having a child at an early age can potentially hamper a woman's educational pursuits and prospects of finding the optimal partner, resulting in reduced socioeconomic resources for her children. Several studies have found that children whose mothers had first childbirth during adolescence have lower educational performance and more behavioral

problems than those whose mothers never experienced a teen birth (Addo et al. 2016; Hofferth and Reid 2002; Hofferth et al. 2001; Hoffman et al. 1993), although some researchers are skeptical that the former group's disadvantages are due to their mother's age (Geronimus et al. 1994; Hotz et al. 2005; Mollborn and Dennis 2012; Turley 2003). Other research indicates that children born to older mothers, not just mothers who had first birth past their teens, have better outcomes and that the benefit continues to grow if the birth is delayed further into women's 30s (Duncan et al. 2018; Francesconi 2008; Kalmijn and Kraaykamp 2005; Powell et al. 2006).

Despite demographers' long-standing interest in the consequences of early childbearing, we know little about the conditions that curtail or amplify the importance of maternal age at birth. Research has increasingly found that children's genetic or early-formed dispositional differences, albeit conditioned by their available social resources, help shape their long-term achievements and well-being (Freese and Shostak 2009; Guo and Stearns 2002; Shanahan and Hofer 2005). Consistent with the idea that children with differing dispositions may react differently to the shortage or abundance of family resources, research has shown that youths from the same family, who share many parental and contextual characteristics, can vary substantially in educational, behavioral, and psychological outcomes (Conley et al. 2007; Fletcher 2010; Grätz 2018; Levy et al. 1996). If both children's dispositions and family resources are critical to their development, then any consideration of the consequences of early (or late) childbearing on the children should also account for dispositional differences.

In line with research highlighting children's genetic or early-formed dispositions, the psychological literature has long emphasized a child's early temperament, defined as behavioral styles that are independent of cognitive ability and appear early in life (Rothbart 1989; Rothbart et al. 2006). An early exhibition of a difficult or less adaptive temperament, for example, raises the odds of having childhood conduct problems (Lahey et al. 2008), decreases children's self-control (Walters 2015), and amplifies the likelihood of depression in adolescence or young adulthood (Bould et al. 2014; Sherman et al. 2016). Conversely, a positive-affect temperament—that is, the disposition to experience positive emotions—has a lasting positive effect on educational attainment (Entwisle et al. 2005). Because child temperament is produced by both genetic propensities and very early events that shape parent–child interactions (Saudino 2005), even siblings may differ in their temperament.

Joining the research on childbearing age and early temperament, we ask whether and how maternal age moderates the effects of having an insecure temperament during early childhood on the youth outcomes of academic performance, educational attainment, and psychological distress. Using longitudinal data from siblings, we examine whether older or younger mothers can more effectively reduce disparities associated with their children's differing dispositions. Because being older increases a mother's maturity and access to tangible and intangible resources (Powell et al. 2006), older mothers may better overcome their children's temperamental challenges and ensure that all their children, regardless of temperamental attributes, achieve similar outcomes. If so, then late childbearing would be especially beneficial for offspring with temperamental challenges. At the same time, however, a mother's resource insufficiency could universally hamper her children's academic performance and well-being (Becker and Tomes 1986; Conley et al. 2007). Therefore, siblings differing in early temperament may diverge less in families with very young mothers than in

those with older mothers. That is, older mothers could be especially advantageous for temperamentally secure children. In this scenario, the timing of childbearing would make a greater difference for children with a more secure temperament.

In addition to illuminating when women's childbearing timing may be especially consequential, this study makes important empirical contributions by using sibling data and statistical models that account for unobserved factors shared by children of the same mothers. This analysis avoids problems caused by different mothers assessing their children's temperaments using different standards (Seifer et al. 2004). It also helps rule out the possibility that unmeasured maternal differences, rather than maternal age at childbirth, are responsible for children's differing outcomes. Further, studies addressing maternal age and sibling disparities have mostly focused on disparities in educational outcomes (Duncan et al. 2018; Grätz 2018; Kalmijn and Kraaykamp 2005). This study adds to the literature by extending the focus to sibling disparities in psychological distress during adolescence and early adulthood.

Early Behavioral Dispositions and Youth Outcomes

The psychological literature has emphasized the importance of early-emerged behavioral styles and dispositions. Temperament theory, in particular, contends that infant variations in emotional, motor, and attentional responses to people and stimuli are critical indicators of their interactions with social environments, which shape their personalities (Rothbart 1989; Rothbart et al. 2006). Fearful infant temperament, for example, contributes to the development of conscientious and neurotic personality traits, whereas positive-affect temperament is linked to extraversion (Rothbart 2007; Rothbart et al. 2000). Early temperament can also facilitate or impede children's learning of noncognitive skills. Infants with a difficult temperament (e.g., highly fussy) have lower levels of self-control later on, whereas infants displaying physical needs (e.g., hunger, sleepiness) in a highly predictable rhythm have fewer conduct problems in middle childhood (Lahey et al. 2008).

Beyond infancy, young children continue to exhibit different behavioral dispositions that could have long-term implications. Entwisle et al. (2005) found that children assessed by their teachers as having a positive temperament in first grade have higher educational attainment at age 22, even after controlling for their first-grade academic performance. Similarly, young children who have more frequent negative emotional reactions to stimuli have a greater depression risk during adolescence (Bould et al. 2014). Having shy and inhibited behavioral styles in early childhood decreases the likelihood of externalizing and aggressive behavior during teen years (Schwartz et al. 2009).

Although many temperamental or dispositional traits have been linked to later outcomes, one early childhood behavioral style that has well-documented negative consequences on development is insecure attachment.[1] Young children with an insecure disposition are more likely to feel anxious when separating from their mother and

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[1] Some psychologists consider insecure attachment to be a potential consequence of genetically based temperament rather than a temperamental trait. Others see attachment and temperament as closely intertwined (Mangelsdorf and Frosch 1999; van IJzendoorn and Bakermans-Kranenburg 2012). In this study, we use a broader definition of temperament, considering any noncognitive behavioral style developed

are more difficult to be soothed once they are upset. Such children have greater risks of anxiety and depression during adolescence (Colonnesi et al. 2011; Sund and Wichstrøm 2002). Insecure disposition observed in early childhood is also linked to poorer academic performance in the near future and during adolescence (Jacobsen and Hofmann 1997; Moss and St-Laurent 2001), given that such disposition tends to increase children's difficulty adjusting to school environments and developing self-confidence.

Despite the large body of research linking an insecure disposition during early childhood to detrimental youth outcomes, most evidence has been derived from comparisons of children from different families (Colonnesi et al. 2011; Entwisle et al. 2005; Moss et al. 2004; Moss and St-Laurent 2001). Such comparisons can lead to erroneous conclusions if there are unobserved family factors, such as parents' personality traits and overall health conditions, that simultaneously affect children's formation of early temperament and their later outcomes. Moreover, most studies of the long-term influences of early childhood temperament have relied on parents', typically mothers', assessments of their children (Saudino et al. 2004). Such assessments are subject to bias because mothers differ in their experiences and expectations regarding nonstandard child behavior (Seifer et al. 2004). One strategy to overcome unobserved heterogeneity and reduce measurement errors caused by between-mother differences is to examine the developmental outcomes of siblings who were evaluated by the same mothers to be temperamentally different. We are unaware of such an examination.

Further, prior research sheds little light on whether families differ in how strongly siblings' dispositional differences are tied to intrafamily disparities in youth outcomes. Although a mother's assessment of her children's temperament tends to affect how she treats each child (Saudino et al. 2004), not all mothers can afford to provide extra support for the children they perceive to need support. The differential access to support networks and resources among mothers can also affect how they treat the siblings of children with temperamental difficulties. Mothers with abundant support and resources may be able to satisfy their other children's needs (e.g., by working fewer hours or hiring help) while spending ample time and resources on the child with a challenging temperament. Conversely, mothers with few resources to spare may have to deprive their other children of attention and monetary support to meet the needs of the comparatively difficult child. Thus, not all observed early sibling differences in temperament may result in similar levels of intrafamily variation in educational achievements or psychological health. In the next section, we discuss how a mother's age at birth, which has long been considered pertinent to the tangible and intangible resources mothers have for their children (Duncan et al. 2018; Hofferth and Reid 2002; Powell et al. 2006), may have implications for the links between an insecure disposition and youth outcomes.

Research on Maternal Age and Child Development

Demographic research has demonstrated connections between maternal age, especially maternal age at first birth, and children's outcomes. Children of women who

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through genetics and life experiences to be a temperamental trait (Saudino 2005). We thus refer to the behavioral tendency toward insecure attachment as *insecure disposition* or *insecure temperament*.

became mothers at a young age, particularly in their teens, tend to have lower school performance, more behavioral problems, and worse health and well-being than children whose mothers had a later first birth (Barclay and Myrskylä 2016; Duncan et al. 2018; Hofferth and Reid 2002; Hofferth et al. 2001; Kalmijn and Kraaykamp 2005; Levine et al. 2007; Levine et al. 2001). The differences in children's outcomes by maternal age at birth have been observed for children of various ages (Hofferth 1987). Even in young adulthood, there are discernible differences in achievements and well-being between children born to teen mothers and children born to adult mothers (Francesconi 2008).

The explanation for why early childbearing is detrimental to the offspring often focuses on how becoming a mother as a teen can derail the mother's educational, work, and family trajectories. Women who experience childbearing in adolescence face greater difficulties in completing their schooling (Kane et al. 2013). Because motherhood reduces a woman's ability to devote time and energy to the workplace (Budig and England 2001), early childbearing can also hamper her pursuit of a career during young adulthood (Miller 2011). Lower education and poorer career development can obstruct teen mothers' access to monetary and nonmonetary resources (e.g., information), causing their children to be comparatively disadvantaged. Moreover, early childbearing, which often results in single motherhood, increases the difficulty of finding suitable mates (Qian et al. 2005). Although some children of teen mothers are born to married parents, marriages formed by very young couples are less stable (Lehrer 2008). Children of women with a history of early childbearing therefore more commonly live in single-mother families or experience family instability. Either condition contributes to worse outcomes for the children (McLanahan and Percheski 2008).

Although the arguments about the negative effects of early childbearing on the mother's life course trajectories and resource availability seem plausible, some researchers are skeptical that teen childbearing indeed causes disadvantages. Because teen mothers often come from underprivileged backgrounds, their children's worse outcomes could reflect the disadvantages that led them to have children in adolescence rather than early childbearing itself (Turley 2003). Two studies—one using data on cousins whose mothers came from the same family (Geronimus et al. 1994) and one based on scenarios involving teenage miscarriage, in which not having a teen birth is not the individual's own choice (Hotz et al. 2005)—found minimal adverse effects of teen childbearing on the mother and child after accounting for the selectivity into early childbearing.

The possibility that the selectivity into having early childbirths can explain the negative consequences of such births has also prompted researchers to use sibling data to estimate the effects of maternal age on children (Francesconi 2008; Kalmijn and Kraaykamp 2005). By comparing siblings with the same mothers who were born at different times in the mother's life, such research can largely control for unobserved between-mother differences that contribute to their children's differing outcomes, such as mothers' personality traits and parenting styles. Contrary to earlier research using U.S. data on cousins (Geronimus et al. 1994), a study using British household data found that young adults born to teenage mothers fare worse than their siblings born after the mother reaches adulthood (Francesconi 2008). Because sibling comparisons necessarily shift the focus from women's age at first birth to their age at each birth, studies have increasingly suggested that being born to older

mothers, regardless of the mother's first-birth timing, is beneficial (Duncan et al. 2018; Kalmijn and Kraaykamp 2005). Some recent research has argued that distinguishing childbearing in women's early 20s from late 20s or 30s is just as important as distinguishing between teen and nonteen births when considering the impacts on the offspring (Addo et al. 2016; Francesconi 2008).

Increases in maternal age at birth, even beyond the typical age range when women pursue formal education and transition from school to work, could positively affect children's academic and psychological outcomes for several reasons. First, older parents have more years to accumulate income, wealth, and valuable social networks, leading to greater economic security and employment stability. Such parents can invest more time and money in their children. A previous study found that children born to older mothers receive more cultural, social, and economic resources (Powell et al. 2006), which likely lead to better developmental outcomes.

Second, women who delay childbearing until their late 20s or 30s have more time to improve their economic standing and try out different partners, both of which enhance their likelihood of finding optimal partners (Oppenheimer 1988). Such women may have more stable romantic unions and hence better offspring outcomes than those bearing children earlier.

Third, children born to older mothers might benefit from the socioeconomic progress their society experiences over time (Barclay and Myrskylä 2016). Within the same family, a child born later in the mother's life grows up in a later period. In societies where educational and health resources constantly improve, siblings born later may fare better because they can draw more resources from the environment.

Fourth, older mothers are likely to have prior child-rearing experiences. Children of older mothers are less likely to be firstborn in the family, so their parents tend to have accumulated parenting knowledge and skills from raising an older child. Such knowledge and skills could enhance children's outcomes. Although research on sibship characteristics has often found later-born children to have worse educational outcomes than firstborns, because firstborns benefit from their parents' undivided attention before their siblings' arrival (Black et al. 2018; Conley et al. 2007; Steelman et al. 2002), it is still possible that some of the effect of maternal age is mediated by having prior parenting experience.

Finally, advanced age may itself be a resource for mothers. With age, people gain maturity and experience, which enhance their ability to handle life stressors. Research has found that individuals' depression levels decline from early to middle adulthood (Mirowsky and Ross 2003). Thus, women who give birth at an older age—say, in their 30s—are likely to have better mental health than those who do so in early adulthood. Moreover, older adults tend to experience less anger and anxiety and, on the whole, are calmer and more contented (Ross and Mirowsky 2008; Schieman 1999). The increased serenity with age might better enable mothers to address difficulties and setbacks in child-rearing. Although some may suspect that older mothers' potentially lower energy, worse physical health, and greater care obligations (e.g., for their parents) would erode their age-related advantages over young mothers, empirical evidence generally does not support these speculations (Duncan et al. 2018; Powell et al. 2006).

Because a higher maternal age may be linked to various resources that could amplify advantages for children, maternal age will likely moderate the associations

between early insecure temperament and children's outcomes from middle childhood to young adulthood, including academic performance, educational attainment, and psychological well-being. Greater socioeconomic resources might ease mothers' acquisition of help (e.g., hired tutors) and enable them to provide additional support for children whose insecure disposition hinders their cognitive and noncognitive skill acquisition. Likewise, the greater maturity and serenity that come with age may allow older mothers to be patient and overcome the difficulties of raising temperamentally insecure children. If older mothers are more likely to have and allocate extra resources for children with an insecure disposition without depriving other children, we should expect that this disposition will be less detrimental to youth outcomes when the mother's age at birth is higher.

At the same time, Becker and Tomes's (1986) capital constraint theory suggests that the resources associated with maternal age may moderate the effect of children's insecure temperament differently. The theory contends that siblings from families with few resources tend to have more similar achievement levels because the overall resource shortage limits all children's development. Providing some support for the theory, Conley and colleagues (2007) found that siblings from lower income families have more similar behavioral problems than those in higher income households. The capital constraint theory can also be applied to within-family disparities in psychological health. Siblings from families with fewer resources may be more likely to suffer uniformly from mental health problems: the relatively secure children are likely to face challenges because their relatively insecure siblings occupy most of their mothers' limited time and attention. In this sense, the effect of having an insecure disposition in early childhood on youth outcomes may be smaller in families with younger mothers, who tend to have fewer tangible and intangible resources.

As discussed earlier, the potential reasons why maternal age is relevant to child development include the aging process itself as well as socioeconomic and family consequences associated with women's age at the child's birth. To gain a deeper understanding, we examine not only how maternal age moderates the effects of an early insecure temperament on youth outcomes but also whether factors related to mothers' age (mothers' education, family structures, employment status, and economic conditions) explain why younger or older mothers are more likely to bridge the gaps in youth outcomes among their children who differ in early temperament.

Methods

Data

We used data from the National Longitudinal Survey of Youth 1979 Children and Young Adults (NLSY79-CYA). The survey follows the biological children of women in the National Longitudinal Survey of Youth 1979 (NLSY79), which has been collecting information annually or biannually since 1979 from a nationally representative sample of people born in 1957–1964. The data collection for the NLSY79 women's children began in 1986, with biannual interviews with the mother or child (depending on the child's age). By 2018, more than 10,000 children had been interviewed for at least one round. Because the NLSY79 women experienced childbirths

at various times, not all their children are in the same birth cohort. Nevertheless, the NLSY79-CYA can be considered representative of the children of women born in 1957–1964. The survey includes all biological children from the NLSY79 women, thereby enabling us to analyze intrafamily variations in youth outcomes and account for unobserved shared sibling experiences. The NLSY79-CYA is also unique in that it can be linked to the NLSY79; thus, we can better account for the changes mothers experienced that are potentially relevant to their children.

For the statistical analysis, we pooled the NLSY79-CYA data from 1986 to 2018, with linked data to respondents' mothers' information from the NLSY79 in the same years. By 2018, all the NLSY79 women were in their mid-50s or older, enabling us to capture a full range of maternal age at birth. Because our focus is on the influence of early disposition, especially the behavioral style that indicates insecure attachment, we selected only respondents whose early temperamental traits had been recorded.[2] Approximately 80% of respondents with valid data on insecure disposition were at least 20 years old at their latest interview. We can therefore link this dispositional trait to various outcomes during middle childhood, adolescence, and young adulthood. The NLSY79-CYA typically administers questions to children on the basis of their age, not the survey year; for example, the temperament questions are given to all those under age 7 in any survey year. Therefore, siblings' data for each outcome were likely collected in different calendar years, making their family circumstances (e.g., mother's education, number of children at home) different. Because some of the questions used to measure our outcome variables were administered to youth within a certain age range and did not appear in all rounds, a small proportion of respondents never met the age requirement to provide information for each outcome of interest. We further excluded the respondents with invalid data on the dependent variable for each model. Depending on the specific outcome of interest, our final models contain 7,145 to 7,450 respondents born to 3,373 to 3,562 mothers.

To take full advantage of the longitudinal information and reduce measurement errors randomly occurring for any one-time observation, we included all person-years with valid data for the outcome variable of the model when the outcome was measured multiple times. Doing so also enabled us to observe how the influence of insecure temperament changes with the child's age, without the child's age being perfectly correlated with the mother's age at birth. We conducted an additional analysis in which we limited the sample to one observation per person and found similar results (see Table S1, online appendix). To ensure the time order, we restricted the person-year sample to the years after respondents' temperamental traits were recorded. Given our primary interest in youth development and outcomes, we also limited the person-year sample to age 24 or younger. Depending on the dependent variable, the person-years included in the models range from 23,524 to 28,548.[3]

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[2] Approximately 17% of respondents had no temperament scores because they were above the age cutoff (83 months old) when the survey began to collect data on early childhood temperament or because they missed the interviews while in the appropriate age range.

[3] The total number of person-year observations used in this study is 55,060 (see upcoming Table 1). This number is much larger than the number of observations in each model because the person-years used to analyze academic performance hardly overlap with those used to analyze educational attainment and psychological distress; these variables were measured within different age ranges (as discussed in detail later).

Variables and Measurement

The analysis focuses on three youth outcomes: academic performance, educational attainment, and psychological distress. For academic performance, we created a composite measure based on respondents' Peabody Individual Achievement Test (PIAT) scores, which are commonly used to assess youth learning outcomes (Duncan et al. 2018). From 1986 to 2014, the NLSY79-CYA administered the PIAT math, reading recognition, and reading comprehension tests to all children older than 5 and repeated the tests through their adolescence. We used the alpha scoring method to construct an index that is virtually an average of the three subjects' percentile scores (Cronbach's alpha = .83). We chose percentile scores because they allow us to compare academic achievements among children of all ages. The results were similar when we separately tested the PIAT math and reading scores in an exploratory analysis (see Table S2, online appendix). To capture respondents' school performance and to ensure that the achievement tests were administered after the assessments of temperamental traits, we used only the PIAT scores recorded since respondents turned 7 years old to construct the measure of academic performance.

We measured educational attainment as the years of formal schooling respondents had completed. Because youths' years of schooling tend not to diverge until near high school graduation, we examine educational attainment only for the years when respondents were aged 17–24. For the third outcome, psychological distress, we relied on a short form of the Center for Epidemiological Studies Depression Scale (CES-D), which uses seven items to gauge depression symptoms (Mirowsky and Ross 2003; Radloff 1977).[4] Respondents were asked to report how many days during the past week they felt each of the described symptoms, with response categories coded as 0 for 0 or less than 1 day, 1 for 1–2 days, 2 for 3–4 days, and 3 for 5–7 days. We averaged the responses to the seven items to indicate each respondent's level of distress, with a higher score representing greater distress (Cronbach's alpha = .71). The NLSY79-CYA did not ask about the CES-D items until respondents were aged 14. Our models for psychological distress therefore contain person-years only between ages 14 and 24.

The main predictor in our analysis is maternal age at birth, which was measured in years based on the reports of the birth years for both the mother and each of her children. The other key variable in the study is insecure disposition in early childhood. We used the score provided by the NLSY79-CYA, which is the sum of the respondent's mother's responses to seven items concerning the frequency with which (1) the mother has trouble soothing or calming the child when upset; (2) the child stays close and makes sure to see the mother when playing; (3) the child tries to copy the mother; (4) the child gets upset when the mother leaves the room and leaves the child alone; (5) the child is demanding and impatient when the mother is busy; (6) the child is worried and tries to make the mother feel better when the mother is upset about something; and (7) the child wants help from the mother for what the child is doing. These items were largely derived from Rothbart's Infant Behavior Questionnaire

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[4] Respondents were asked how many days in the past week they (1) felt they could not get going, (2) felt sad, (3) had trouble falling asleep or staying asleep, (4) felt that everything was an effort, (5) felt lonely, (6) felt they could not shake the blues, and (7) had trouble keeping their mind on what they were doing.

(Baker and Mott 1989). Baydar's (1995) analysis indicates that the insecure temperament measure created from the NLSY79-CYA's items has reasonable reliability and validity.[5] Respondents' mothers were asked to assess their children's insecure disposition when the children were younger than 24 months and between 24 and 83 months. If a child had been assessed multiple times, we used the last score available. The insecurity score ranges from 7 to 35, with a higher score indicating a less secure behavioral style. Because not all children were evaluated at the same age, our models also included a control for the exact month of age when the respondent was assessed for insecure disposition.

We also controlled for the respondent's gender (male vs. female) and race, both of which were recorded just once and are therefore time-constant. Using respondents' self-identification, we divided them into six mutually exclusive ethnoracial categories: (1) White, (2) Black, (3) Hispanic, (4) Native American, (5) Asian or Pacific Islander, and (6) other.[6] Age, measured as time-varying and in years, was also introduced in the models. Because research on educational outcomes has found that the undivided attention available only to firstborn children contributes to their advantages over siblings (e.g., Black et al. 2018; Conley et al. 2007), we constructed a binary variable indicating that the respondent is their mother's firstborn.[7] In addition, we created an indicator for urban residence (vs. rural or unknown residence) using census definitions. We used the mother's location to construct this variable because the survey did not include respondents' locations until they were older.

Because women's childbearing timing is thought to affect their children by shaping the children's family circumstances, we fitted additional models that include time-varying indicators of family structure and the number of children at home to show the extent to which the associations between maternal age at birth and children's outcomes are mediated by family conditions. We measured family structure by whether the child lived in (1) an intact two-parent family, (2) a single-mother household, (3) a single-father household, (4) a household with an adoptive parent or other relatives, (5) the child's own independent residence, or (6) any other type of arrangement. The number of children at home was included because women entering motherhood early might have more children than other mothers. Children born to younger mothers may therefore grow up with more

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[5] Baydar argued that a potential factor that weakens the validity of the temperament measures is between-mother differences and that focusing on between-sibling differences can enhance validity.

[6] Although our models control for between-family differences (described in detail later), within-family variation in ethnoracial identification is possible because a mother's biological children do not necessarily have the same father. Even when siblings have the same parents, they might identify themselves differently in cases where ambiguity exists (e.g., among multiracial families).

[7] Other than firstborn children's unique position to receive undivided parental attention, arguments about why and whether birth order has independent effects are often disputed, with many considering birth order merely a proxy for family size or parental age (Freese et al. 1999; Kanazawa 2012; Rodgers 2001; Steelman et al. 2002). In addition, differentiating non-firstborns by their specific ordinal position in family fixed-effects models, which rely exclusively on within-family differences for estimation, is problematic. The within-family differences in birth-order ranks are bound to be highly correlated with those in maternal age at birth (.84 in our sample). Still, we distinguished second-born from third- or later-born in an additional analysis (Table S3, online appendix). The main patterns remained, and many of the differences between second-born and later-born children were nonsignificant.

siblings, diluting their family resources (Steelman et al. 2002). We constructed this variable using mothers' time-varying reports of the number of children in the household.

The effect of maternal age on children may also be mediated by mothers' socioeconomic conditions. Therefore, in the additional models, we included time-varying variables for the mother's years of education completed, her work status (no job, working less than 30 hours per week, working more than 30 hours per week),[8] and her family income. Because most NLSY79-CYA respondents could not provide valid family income information before they reached adulthood, we used their mothers' reports of family income. Most respondents lived with their mothers during childhood and adolescence. Even for young adults, their mothers' family income still serves as a useful proxy for the number of economic resources to which they have access. We took the natural log of the reported income for the analysis because the distribution of family income is skewed. We also included a binary indicator for the small number of observations with missing family income (<8%).

In addition, we included the mother's relationship with the focal child and her aspirations for the child's educational attainment in the models with mediators. Both factors can be influenced by maternal resources and child temperament, and they have the potential to shape youth outcomes. Respondents' mothers were asked to report whether their relationship with each child was excellent, good, fair, or poor. They were also asked whether they expected the focal child to complete high school or less, some college, college, or above college in the future. Both questions were asked beginning in 1988, as long as the focal child was younger than 15. Therefore, the answers to these questions are time-varying. For person-years beyond age 15, we used the last answers from the mother for both variables. The minimum age respondents must have reached for their mothers to report about the relationship or aspirations varied somewhat over the years. We added a separate category ("other") for both variables to represent the observations for which alternative answers or no data were collected.

We present descriptive statistics for the analytic sample in Table 1. Although some researchers argue that period trends in society, approximated by the children's birth calendar years, explain why late childbearing benefits the children (Barclay and Myrskylä 2016), testing this argument is difficult with our data and modeling strategy. Because NLSY79-CYA respondents' mothers are from the same birth cohort, the sum of maternal age at birth and the child's age are nearly perfectly collinear with the calendar year. Moreover, our models rely exclusively on differences between siblings of the same mother for estimation (as described later). Among such siblings, the differences in maternal age at birth are identical to the differences in the calendar year of their birth. Nevertheless, we conducted a separate analysis including dummy variables for wider periods, on the assumption that meaningful societal changes take at least a few years. The results were consistent with those presented in this article (Table S3, online appendix).

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[8] We explored using an alternative variable: the mother's work pattern during the past 10 years (e.g., rarely employed, worked mostly part-time, worked mostly full-time). The results were virtually unchanged.

Table 1 Descriptive statistics

	Mean/ Percentage	SD		Mean/ Percentage	SD
Achievement Score (%)	59.37	23.98	Maternal Work Status (%)		
Educational Attainment (years)	12.44	1.96	No job	30.99	
CES-D	0.60	0.53	<30 weekly hours	13.69	
Insecure Temperament Score	17.78	4.18	≥30 weekly hours	55.32	
Age (years)	15.19	5.15	Family Structure (%)		
Gender (%)			Intact family	47.53	
Male	50.68		Single-mother household	28.74	
Female	49.32		Single-father household	2.53	
Race (%)			Adoptive parents/other		
White	71.07		relatives	1.50	
Black	17.11		Independent residence	11.11	
Hispanic	6.87		Other	8.59	
Native American	1.24		Number of Children in		
Asian or Pacific Islander	0.76		Mother's Home	2.17	1.24
Other	2.96		Log Family Income	10.61	1.54
Firstborn (%)			Mother–Child Relationship (%)		
Yes	38.66		Poor	0.31	
No	61.34		Fair	3.77	
Age Temperament Assessed			Good	28.76	
(months)	69.25	9.55	Excellent	59.92	
Residence (%)			Other	7.24	
Rural	24.38		Mother's Educational Aspirations for Child (%)		
Urban	66.52		High school or less	13.58	
Unknown	9.10		Some college	17.95	
Maternal Age at Birth	27.36	5.33	College	48.73	
Maternal Age at First Birth	23.80	5.24	Above college	16.12	
Mother's Years of Education	13.44	2.46	Other	3.62	

Notes: The numbers are based on the analytic sample, which contains all person-years included in any of the models ($N = 55,060$). The exceptions are the three outcome variables, achievement score, educational attainment, and CES-D, the statistics of which are derived from the respective sample used to predict each outcome. All categorical variables are presented in percentages, whereas the mean and standard deviations are presented in the case of continuous variables. The descriptive statistics were weighted using the NLSY79-CYA longitudinal weights.

Analytic Strategy

For the analysis, we fitted fixed-effects models of the following form:

$$outcome_{it} = \gamma_0 + \gamma_1\, disposition_i + \gamma_2\, maternal\_age_i + \sum a_j \mathbf{X}_{jit} + F_f + \varepsilon_{it},$$

where the outcome is academic performance, educational attainment, or psychological distress level for child i at time t, γ_0 is the intercept, γ_1 is the coefficient for insecure disposition in early childhood, γ_2 is the coefficient for the mother's age when the child was born, $\mathbf{X}_{jit}$ is a vector of child characteristics related to the outcome (e.g., age, gender, and race/ethnicity), $\sum \alpha_j$ indicates the coefficients of this vector of

variables, F_f denotes family (mother) fixed effects, and ε_{it} is the error term. The inclusion of family fixed effects enables us to account for all unobserved time-invariant between-family differences, such as the mother's personality, evaluation standards, and parenting style, as well as the family's overall environment. Including family fixed effects also means that the models must rely exclusively on within-family variations for estimation. Table S4 (online appendix) shows considerable within-family variation in the variables of interest, indicating that the data are suitable for family fixed-effects models.

To illuminate how the effects of insecure disposition may depend on the mother's age at birth, we further estimated models of the following form:

$$outcome_{it} = \gamma_0 + \gamma_1\ disposition_i + \gamma_2\ maternal\_age_i +\ \gamma_3\ maternal\_age_i \\ \times disposition_i + \sum a_j \mathbf{X}_{jit}\ + F_f + \varepsilon_{it}.$$

Next, we added a series of potential mediators—the mother's socioeconomic conditions, family stability, and the mother's relationship with and educational aspirations for the focal child—to show the extent to which these factors account for the results for maternal age at birth and early temperament. Including these variables alone, however, is insufficient to clarify why maternal age at birth may moderate the effect of insecure temperament. If the moderating effect of maternal age is due to its influence on the focal child's family resources, then this effect should significantly decrease after we consider how other indicators of family resources moderate the relationships between insecure temperament and youth outcomes. We therefore fitted another set of models, expressed as follows:

$$outcome_{it} = \gamma_0 + \gamma_1\ disposition_i + \gamma_2\ maternal\_age_i + \gamma_3\ maternal\_age_i \\ \times disposition_i + \sum a_j\ \mathbf{X}_{jit}\ + \sum b_k c \mathbf{Y}_{kit} + \sum c_k \mathbf{Y}_{kit} \times disposition_i + F_f + \varepsilon_{it},$$

where $\mathbf{Y}_{kit}$ represents a vector of factors that may explain the moderating effect of maternal age at birth, $\sum b_k$ denotes their coefficients, and $\sum c_k$ indicates how these factors moderate the relationship between insecure disposition and the outcome. We also included the mother's age of first birth as one of the factors denoted by $\mathbf{Y}_{kit}$ to test whether the moderating effect of maternal age at birth is related to the mother's first-birth timing, the focus of much prior research (e.g., Addo et al. 2016; Hofferth and Reid 2002). Children born to younger mothers are likely the ones whose mothers began childbearing at a very young age. How strongly an insecure disposition is tied to youth outcomes might depend on how early the focal child's mother entered parenthood rather than how old the mother was at the child's birth.

Because most respondents have multiple observations in the sample, we clustered observations of each individual and adjusted for the nonindependence of these observations in all models. We used the NLSY79-CYA individual-specific longitudinal weights to adjust for both the initial oversampling of minority groups and attrition. Fitting the models without weights generally yielded consistent results (Table S5, online appendix). Because of the clustering and the use of weights, we estimated robust standard errors for all models.

Results

Maternal Age at Birth, Childhood Temperament, and Youth Outcomes

We begin with models showing how maternal age at birth and an insecure temperament in early childhood are independently associated with youth outcomes. Table 2 presents family fixed-effects models predicting academic achievement scores from middle childhood to early adolescence and years of education in late adolescence and young adulthood. Table 3 shows similar models using psychological distress as the dependent variable. Looking at the main models (i.e., without mediators), those exhibiting a more insecure disposition early in life have worse achievement test performance, lower educational attainment, and higher distress levels. Because our models focus on within-family variations, the negative associations between an insecure temperament and educational outcomes cannot be attributed to interfamily differences that lead to both insecure attachment and academic or mental health disadvantages in certain children. The models thus provide rigorous evidence for the argument that an early-childhood insecure disposition contributes to long-term negative consequences.

Models 1 and 4 in Table 2 indicate that maternal age at birth is positively linked to educational outcomes, although the association with years of education is only marginally significant. Model 1 in Table 3 shows a nearly significant negative relationship between maternal age at birth and psychological distress. These results suggest some academic and mental health benefits for children born to older mothers, but the benefits are rather modest. Within the same family, being born five years later in the mother's life, for example, is associated with scoring 1 percentile higher in achievement tests ($.197 \times 5 = .99$), which is nearly one third of the association between being firstborn and achievement scores. The effect of being born 10 years later on youth educational attainment appears comparable to that of being firstborn, with both adding nearly one eighth of a year of schooling. One reason for these relatively small effects is that family fixed-effects models consider all time-constant between-family differences, including the differences in mothers' age at first childbirth and differences in the period and age when the mother experienced most child-rearing burdens; the effects of any measures net of between-family differences in similar measures should be smaller than those estimated based on population averages. Another reason, however, is that the estimates from Tables 2 and 3 indicate the average associations between maternal age at birth and youth outcomes. If early childbearing is detrimental only to offspring with a certain disposition, then the average effect of maternal age could be weak. We therefore need to revisit the issue of effect size after testing the interaction between maternal age at birth and an early insecure disposition.

Tables 2 and 3 also show models with various mediators. Somewhat surprisingly, adding the mediators representing family structures and maternal resources hardly affects the associations between maternal age at birth and educational outcomes (Models 2 and 4, Table 2). For psychosocial distress, we add the same mediators as well as respondents' years of education, given that education is an important predictor of mental health (Mirowsky and Ross 2003). The coefficient for maternal age at birth is virtually unchanged (Model 2, Table 3). These results suggest that the variations in youth outcomes among siblings born at different times of their mother's life cannot be explained by the differing maternal resources or family structures they experience.

Table 2 Family fixed-effects models predicting educational outcomes among youth

	Achievement Score			Educational Attainment		
	(1)	(2)	(3)	(4)	(5)	(6)
Insecure Temperament	−0.232**	−0.232**	−0.214**	−0.020**	−0.020**	−0.019**
	(0.072)	(0.072)	(0.067)	(0.006)	(0.006)	(0.006)
Maternal Age at Birth	0.197*	0.218*	0.195*	0.011†	0.010	0.005
	(0.088)	(0.087)	(0.084)	(0.006)	(0.007)	(0.007)
Age	−0.908***	−0.851***	−0.857***	0.434***	0.425***	0.423***
	(0.072)	(0.056)	(0.057)	(0.006)	(0.007)	(0.007)
Male	−0.777	−0.793†	0.076	−0.413***	−0.415***	−0.373***
	(0.480)	(0.480)	(0.452)	(0.035)	(0.035)	(0.034)
Race/Ethnicity (ref. = White)						
Black	−2.146	−2.017	−3.037	−0.107	−0.104	−0.175
	(3.382)	(3.353)	(3.566)	(0.207)	(0.209)	(0.214)
Hispanic	−7.179**	−7.158**	−5.391**	−0.016	−0.024	0.043
	(2.213)	(2.195)	(2.070)	(0.139)	(0.139)	(0.139)
Native American	−2.007	−1.962	−1.050	0.176	0.164	0.208
	(2.399)	(2.403)	(2.242)	(0.212)	(0.212)	(0.211)
Asian	−2.117	−2.102	−1.915	0.072	0.052	0.046
	(2.237)	(2.249)	(2.312)	(0.245)	(0.243)	(0.235)
Other	−3.342	−3.215	−2.285	0.105	0.106	0.139
	(2.070)	(2.066)	(1.967)	(0.125)	(0.124)	(0.122)
Firstborn	3.234***	3.184***	2.670***	0.115**	0.123**	0.096**
	(0.555)	(0.557)	(0.528)	(0.038)	(0.038)	(0.037)
Residence (ref. = rural)						
Urban	−0.442	−0.344	−0.333	0.090*	0.080†	0.089*
	(0.528)	(0.505)	(0.502)	(0.041)	(0.041)	(0.041)
Unknown	0.764	−0.407	−0.433	0.213***	0.070	0.090
	(0.984)	(1.134)	(1.125)	(0.055)	(0.055)	(0.055)
Age When Temperament						
Assessed	0.042	0.041	0.018	0.002	0.001	−0.000
	(0.028)	(0.027)	(0.026)	(0.003)	(0.003)	(0.002)
Potential Mediators						
Family structure (ref. = intact family)						
Single-mother household		−0.873	−0.833		0.351***	0.351***
		(0.574)	(0.551)		(0.043)	(0.043)
Single-father household		2.335	3.035		0.509***	0.495***
		(2.145)	(2.140)		(0.074)	(0.074)
Adoptive parents/ other relatives		1.381	2.482		0.404***	0.425***
		(2.308)	(2.257)		(0.078)	(0.078)
Independent residence		−5.222	−5.530		0.242***	0.248***
		(13.028)	(12.955)		(0.045)	(0.046)
Other		0.382	0.197		0.415***	0.411***
		(1.338)	(1.326)		(0.045)	(0.045)
Number of children at home		0.253	0.399		−0.013	−0.014
		(0.393)	(0.390)		(0.022)	(0.022)
Mother's education		0.013	−0.077		0.030	0.028
		(0.388)	(0.379)		(0.032)	(0.031)

Table 2 (continued)

	Achievement Score			Educational Attainment		
	(1)	(2)	(3)	(4)	(5)	(6)
Mother's work status (ref. = no job)						
<30 weekly hours		−0.251	−0.209		−0.035	−0.037
		(0.500)	(0.494)		(0.053)	(0.053)
≥30 weekly hours		−1.608***	−1.538***		0.086*	0.085*
		(0.450)	(0.449)		(0.038)	(0.038)
Log family income		0.078	0.058		−0.001	−0.002
		(0.104)	(0.105)		(0.008)	(0.008)
Missing family income		9.543	9.186		0.020	0.028
		(6.731)	(6.840)		(0.074)	(0.074)
Mother–child relationship (ref. = poor)						
Fair			1.054			−0.044
			(2.218)			(0.222)
Good			0.534			0.159
			(2.122)			(0.216)
Excellent			1.062			0.324
			(2.133)			(0.219)
Other			4.287†			0.396†
			(2.396)			(0.227)
Mother's educational aspirations for child (ref. = high school or less)						
Some college			5.687***			0.258***
			(0.726)			(0.062)
College			11.903***			0.552***
			(0.791)			(0.064)
Above college			16.929***			0.735***
			(0.879)			(0.075)
Other			7.489***			−0.070
			(1.903)			(0.252)
Constant	64.737***	63.108***	54.891***	3.647***	3.227***	2.868***
	(3.747)	(6.283)	(6.458)	(0.319)	(0.561)	(0.573)
Number of Observations	23,524	23,524	23,524	23,644	23,644	23,644

Notes: Observations from the same individuals are clustered, with robust standard errors (shown in parentheses) estimated for the models. The NLSY79-CYA longitudinal weights were applied in estimating the models.

†$p<.10$; *$p<.05$; **$p<.01$; ***$p<.001$

In fact, only a few changes in a mother's work status and family structures are associated with variations in educational or mental health outcomes within families.[9]

Similarly, the coefficients for insecure disposition change only slightly after adding mother–child relationship and the mother's educational aspirations for the focal child

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[9] We omit discussions of ancillary results in the main text to conserve space. Note that the seemingly surprising finding that nonintact family structures are tied to more years of schooling needs to be understood in the context of family fixed-effects models, which capture intrafamily changes over time. The finding means that children who have experienced a shift from intact to nonintact family tend to have better educational outcomes after their parents' separation, although they also become more distressed, as Table 3 indicates.

Table 3 Family fixed-effects models predicting psychological distress among youth

	(1)	(2)	(3)
Insecure Temperament	0.005**	0.004**	0.004**
	(0.002)	(0.002)	(0.002)
Maternal Age at Birth	−0.004†	−0.004*	−0.003
	(0.002)	(0.002)	(0.002)
Age	−0.004**	0.008**	0.008**
	(0.001)	(0.003)	(0.003)
Male	−0.112***	−0.120***	−0.121***
	(0.011)	(0.011)	(0.011)
Race/Ethnicity (ref. = White)			
Black	0.024	0.022	0.032
	(0.043)	(0.043)	(0.044)
Hispanic	0.066	0.063	0.064
	(0.040)	(0.040)	(0.040)
Native American	−0.029	−0.024	−0.027
	(0.062)	(0.061)	(0.060)
Asian	−0.080	−0.076	−0.076
	(0.092)	(0.093)	(0.094)
Other	0.010	0.010	0.011
	(0.043)	(0.043)	(0.043)
Firstborn	0.001	0.003	0.003
	(0.012)	(0.012)	(0.012)
Residence (ref. = rural)			
Urban	0.010	0.014	0.012
	(0.013)	(0.013)	(0.013)
Unknown	0.013	0.009	0.005
	(0.017)	(0.018)	(0.018)
Age When Temperament Assessed	−0.001	−0.001	−0.001
	(0.001)	(0.001)	(0.001)
Potential Mediators			
Education		−0.020***	−0.020***
		(0.003)	(0.003)
Family structure (ref. = intact family)			
Single-mother household		0.033**	0.033**
		(0.013)	(0.013)
Single-father household		0.023	0.024
		(0.026)	(0.026)
With adoptive parents/other relatives		0.049†	0.049†
		(0.029)	(0.029)
Independent residence		−0.007	−0.005
		(0.015)	(0.015)
Other		0.023	0.024†
		(0.014)	(0.014)
Number of children at home		−0.006	−0.005
		(0.006)	(0.006)
Mother's education		0.014	0.015†
		(0.009)	(0.009)
Mother's work status (ref. = no job)			
<30 weekly hours		−0.049**	−0.048**
		(0.017)	(0.017)
≥30 weekly hours		−0.017	−0.016
		(0.013)	(0.013)

Table 3 (continued)

	(1)	(2)	(3)
Log family income		0.002	0.002
		(0.003)	(0.003)
Missing family income		−0.011	−0.010
		(0.022)	(0.022)
Mother–child relationship (ref. = poor)			
Fair			−0.059
			(0.073)
Good			−0.080
			(0.069)
Excellent			−0.088
			(0.069)
Other			−0.019
			(0.075)
Mother's educational aspirations for child (ref. = high school or less)			
Some college			−0.008
			(0.021)
College			−0.020
			(0.021)
Above college			−0.035
			(0.025)
Other			−0.104*
			(0.050)
Constant	0.780***	0.617***	0.675***
	(0.083)	(0.151)	(0.163)
Number of Observations	28,548	28,548	28,548

Notes: Observations from the same individuals are clustered, with robust standard errors (shown in parentheses) estimated for the models. The NLSY79-CYA longitudinal weights were applied in estimating the models.

[†]$p<.10$; *$p<.05$; **$p<.01$; ***$p<.001$

(Models 3 and 6 in Table 2 and Model 3 in Table 3), although mothers' educational aspirations for their children are linked to their children's academic performance. Those whose mothers have higher educational aspirations for them score higher on achievement tests and have more years of education. Overall, the models with and without mediators reveal similar patterns regarding the relevance of maternal age at birth and insecure temperament to within-family variations in youth outcomes.

Moderating Roles of Maternal Age at Birth

Table 4 shows family fixed-effects models addressing the study's main question: how maternal age at birth moderates the effects of early-childhood temperament on later outcomes. In both the main models and models with mediators, the interaction between an insecure disposition and maternal age is positive for educational outcomes and negative for psychological distress. Contrary to the capital constraint

Table 4 Family fixed-effects models concerning the moderating effects of maternal age on youth outcomes

	Achievement Score		Educational Attainment		Psychological Distress	
	(1)	(2)	(3)	(4)	(5)	(6)
Insecure Temperament	−0.958**	−0.911**	−0.114***	−0.120***	0.023**	0.020**
	(0.316)	(0.293)	(0.023)	(0.022)	(0.007)	(0.007)
Maternal Age at Birth	−0.288	−0.272	−0.054**	−0.065***	0.008	0.007
	(0.232)	(0.218)	(0.018)	(0.017)	(0.005)	(0.005)
Insecure Temperament × Maternal Age	0.026*	0.025*	0.004***	0.004***	−0.001*	−0.001*
	(0.011)	(0.011)	(0.001)	(0.001)	(0.000)	(0.000)
Age	−0.909***	−0.859***	0.434***	0.423***	−0.004**	0.008**
	(0.072)	(0.057)	(0.006)	(0.007)	(0.001)	(0.003)
Male	−0.768	0.085	−0.413***	−0.373***	−0.112***	−0.121***
	(0.479)	(0.451)	(0.034)	(0.034)	(0.011)	(0.011)
Firstborn	3.212***	2.654***	0.111**	0.092*	0.001	0.004
	(0.555)	(0.529)	(0.038)	(0.037)	(0.012)	(0.012)
Race/Ethnicity (ref. = White)						
Black	−2.193	−3.078	−0.102	−0.165	0.024	0.031
	(3.345)	(3.523)	(0.204)	(0.210)	(0.042)	(0.044)
Hispanic	−7.032**	−5.247*	0.020	0.082	0.060	0.059
	(2.222)	(2.077)	(0.136)	(0.137)	(0.040)	(0.040)
Native American	−1.779	−0.832	0.204	0.241	−0.033	−0.032
	(2.382)	(2.234)	(0.210)	(0.208)	(0.062)	(0.060)
Asian	−2.356	−2.130	0.036	0.010	−0.076	−0.073
	(2.231)	(2.339)	(0.239)	(0.228)	(0.092)	(0.093)
Other	−3.300	−2.247	0.119	0.155	0.008	0.008
	(2.076)	(1.974)	(0.123)	(0.119)	(0.042)	(0.042)
Residence (ref. = rural)						
Urban	−0.450	−0.341	0.090*	0.089*	0.010	0.012
	(0.528)	(0.502)	(0.041)	(0.041)	(0.013)	(0.013)
Unknown	0.781	−0.427	0.214***	0.091†	0.012	0.005
	(0.984)	(1.128)	(0.055)	(0.055)	(0.017)	(0.018)
Age When Temperament Assessed	0.042	0.017	0.002	−0.000	−0.001	−0.001
	(0.027)	(0.026)	(0.003)	(0.002)	(0.001)	(0.001)
Potential Mediators		Included		Included		Included
Constant	78.222***	68.015***	5.368***	4.764***	0.448**	0.379†
	(6.956)	(8.608)	(0.492)	(0.669)	(0.152)	(0.211)
Number of Observations	23,524	23,524	23,644	23,644	28,548	28,548

Notes: Observations from the same individuals were clustered, with robust standard errors (shown in parentheses) estimated for the models. The NLSY79-CYA longitudinal weights were applied in estimating the models. The mediators included in Models 2, 4, and 6 are family structure, number of children at home, mother's education, mother's work status, family income, mother–child relationship, and respondent's mother's educational aspirations for them—the same as those in models presented in Tables 2 and 3. Model 6 also includes the respondent's education as a potential mediator. We omit the coefficients for the mediators to conserve space.

†*p*<.10; *p*<.05; **p*<.01; ***p*<.001

theory, for a child born to an older mother, the negative effects of an insecure temperament on the child's academic performance and educational attainment are less pronounced, and the tendency for the child's insecure temperament to lead to higher distress is decreased.

To further illustrate the aforementioned interaction results, we calculated the predicted achievement scores, years of education, and levels of psychological distress using coefficients from the main models in Table 4. We created two hypothetical scenarios in which the mother gave birth at ages 18 and 34 (the 10th and 90th percentiles of the NLSY79 women's childbearing age, respectively). We calculated how, all else being equal, the outcomes of her children born at different times would vary with the children's levels of insecure temperament. Figure 1 presents the results. Clearly, a highly insecure temperament in early childhood is predictive of low achievement test scores, fewer years of schooling, and higher psychological distress during youth if a child was born to a very young mother. When the mother was much older at childbirth, a child would have consistent educational and mental health outcomes regardless of how insecure the child's early disposition was. Thus, early temperamental differences manifest more in children with younger mothers.

Figure 1 also shows that maternal age at birth is more important for children with a more insecure temperament. For a child with a highly insecure disposition—say, with a score of 27—being born to an 18-year-old mother is associated with nearly a 7-percentile-point-lower achievement score, two thirds of a year less schooling, and a 0.15-point-higher distress level (which is greater than the average gender gap in distress), compared with being born to a 34-year-old mother. These differences are substantial, given that the size of sibling gaps in youth outcomes tends to be small. The fact that mothers' childbirth timing is relevant mostly to comparatively insecure children partly explains why the average associations between maternal age at birth and within-family variations in youth outcomes are modest, at best (as shown in Tables 2 and 3).

Factors Potentially Explaining the Moderating Roles of Maternal Age

To what extent do factors typically associated with maternal age at birth, including the mother's timing of first childbearing, family stability, socioeconomic status, and prior child-rearing experience, explain why maternal age at birth moderates the effects of insecure temperament? Tables 5–7 address this question with a series of family fixed-effects models predicting the three outcomes. In the first model in Table 5, we add the interaction between the mother's age at first birth and the child's insecure disposition to Model 2 in Table 4, omitting some coefficients to conserve space. We did not estimate the main effect of the mother's first-birth timing because only factors that change within the family can be included in the fixed-effects model. The interaction between mother's age at first childbearing and insecure temperament is not significant, and adding it does not alter the moderating role of maternal age at birth.

The second model includes the interaction between insecure disposition and a series of family structure variables. Interestingly, the coefficient for the interaction between an insecure disposition and maternal age at birth becomes slightly larger (compared with Model 2 in Table 4) in this model. This result indicates that
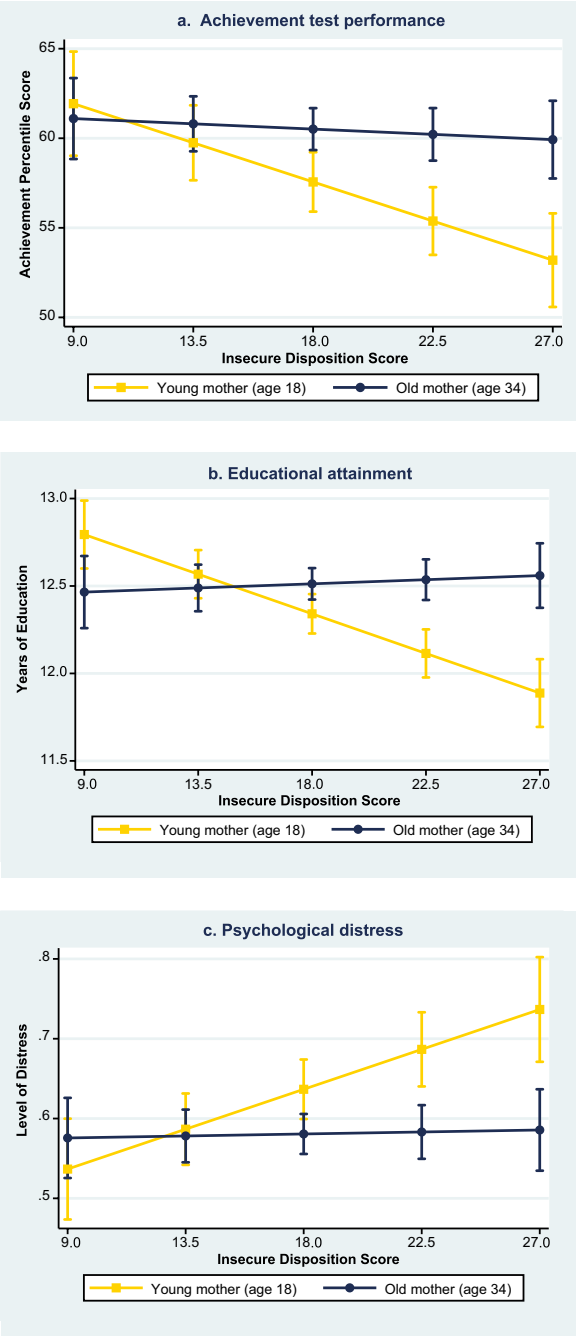
Fig. 1 Predicted youth outcomes by level of insecure disposition and maternal age at birth. The predicted values were calculated using the coefficients from Models 1 (panel a), 3 (panel b), and 5 (panel c) in Table 4. The predicted values are presented with 95% confidence intervals. Because the family fixed effect is assumed to be 0, the predicted values are lower than the average observed values. Nevertheless, the patterns are the same regardless of the actual value of the fixed effect.

Table 5 Family fixed-effects models of youth achievement scores with interactions between insecure temperament and various factors

	(1)	(2)	(3)	(4)	(5)
Insecure Temperament	−0.632[†]	−1.115***	−0.387	−0.529	−0.597[†]
	(0.340)	(0.300)	(0.421)	(0.324)	(0.325)
Maternal Age at Birth	−0.439[†]	−0.355	−0.381[†]	−0.262	−0.115
	(0.245)	(0.220)	(0.222)	(0.218)	(0.231)
Insecure × Maternal Age at Birth	0.034**	0.030**	0.031**	0.025*	0.016
	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)
Insecure × Maternal Age at First Birth	−0.023				
	(0.015)				
Age	−0.861***	−0.861***	−0.852***	−0.213	−0.860***
	(0.057)	(0.057)	(0.055)	(0.261)	(0.057)
Insecure × Age				−0.036**	
				(0.014)	
Firstborn	2.626***	2.637***	2.611***	2.649***	6.601**
	(0.528)	(0.528)	(0.528)	(0.529)	(2.035)
Insecure × Firstborn					−0.225*
					(0.112)
Family Structure (ref. = intact family)					
Single-mother household	−0.758	−4.864*	−0.740	−0.781	−0.735
	(0.549)	(1.939)	(0.532)	(0.550)	(0.548)
Single-father household	3.247	2.068	3.099	3.135	3.158
	(2.144)	(8.028)	(2.140)	(2.143)	(2.141)
With adoptive parents/other relatives	2.457	9.725	2.532	2.569	2.511
	(2.274)	(7.062)	(2.276)	(2.254)	(2.265)
Independent residence	−4.953	60.278*	−5.150	−5.346	−5.253
	(13.207)	(25.777)	(13.154)	(13.008)	(13.122)
Other	0.232	2.712	0.114	0.197	0.249
	(1.331)	(4.777)	(1.265)	(1.334)	(1.330)
Insecure × single-mother household		0.227*			
		(0.100)			
Insecure × single-father household		0.049			
		(0.427)			
Insecure × adoptive parents/other relatives		−0.328			
		(0.315)			
Insecure × independent residence		−3.826*			
		(1.563)			
Insecure × other		−0.140			
		(0.235)			
Mother's Education	−0.075	−0.066	1.105[†]	−0.078	−0.086
	(0.381)	(0.381)	(0.616)	(0.379)	(0.380)
Insecure × Mother's Education			−0.067*		
			(0.027)		
Log Family Income	0.066	0.055	−0.252	0.066	0.062
	(0.105)	(0.104)	(0.392)	(0.104)	(0.105)

Table 5 (continued)

	(1)	(2)	(3)	(4)	(5)
Insecure × Log Family Income			0.016		
			(0.019)		
Family Income Missing	9.232	8.852	39.542	9.408	9.241
	(6.843)	(6.364)	(25.934)	(6.945)	(6.847)
Insecure × Family Income Missing			−1.743		
			(1.210)		
Mother's Work Status (ref. = no job)					
<30 weekly hours	−0.158	−0.177	0.286	−0.185	−0.181
	(0.493)	(0.491)	(2.067)	(0.494)	(0.493)
≥30 weekly hours	−1.462**	−1.466***	−1.875	−1.516***	−1.479***
	(0.448)	(0.441)	(1.788)	(0.447)	(0.448)
Insecure × <30 weekly hours			−0.025		
			(0.113)		
Insecure × ≥30 weekly hours			0.026		
			(0.094)		
Constant	72.984***	71.616***	59.018***	61.054***	62.561***
	(9.198)	(8.587)	(10.235)	(8.881)	(8.815)
Number of Observations	23,524	23,524	23,524	23,524	23,524

Notes: Observations from the same individuals were clustered, with robust standard errors (shown in parentheses) estimated for the models. The NLSY79-CYA longitudinal weights were applied in estimating the models. Each model also controlled for gender, race, mother–child relationship, respondent's mother's educational aspirations for them, urban residence, region, and respondent's age when temperament was assessed; we omit the coefficients for these variables to conserve space.

$^\dagger p<.10$; $^* p<.05$; $^{**} p<.01$; $^{***}\ p<.001$

differences in family stability are not the reason why children of older mothers have more consistent academic performance regardless of the extent of their insecure attachment in early childhood.

Model 3 in Table 5 contains the interaction between insecure disposition and various socioeconomic indicators of the mother or family, including the mother's education, work status, and family income. The coefficient for the interaction between mothers' education and insecure temperament is significant. Nonetheless, mothers' education does not explain the reduction of the temperament effect for children of older mothers. In fact, the mother's education moderates the effect of insecure temperament in the opposite direction: an early insecure disposition is more detrimental to academic performance when the mother has attained more years of schooling.

Model 4 in Table 5 includes the interaction between an insecure disposition and being firstborn. This inclusion leads to a substantial reduction in the coefficient for the interaction between the disposition and maternal age at birth; this coefficient is no longer significant. Thus, early insecure temperament is less relevant to academic performance for those born to older mothers because they are less likely to be firstborn. Perhaps because mothers with prior child-rearing experience are better at raising children whose temperament brings more challenges, insecure temperament is less detrimental to academic performance for children who are not firstborn in their families.

Beyond testing the various mechanisms that can be expected to explain why children with an insecure disposition fare better with older mothers, we also examined whether the moderating effect of maternal age is related to its connection to children's age (Model 5). Because those who were born to older mothers might not have reached young adulthood by the last wave included in the study, respondents observed at older ages were more likely born to younger mothers. Because of this correction, the moderating roles observed for maternal age at birth could be an artifact reflecting how the influence of an insecure disposition changes with age. Results for Model 5 show that the negative effect of an insecure temperament on academic performance increases with a child's age. Nevertheless, the interaction between maternal age at birth and insecure disposition remains and is similar in magnitude to that in Table 4.

Results for educational attainment, shown in Table 6, are mostly similar to those in Table 5. Considering the potential moderating roles of the mother's first-birth timing, family stability, and socioeconomic conditions hardly alters the interaction effect between mother's age and insecure temperament. These factors therefore do not explain why children with an insecure disposition are less likely to fall behind their temperamentally different siblings in educational attainment when raised by older mothers. Also akin to the results for achievement test performance, years of schooling diverge more among temperamentally diverse siblings when the mother is more educated. Moreover, Model 5 in Table 6 shows that the effect of an early-childhood insecure disposition on educational attainment depends on the child's age; early temperament becomes more influential as adolescents grow into young adults. However, having an older mother at birth still weakens the association between insecure disposition and educational attainment.

Although many results in Table 6 are similar to those in Table 5, those from Model 4 constitute an exception. Being firstborn does not amplify the effect of an insecure temperament on years of schooling, nor does including the interaction with being firstborn affect how maternal age moderates the effect of an insecure temperament on educational attainment. Thus, the greater likelihood of having prior child-rearing experience does not explain why children of older mothers and their siblings complete comparable years of schooling, regardless of their temperamental traits in early childhood.

Also similar to models in the previous two tables, the coefficient for the interaction between maternal age at birth and insecure disposition in Table 7 hardly changes across the models. The lower likelihood that an early insecure disposition will manifest in psychological distress for youth with older mothers cannot be explained by older women's delay of motherhood, lower family instability, better socioeconomic conditions, or greater likelihood of having prior child-rearing experience (Models 1–3 and 5). Although the link between insecure temperament and distress strengthens as respondents age, adding the interaction between age and temperament hardly affects how maternal age at birth moderates this link (Model 4). Overall, a mother's age itself, rather than the various circumstances associated with it, appears to weaken the influences of an insecure temperament on various youth outcomes.

Discussion and Conclusions

Family scholars and demographers have long debated the consequences of early childbearing (e.g., Barclay and Myrskylä 2016; Geronimus et al. 1994; Hofferth and Reid

Table 6 Family fixed-effects models of youth educational attainment with interactions between insecure temperament and various factors

	(1)	(2)	(3)	(4)	(5)
Insecure Temperament	−0.075**	−0.097***	−0.085**	0.087*	−0.100***
	(0.025)	(0.024)	(0.032)	(0.035)	(0.025)
Maternal Age at Birth	−0.092***	−0.057***	−0.074***	−0.055**	−0.054**
	(0.019)	(0.017)	(0.017)	(0.017)	(0.017)
Insecure × Maternal Age at Birth	0.005***	0.003***	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Insecure × Maternal Age at First Birth	−0.004***				
	(0.001)				
Age	0.423***	0.423***	0.423***	0.592***	0.423***
	(0.007)	(0.007)	(0.007)	(0.024)	(0.007)
Insecure × Age				−0.009***	
				(0.001)	
Firstborn	0.088*	0.092*	0.089*	0.092*	0.330*
	(0.037)	(0.037)	(0.037)	(0.037)	(0.148)
Insecure × Firstborn					−0.014
					(0.008)
Family Structure (ref. = intact family)					
Single-mother household	0.355***	0.354	0.355***	0.335***	0.355***
	(0.043)	(0.218)	(0.043)	(0.043)	(0.043)
Single-father household	0.492***	0.530	0.488***	0.487***	0.492***
	(0.073)	(0.340)	(0.073)	(0.073)	(0.073)
With adoptive parents/other relatives	0.420***	0.653†	0.420***	0.422***	0.420***
	(0.078)	(0.348)	(0.078)	(0.078)	(0.078)
Independent residence	0.247***	0.784***	0.247***	0.239***	0.246***
	(0.046)	(0.207)	(0.045)	(0.046)	(0.046)
Other	0.410***	0.578**	0.411***	0.403***	0.410***
	(0.045)	(0.210)	(0.045)	(0.045)	(0.045)
Insecure × single-mother household		−0.001			
		(0.012)			
Insecure × single-father household		−0.003			
		(0.018)			
Insecure × adoptive parents/other relatives		−0.014			
		(0.018)			
Insecure × independent residence		−0.031**			
		(0.011)			
Insecure × other		−0.010			
		(0.011)			
Mother's Education	0.028	0.028	0.119**	0.027	0.028
	(0.031)	(0.031)	(0.044)	(0.031)	(0.031)
Insecure × Mother's Education			−0.005**		
			(0.002)		
Log Family Income	−0.003	−0.002	−0.017	−0.001	−0.003
	(0.008)	(0.008)	(0.032)	(0.008)	(0.008)

Table 6 (continued)

	(1)	(2)	(3)	(4)	(5)
Insecure × Log Family Income			0.001		
			(0.002)		
Family Income Missing	0.029	0.030	0.185	0.030	0.030
	(0.074)	(0.074)	(0.265)	(0.073)	(0.074)
Insecure × Family Income Missing			−0.009		
			(0.015)		
Mother's Work Status (ref. = no job)					
<30 weekly hours	−0.045	−0.037	−0.757*	−0.031	−0.041
	(0.053)	(0.053)	(0.343)	(0.053)	(0.053)
≥30 weekly hours	0.082*	0.084*	−0.158	0.085*	0.085*
	(0.038)	(0.038)	(0.141)	(0.038)	(0.038)
Insecure × <30 weekly hours			0.041*		
			(0.019)		
Insecure × ≥30 weekly hours			0.013[†]		
			(0.008)		
Constant	5.608***	4.377***	4.180***	1.054	4.429***
	(0.708)	(0.707)	(0.763)	(0.796)	(0.714)
Number of Observations	23,644	23,644	23,644	23,644	23,644

Notes: Observations from the same individuals were clustered, with robust standard errors (shown in parentheses) estimated for the models. The NLSY79-CYA longitudinal weights were applied in estimating the models. Each model also controlled for gender, race, mother–child relationship, respondent's mother's educational aspirations for them, urban residence, region, and respondent's age when temperament was assessed; we omit the coefficients for these variables to conserve space.

[†]$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$

2002; Hotz et al. 2005; Levine et al. 2007; Levine et al. 2001; Turley 2003). Using sibling data and fixed-effects models accounting for many unobserved between-family differences, we found that, on average, the associations between maternal age at birth and youth outcomes are rather modest, even without various mediators included. This finding, however, does not rule out the importance of mothers' child-birth timing for their children's development. Our findings demonstrate that the likelihood that children of younger mothers will fare worse depends on the children's temperamental traits. Youth whose early temperament indicated a secure attachment tend to have similar educational and psychological outcomes regardless of whether they were born to young or old mothers. Conversely, among youth who displayed a highly insecure early temperament, those with older mothers are clearly less disadvantaged in educational achievements and psychological health. By uncovering the conditions under which maternal age at birth is highly relevant to the offspring's well-being, this research enriches the previous debate, which tended to view the consequences of early childbearing on the offspring as either universally negative or entirely exaggerated.

Because early insecure temperament is less likely to affect the educational performance and mental health of children with older mothers, temperamentally different siblings in families with older mothers are likely to converge more than those in families with younger mothers. Thus, our study also highlights an important consequence that prior research on women's childbearing age has overlooked: women who delay

Table 7 Family fixed-effects models of youth psychological distress with interactions between insecure temperament and various factors

	(1)	(2)	(3)	(4)	(5)
Insecure Temperament	0.020*	0.022**	0.026*	0.006	0.024**
	(0.008)	(0.008)	(0.010)	(0.009)	(0.008)
Maternal Age at Birth	0.008	0.009	0.008	0.007	0.009†
	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)
Insecure × Maternal Age at Birth	−0.001†	−0.001*	−0.001*	−0.001*	−0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Insecure × Maternal Age at First Birth	0.000				
	(0.000)				
Age	0.008**	0.007**	0.007**	−0.005	0.008**
	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)
Insecure × Age				0.001*	
				(0.000)	
Firstborn	0.004	0.004	0.004	0.004	0.045
	(0.012)	(0.012)	(0.012)	(0.012)	(0.049)
Insecure × Firstborn					−0.002
					(0.003)
Family Structure (ref. = intact family)					
Single-mother household	0.032*	0.034	0.033**	0.034**	0.032*
	(0.013)	(0.050)	(0.013)	(0.013)	(0.013)
Single-father household	0.024	0.141	0.025	0.025	0.024
	(0.026)	(0.095)	(0.026)	(0.026)	(0.026)
With adoptive parents/other relatives	0.049†	0.166	0.048†	0.049†	0.049†
	(0.029)	(0.116)	(0.029)	(0.029)	(0.029)
Independent residence	−0.005	−0.043	−0.005	−0.005	−0.005
	(0.015)	(0.052)	(0.015)	(0.015)	(0.015)
Other	0.024†	−0.075	0.023	0.025†	0.024†
	(0.014)	(0.053)	(0.014)	(0.014)	(0.014)
Insecure × single-mother household		0.000			
		(0.003)			
Insecure × single-father household		−0.006			
		(0.005)			
Insecure × adoptive parents/other relatives		−0.006			
		(0.006)			
Insecure × independent residence		0.002			
		(0.003)			
Insecure × other		0.006†			
		(0.003)			
Mother's Education	0.015†	0.015†	0.022	0.015†	0.015†
	(0.009)	(0.009)	(0.014)	(0.009)	(0.009)
Insecure × Mother's Education			−0.000		
			(0.001)		
Log Family Income	0.002	0.002	0.000	0.002	0.002
	(0.003)	(0.003)	(0.010)	(0.003)	(0.003)
Insecure × Log Family Income			0.000		
			(0.001)		
Family Income Missing	−0.011	−0.012	−0.179*	−0.011	−0.011
	(0.022)	(0.022)	(0.079)	(0.022)	(0.022)
Insecure × Family Income Missing			0.009*		
			(0.004)		

Table 7 (continued)

	(1)	(2)	(3)	(4)	(5)
Mother's Work Status (ref. = no job)					
<30 weekly hours	−0.047**	−0.048**	0.004	−0.048**	−0.047**
	(0.016)	(0.016)	(0.064)	(0.016)	(0.016)
≥30 weekly hours	−0.016	−0.016	0.045	−0.016	−0.016
	(0.013)	(0.013)	(0.048)	(0.013)	(0.013)
Insecure × <30 weekly hours			−0.003		
			(0.004)		
Insecure × ≥30 weekly hours			−0.003		
			(0.003)		
Constant	0.376†	0.348	0.276	0.634**	0.323
	(0.226)	(0.219)	(0.243)	(0.235)	(0.217)
Number of Observations	28,548	28,548	28,548	28,548	28,548

Notes: Observations from the same individuals were clustered, with robust standard errors (shown in parentheses) estimated for the models. The NLSY79-CYA longitudinal weights were applied in estimating the models. Each model also controlled for gender, race, mother–child relationship, respondent's mother's educational aspirations for them, urban residence, region, and respondent's age when temperament was assessed; we omit the coefficients for these variables to conserve space.

†$p<.10$; *$p<.05$; **$p<.01$

childbearing are likely to have children with smaller disparities in educational and psychological outcomes.

Why can children of older mothers overcome the challenges brought by their insecure disposition and reach achievement levels similar to those of their siblings who do not have such challenges? Our analysis suggests that older mothers' first-birth age, education, family structures, family income, and work status cannot explain their children's experience of fewer setbacks from having an insecure disposition. Older mothers' greater likelihood of having prior child-rearing experience accounts for the lower relevance of an insecure temperament to their children's academic performance during middle childhood and adolescence, but it does not explain why their temperamentally insecure children have relatively better educational attainment and psychological health in late teens and young adulthood. Taking all the results together, we suggest that a key explanation for maternal age's moderating effects might be the aging process itself. Because age brings maturity and serenity, women who bear children at an older age are likely better at handling the difficulties that their relatively insecure children would face growing up. Consequently, among children with an insecure disposition, those born to older mothers fare better than those born to younger mothers.

Despite our study's contributions to the literature on women's childbearing timing, it has some limitations. First, the NLSY79-CYA's insecure temperament measure differs from that of some psychologists (e.g., Main and Cassidy 1988) and is based on caretakers' assessments, which may not be sufficiently objective. Nevertheless, prior research has shown that the measure is reasonably reliable and valid, especially when used to compare sibling differences (Baydar 1995). Second, we do not have direct measures of changes in mothers' maturity or coping skills with

age. Our results suggest that the aging process itself, not mothers' socioeconomic circumstances resulting from their childbearing timing, is relevant to the children's outcomes, especially for temperamentally insecure children. However, future data collection on shifts in mothers' noncognitive ability and mentality over time will help provide more concrete evidence.

In addition to contributing to the literature about childbirth timing, this study also contributes to our knowledge of inequalities in education and other outcomes among siblings. We found that early-emerged temperamental differences are linked to sibling discrepancies in educational achievement and mental health even as late as in young adulthood, but the negative consequences of early insecure temperament are far from deterministic. Sibling disparities are lower when all siblings were born when their mother was relatively old. Thus, the extent to which youth from the same family differ is a function of both within- and between-family variations. Whereas within-family dispositional differences set the starting point for sibling divergence, between-family differences (e.g., the mother's overall childbearing timing) condition the degree to which the dispositional differences will materialize as the siblings grow up.

This study also enriches our understanding of child development by showing that not all potential resources for mothers weaken the negative effects of insecure temperament. Whereas mothers' calmness and maturity with age appear to help equalize outcomes between children with an insecure temperament and their temperamentally different siblings, mothers' education seems to disproportionately boost academic achievement for the children with a more secure disposition, thereby further differentiating siblings. These results suggest that the mechanisms through which the family environment affects the influences of early disposition cannot be reduced to whether the environment enables access to resources. Different resources may interact with early disposition differently to shape developmental outcomes. Our research therefore calls for a more nuanced distinction among family resources to better understand the disposition–environment interactions in child development. ∎

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