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Explaining the Early Development and Health of Teen Mothers' Children*

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Abstract

The transmission of social disadvantage from teenage mothers to their children is well established, but when and why do these disparities emerge in the early life course? Using nationally representative data from the Early Childhood Longitudinal Study-Birth Cohort, this study investigated the relationship between teen childbearing and children's cognition, behavior, and health from infancy through preschool. Developmental disparities between teenage mothers' children and others were largely nonexistent at 9 months but accumulated with age. Having a teenage mother predicted compromised development across several domains by age 4½. Our conceptual model expected preexisting disadvantage, ongoing resource disadvantage, and compromised parenting quality to explain the association between teen childbearing and child outcomes. Preexisting social disadvantage accounted for much of this relationship. Financial, social, and material resources in the child's household partially or fully explained each of the remaining significant relationships between teenage childbearing and child outcomes. Parenting quality explained a smaller proportion of these relationships than did resources, and these factors' influences were largely independent. Because children of teenage mothers with a modest set of resources were not predicted to have compromised development, resources provided in early childhood may have the potential to reduce developmental disparities for teenage mothers' children.

Keywords

teenage motherhood; teen childbearing; early childhood; intergenerational transmission; life course; ECLS-B

INTRODUCTION

Teen parenthood may be an important mechanism through which social disadvantage in the United States is transmitted from one generation to the next. More than 1 in every 6 U.S. girls is projected to have a teenage birth (Perper and Manlove, 2009). Teen childbearing has long been considered an important social issue, in part because of a concern that young mothers and their children face curtailed future opportunities (Furstenberg, 2003). The national survey we analyze shows that severe socioeconomic disadvantage and early

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childbearing are indeed strongly linked. About half of all teenage mothers were living in poverty when their children were infants. But perhaps more surprisingly, 56 percent of all children who were living in poverty were born to a mother who was a teenager either at their birth or an older sibling's birth. Similarly, 62 percent of mothers who had not finished high school were currently or had been teen mothers. Early childbearing is thus important for anyone working to understand broader social disadvantage.

This study investigates the relationship between teen parenthood and early child development. The preschool period is critical for understanding children's future outcomes (Duncan et al., 2007). Children's early cognitive, behavioral, and verbal outcomes are strongly related to successful transitions to school, which are linked later academic achievement, high school completion, and educational attainment (Baydar et al, 1993; see Entwisle et al., 2004 for a review). Because early childhood is at the root of cumulative disadvantage across the life course, it is of great interest to scholars, but data constraints have limited the sociological literature on early childhood. Especially because teen childbearing is fundamentally intertwined with socioeconomic disadvantage, examining the emergence of developmental disparities among teen parents' children in the early life course can help explain how social disadvantage is transmitted across generations.

In conceptualizing how teen mothers' lives are linked to their children's, we employ a life course theoretical framework (Elder, 1974). Using data from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), a nationally representative survey of children born in 2001 with a large subsample of teenage mothers, this study measures the association between having a young mother and children's development in the first years of life and tests possible explanations for this relationship. Beyond these contributions, we also include a broad conceptualization of child development. Academic preparedness, behavior, and health are all important for success in the transition to school, which is a key predictor of educational outcomes years in the future (Crosnoe, 2006; Entwisle et al., 2004). If research can identify processes through which the children of teenage mothers become developmentally disadvantaged, then interventions can try to reduce early developmental and health differences and thus prevent them from accumulating over time. This approach is particularly attractive given research suggesting that policy investments in early childhood pay off considerably by improving outcomes through life (Duncan et al., 2007).

COMPROMISED DEVELOPMENT AMONG YOUNG MOTHERS' CHILDREN

According to the life course perspective, the "linked lives" (Elder and O'Rand, 1995) of teenage mothers and their children should result in intergenerational transmission of the social disadvantage experienced by the mothers. Indeed, most previous research has found that at least some children of teenage[1] mothers have substantially worse developmental outcomes in areas such as cognitive, language, physical, and social development than children of older mothers (Geronimus et al., 1994; Levine et al., 2001; Moore and Snyder, 1991; Turley, 2003). The literature generally agrees that developmental differences (for example, in cognitive development, attachment, physical growth, health, and language learning) between the children of teenage mothers and those of older mothers are established by the start of schooling and widen in middle childhood and adolescence (Brooks-Gunn and Furstenberg, 1986), although Turley (2003) found that differences in test scores associated with maternal age remained stable over time. But less is known about patterns of health and development among teenage mothers' children *before* the transition to school. Drawing on past research, our *Hypothesis 1* states that teen mothers' children will have compromised

[1]In this study, we defined teen mothers as giving birth before age 20, but our analyses found that the social processes governing young parenthood were more a continuum than a threshold.

health and developmental outcomes in the year before kindergarten compared to children of older mothers (see our conceptual model in Figure I). To our knowledge, previous research has not assessed the consequences of teenage motherhood throughout this age range using nationally representative data. We also expand Hypothesis 1 to compare children of younger and older teenage mothers: Children of school-aged teenage mothers may experience compromised development to a greater extent than children of older teenage mothers, who have reached legal adulthood and passed the normative age for attending high school.

Will the negative relationship between young maternal age and child outcomes remain stable from infancy through age 4½? Theories of cumulative advantage and disadvantage suggest that these disparities should accumulate over time (Dannefer, 2003). Extant research has not addressed this question, but we consider two types of indirect evidence suggesting that teen mothers' children may evidence developmental disadvantages starting in infancy and widening over time. First, differences in preterm birth and birth weight have been documented for at least some groups of teenage mothers compared to older mothers (Chen et al., 2007; Geronimus, 1996), and low birth weight has been linked to children's later development (Boardman et al., 2002). Second, some evidence from the school years suggests that compromised outcomes among teenage mothers' children accumulate over time from more modest to larger differences (Baydar et al., 1993).

EXPLAINING THE COMPROMISED DEVELOPMENT OF TEEN MOTHERS' CHILDREN

Our remaining hypotheses aim to explain the relationship between teen childbearing and child outcomes. The existence of children's developmental disparities by maternal age has been documented using less recent data sources, but its causes are still debated. Why would it matter for a child's development that her mother is a teenager? As Hardy and colleagues wrote, "It seems clear that age serves as a marker for other as yet unidentified characteristics and that questions surrounding the long-range effects of young maternal age require additional investigation" (1997:808). Building on past research, our conceptual model "unpacks" this marker by positing potential explanations for the relationship between teen childbearing and child development.

Building on existing research, we articulate three potential explanations for the relationship between having a teenage mother and children's health and development (see Figure I): preexisting social disadvantage, ongoing resource disadvantage, and parenting practices. Like other conceptual models of intergenerational transmission that have not been applied specifically to teen parenthood (e.g., Conger et al, 1992; Elder, 1974), ours integrates structural circumstances and interpersonal interactions, particularly parenting. Given the contexts of teen parents' lives described below, the dual emphasis on resources and parenting seems particularly important for this population.

The first explanation for the link between teen motherhood and child outcomes, *preexisting social disadvantage*, builds on a strong existing literature and focuses on processes influencing the selection of adolescents into early childbearing: Teenagers who become mothers are more disadvantaged in terms of socioeconomic background and educational potential, even before the child's birth (Hoffman, 1998), and this disadvantage carries on to the next generation independently of maternal age (Moore and Snyder, 1991). In other words, the relationship between teen childbearing and child outcomes is spurious at least in part. Researchers have extensively debated the degree to which the selection of disadvantaged teenagers into childbearing explains observed differences in mothers' and children's outcomes (Hoffman et al., 1993; Levine et al., 2001; Moore and Snyder, 1991; Turley, 2003). Some older studies found a substantial net association of teenage motherhood with at least some child developmental outcomes after accounting for selection (e.g., Hardy et al., 1997), but others have estimated a much smaller or nonsignificant net relationship for

a variety of academic, behavioral, and other outcomes (e.g., Andreozzi et al., 2002; Brooks-Gunn and Furstenberg, 1986). For example, Levine and colleagues (2001) reported that selection and family size explained most of the differences in children's academic outcomes, but young maternal age still negatively influenced several behavioral outcomes. In contrast, Geronimus and colleagues (1994) and Turley (2003) compared first cousins on a variety of academic, behavioral, and other outcomes and concluded that selection bias accounted for these relationships. But on one point these disparate voices seem to agree: Preexisting social disadvantage explains the better part of the compromised development observed among teenage mothers' children.

Much of this debate has focused on empirically weighing the relative merits of age-based and disadvantage-based explanations for developmental disparities between younger and older mothers' children. While this is an important goal, we instead focus on articulating a more comprehensive conceptual model of the relationship between teenage childbearing and children's health and development. As a first step to articulating the role of social disadvantage, then, *Hypothesis 2* states that the intergenerational transmission of preexisting social disadvantage is expected to explain much of the relationship between teen childbearing and children's compromised development (see Figure I). Other preexisting factors, such as cognitive skills or genetic influences, may also shape selection into early childbearing, but we focus on socioeconomic status and family composition.

Compared to the large literature on preexisting disadvantage, fewer studies test alternative explanations for the relationship between teenage childbearing and children's health and development. We articulate a second way in which social disadvantage may explain the relationship between teen motherhood and child outcomes, this time focusing on ongoing disadvantage in the form of households' relative lack of material and social resources rather than preexisting disadvantage. A focus on resources has been a part of the life course perspective since Elder's *Children of the Great Depression* (1974). Our conceptual framework asserts that the experience of becoming an adolescent mother may further compound social disadvantage beyond the initial social disadvantage discussed above. The negative effect of teen childbearing on available resources occurs in two ways further articulated below, first by increasing resource needs during a life stage when young parents typically have few resources available, and second by stigmatizing teenagers who become mothers and fostering social isolation and a lack of resources. Of course, family socioeconomic resources available before motherhood strongly influence the material and social resources available to a teenage mother after the birth. Substantial evidence has shown that teenage mothers and their children often experience a lack of resources such as child care, housing, and income (Furstenberg, 1976; Furstenberg and Crawford, 1978; Henly, 1997; Mollborn, 2007). Like all mothers, teen mothers' resource needs increase drastically after childbirth, but they are typically unable to provide resources that older mothers can. Teen mothers are in a life phase in which they are expected to build human capital rather than reaping its rewards. Unless other individuals or institutions step in with support, their children will have unmet resource needs.

An additional consequence of teenage parenthood is the negative social sanctions associated with violating age norms about the appropriate timing of parenthood. Age norms are an important concept in life course theory (Neugarten et al., 1965). Mollborn (2009) found that U.S. adults who subscribed to stronger norms against teen pregnancy were less likely to say they would be willing to provide material support to a hypothetical teen parent in their family. Because most respondents in the study adhered to a norm against teen pregnancy to some degree, this sanctioning process can be expected to reduce the material resources available to teen parents. Teen mothers' age norm violation is also likely to foster social isolation, as bonds with friends, other peers, and family and community members weaken or

break as a result of interpersonal sanctions. For example, Kaplan's (1997) ethnographic research on African American teen mothers found that family members' negative reactions to teen childbearing led to strained relationships and diminished social support.

Why focus on resources when explaining child outcomes? Many explanations have been suggested for why financial, material, and social resources would improve children's health and development. Some influences may be direct, such as the link between hunger and compromised behavioral and cognitive development (Kleinman et al., 1998). Other relationships are expected to work indirectly. For example, income has been linked to children's intellectual development through cognitive stimulation in the home, parenting styles, the home's physical environment, and children's health status at birth (Guo and Harris, 2000). In a local sample, Pogarsky and colleagues (2006) found lower maternal education to be the most powerful explanation for the relationship between teenage motherhood and adolescents' gang membership, drug use, unemployment, and early parenthood. Looking beyond socioeconomic resources, Contreras and colleagues (1999) found that overall social support was positively related to teen mothers' interactions with their children.

As our hypothesis would expect, Ryan and colleagues (2009) found in a sample of low-income (teenage and older) mothers that available material and instrumental resources were associated with improved behavior among their young children. Focusing specifically on teen parents, Mollborn (2007) found that material resources available after the child's birth explained much of the negative association between early parenthood and adolescent mothers' and fathers' educational attainment. Hardy and colleagues (1997) and Levine and colleagues (2001) speculated that resources might similarly mediate the relationship between maternal age and *children's* outcomes, but to our knowledge this hypothesis has not been systematically evaluated. *Hypothesis 3* states that a lack of available resources in the households of teenage mothers and their children should partially explain why having a young mother compromises children's early development (see Figure I). Following researchers who emphasize that social and material resources beyond income and education are important for understanding children's development (e.g., Gershoff et al., 2007), we examine a variety of resources besides income that may predict improved early development, including socioeconomic resources and social support, as well as factors that may increase resource needs, such as additional children and household members with special needs. Our conceptualization of the dual role of social disadvantage, as a selection factor and a consequence of early childbearing, expands and complicates its importance. Social disadvantage not only exposes teenagers to greater risk of becoming mothers, but is also further compounded by early childbearing.

A third explanation for the negative relationship between early childbearing and children's development that is frequently raised in the literature is differences in *parenting practices.* Interpersonal relationships are a central concern of the life course perspective (Elder, 1974). Different explanations exist for why some teenage mothers might parent in ways that compromise their children's development. One explanation is developmental. Because teenagers are still developing psychologically and may not have full maturity or experience with adult social roles, disparities in their parenting styles and skills, home environments, and emotional resources may result (Furstenberg et al., 1989), though teen mothers' parenting practices vary (Luster et al. 2000). A second explanation comes from the family stress model (Conger et al., 1992), which is grounded in life course theory. This model posits that families experiencing economic adversity, as most teenage parents do, perceive economic pressure that leads to psychological distress. This distress is linked to poor parenting, which compromises children's behavior and other outcomes.

Most evidence supports the claim that younger mothers tend to display lower-quality parenting practices. Teen mothers' parenting is compromised compared to older mothers' in terms of behavior frequencies, appropriateness, and vocal responsiveness (Barratt and Roach, 1995) and cognitive preparation, levels of stress in the parenting role, and adaptive parenting styles, the last two of which influence parenting interactions (Sommer et al., 1993). In contrast, Barnett (2008) found in a rural sample that young maternal age was only associated with compromised parenting when other risk factors, such as psychological distress, were present. Research from New Zealand has found that differences in parenting skills at least partially mediate the relationship between having a teenage mother and children's language development (Keown et al., 2001). Based on this evidence, *Hypothesis 4* states that lower-quality parenting should partially explain why having a young mother compromises children's early development (see Figure I).

Resources and parenting quality may work together in explaining why teen childbearing has negative consequences for children. Models of the effects of financial stress on children articulated by Elder (1974) and Conger and colleagues (1992) suggest that parenting practices should mediate the effects of resources on child outcomes, but other research cited above does not posit parenting as a mediating pathway. Although we do not articulate a hypothesis, our analyses assess the relationship between resources and parenting practices when influencing child outcomes.

In summary, our theoretical model expects preexisting social disadvantage, household resources, and parenting practices to explain most or all of the relationship between teen childbearing and children's preschool health, cognitive, and behavioral development. We contribute to the literature by articulating a conceptual model that integrates these influences and tests them in the same analyses. These analyses consider three interrelated domains of child outcomes. The School Transition Model (Alexander et al., 1988) emphasizes the importance of studying children's cognitive achievement around the start of school, and Crosnoe's (2006) extension of the model incorporates child health. We also analyze children's behavior. Behavior problems in early childhood reflect compromised socioemotional development and strongly predict academic and behavior problems at school age (Halonen et al., 2006).

METHODS

Data—The Early Childhood Longitudinal Study-Birth Cohort (ECLS-B) followed children born in 2001 from birth through the start of kindergarten (U.S. Department of Education, 2007). It is the first nationally representative survey in the United States to follow children in this early developmental period using parent interviews and direct, reputable child and parent assessments. The ECLS-B also includes some of the largest samples of teenage mothers and fathers available in comprehensive national surveys. The sample was selected using a clustered, list frame sampling design based on births registered in the National Center for Health Statistics vital statistics system. Investigators sampled births from 96 core primary sampling units, which were counties and county groups. Babies whose mothers were younger than 15 at birth were excluded for confidentiality and sensitivity reasons, so the findings from this study are not representative of children with very young teenage mothers. Because the birth rate for girls aged 10-14 is extremely low (Hamilton, Martin, & Ventura, 2010), the excluded children represent a very small proportion of the population.

This study uses the first three waves of data, collected when the children were about 9 months, 24 months, and 52 months old. The primary parent, almost always the biological mother, was interviewed in person. The weighted response rates for the primary parent interview for Waves 1, 2, and 3 were 74%, 93%, and 91% respectively. Our analyses used Stata software to account for complex survey design through replication weights that make

findings representative of children born in the United States in 2001. We restricted the sample to children with completed parent interviews and child assessments at all three waves, including the particular assessment for that analysis, and whose biological mothers participated in the interview at all three waves, resulting in about 8400 eligible cases for health and behavior and 7800 for math and reading.[2] After listwise deletion of missing data for some variables and inclusion of indicators for people missing information on other variables, our main analysis samples for the various outcomes was approximately 8250 for health and behavior, 7600 for reading, and 7650 for math.[3] Additional analyses were restricted to cases with direct parent assessments at Wave 2 (N≈5900).

Measures

Child preschool outcomes: We examined four developmental and health outcomes as children prepared for the transition to school at age 4½ (Wave 3), drawn from face-to-face child assessments and parent interviews (Najarian et al., 2010; Snow et al., 2007). Table I presents descriptive statistics for these and all other variables. Two measures were based on direct, one-on-one child assessments adapted from several reputable and widely used assessment batteries that were developed for other large studies of preschoolers, such as the Peabody Picture Vocabulary Test, the Preschool Comprehensive Test of Phonological and Print Processing, the PreLAS® 2000, the Test of Early Mathematics Ability-3, and sister study Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K). The (frequently copyrighted) items in the ECLS-B assessments are not released to users of the data, so we relied on scores constructed by ECLS-B staff using item response theory (IRT) modeling. Children's *early reading scores* were assessed using a 35-item test covering areas appropriate for pre-kindergarten learning such as phonological awareness, letter sound knowledge, letter recognition, print conventions, and word recognition (ECLS-B-reported reliability=0.84). *Early math scores* were measured using a two-stage assessment, routed after the first stage depending on the child's score, and involved the areas of number sense, counting, operations, geometry, pattern understanding, and measurement (ECLS-B-reported reliability=0.89). Two other measures were based on parent reports. Children's *behavior* was measured by a standardized continuous variable, constructed from an index of 24 items in which the parent was asked how frequently the child acted in certain ways, using a 5-point scale ranging from "never" to "very often" (Cronbach's alpha=0.86). The items were drawn from the Preschool and Kindergarten Behavior Scales—Second Edition, the Social Skills Rating System, and the Family and Child Experiences Study, as well as new questions developed for the ECLS-B. The questions included items such as how often the child shares belongings or volunteers to help other children, how often the child is physically aggressive or acts impulsively, and how well the child pays attention. *Child health status* was recoded as a dichotomous variable from parent reports, comparing very good or excellent versus good, fair, or poor.[4]

Maternal age: The measurement of maternal age in the literature on early childbearing and child outcomes has been surprisingly inconsistent (Turley, 2003). Some researchers are interested in the effects of maternal age at the birth of the child who is being studied, while others focus on the age at which mothers *first* gave birth (Geronimus et al., 1994; Levine et

[2]Because of ECLS-B confidentiality requirements, all Ns are rounded to the nearest 50. Teenage mothers had significantly higher attrition, with 72% participating in all three waves compared to 81% of older mothers. Among children with completed parent interviews and child assessments at Wave 3, about 500 were excluded because the biological mother was not the "primary parent" respondent at one or more waves.

[3]Of the 7800 eligible cases with a Wave 3 math score, 150 were deleted listwise because of missing data on independent variables. Compared to the analysis sample, they evidenced no significant differences for any Wave 3 child outcome.

[4]The high proportion of reports of favorable child health necessitated this particular dichotomy, as only 3% of child health reports at Wave 3 fell into the "fair" or "poor" categories.

al., 2001). Moore et al. (1997) and Turley (2003) compared these two ways of measuring maternal age, as we do here for specific theoretical reasons. Past research has also assumed that the effects of maternal age are linear (Turley, 2003), or either linear or quadratic (Hoffman et al., 1993). We indicated *teen motherhood at the study child's birth* by the following categories: 15-17 versus 18-19 years old with older ages coded as 20-24, 25-29, 30-34, 35-39, and 40 years or older. We chose 25-29 as the reference category to conform to past research and because the average maternal age for first births in 2001 was 25 (Martin et al., 2002). This strategy allowed the maternal age effect to vary across categories without imposing a specific functional form. The ECLS-B data include large subsamples of teenage mothers compared to other national data sources, with about 850 children of teenage mothers (one third aged 15-17 and two thirds aged 18-19) participating in all three waves.

Household resources at age 2: All resource variables were measured at Wave 2, when the children were about 2 years old.[5] The first group of variables represents socioeconomic resources. Wave 2 *household income* was calculated as a percentage of 2002 poverty guidelines by household size, with 8% of cases were imputed by ECLS-B. *Maternal education* was based on an ECLS-B-constructed variable measuring the mother's highest level of educational attainment, with degrees recoded into approximate years. Household *food security* was constructed by ECLS-B, comparing households with uncertain food provision to those without. The child's *health insurance status* was coded as no insurance, insured through Medicaid, insured through other forms of government insurance besides Medicaid, or solely insured privately (reference group). Additionally, we assessed *wealth* using variables indicating whether anyone in the household owned a car, had a bank account, or had stock or mutual fund holdings. Finally, the family's *housing* situation was coded as homeowner, received free or subsidized housing, or other (such as renter; reference group).

A second group of variables represents social support. Several indicators measured the presence of *additional people in the household* at Wave 1, including the child's biological father, any grandparent, and any other person over 18 excluding parents or their partners. Another variable counted coresident adults not contributing income to the household (who might either provide resources such as child care or be a resource draw), and another counted other coresident children. A variable indicated whether any household member besides the study child had a special need or disability. Frequency of socializing with friends or neighbors measured *social interaction outside the home* and was coded into 5 categories.

The final category of variables represents the everyday activities of the child and primary parent that require or create available resources of time or money. The mother's involvement in *paid work* and *school* was divided into three categories for each: full time, part time, or none. *Child care and payment for care* was coded into four categories: child not receiving care from someone other than parents (reference category), child receiving all care for free, child receiving some free care or some help paying for care, and parent(s) paying full price for the child's care.

Parenting quality at age 2: Three sets of variables measured parent-child relationship quality and the mother's parenting behaviors at Wave 2 (age 2). The *Two Bags Task*, which modifies the Three Bags Task from prior research (Love et al., 2002), is a problem-solving task involving both the child and the parent in a videotaped interaction. Our study used the parent score, for which coders rated mothers' positive regard, sensitivity, and stimulation of

[5]We also conducted analyses using resource measures from Wave 1 and change in resources between Waves 1 and 2, but neither of these models appreciably improved the proportion of variance explained in child outcomes. Therefore, we measured resources at the same wave as the parenting measures to which their influence is being compared.

their child's cognitive development (Nord et al., 2006). The *Toddler Attachment Sort – 45*, a modification of the Attachment Q-Sort (Nord et al., 2006), assessed the child's attachment to the primary caregiver. Coders scored the child on behaviors such as "seeks and enjoys being hugged" and "shows no fear, into everything." The child's attachment relationship with the focal caregiver was then classified as secure (the reference category and most desirable outcome), insecure-avoidant, insecure-ambivalent, or disorganized. Finally, interviewers' observations of the mother's behavior during the assessment indicated whether she engaged in a variety of behaviors such as slapping, kissing/hugging, responding verbally to the child, and interfering with the child's actions. Eight items were coded as 0 for "negative" and 1 for "positive" parenting behaviors and were then averaged.

Selection factors: The ECLS-B survey asked about several background factors from before the pregnancy that have been shown to influence selection into teenage childbearing. The three socioeconomic selection variables measured whether the mother lived in a household that received welfare assistance between ages 5 and 16, whether she ever repeated a grade in school, and her mother's educational attainment. The two family-related selection factors measured whether the mother lived with both of her parents until age 16, and whether her mother was a teenager when she was born (a category was included for missing information because respondents who did not live with their mothers as children and those whose mothers were dead were not asked about their mother's age). This set of measures did not fully account for selection into early motherhood because other important factors (e.g., cognitive and other academic measures; see Moore and Snyder, 1991) were not available for all ECLS-B respondents.

Control variables: Controls in our multivariate analyses included the child's age in months at the Wave 3 assessment (which was necessary for correctly analyzing the age-sensitive raw scores for math and reading), sex, race/ethnicity (constructed by ECLS-B), and birth order; the mother's marital status at birth (obtained from the birth certificate and coded as married versus other); and the household's primary language at Wave 1.

Analysis Plan—Our study used a variety of weighted descriptive and multivariate analyses to address each of the three hypotheses in turn. We first estimated the overall association between having a teenage mother and children's health and development at 9 months, 2 years, and 4½ years. Multivariate regression and other analyses assessed our theoretical model explaining the relationship between maternal age and child outcomes. Our analytic approach allows generalizability to a national population but is likely to overstate the negative association between young maternal age and children's outcomes (Geronimus et al., 1994). Because a larger association would be harder to mediate fully, this presents a conservative test of our hypothesized mediators of the relationship between having a teen mother and children's health and development. Especially given the wide variety of resource and parenting variables, multicollinearity was low, with all variance inflation factors (VIFs) below 3.8 and the mean VIF below 1.7.

RESULTS

Hypothesis 1 stated that having a young mother would be associated with children's compromised early health and developmental outcomes, and we expected that developmental gaps would be apparent from infancy and accumulate with age. Figure II assesses these expectations for maternal age by displaying averages for the four child outcomes at all three waves of assessment, comparing children with mothers aged 15-17, 18-19, and 25-29. Note that only child health status used the same measure at all waves because age-appropriate assessments were conducted, so for this single descriptive analysis we included corresponding measures from 9 and 24 months for cognition and behavior. The

reading and math graphs both display Bayley mental scale scores from Waves 1 and 2, and the behavior graph uses the interviewer-observed Child Behavior Rating Scale for these waves (see Nord et al., 2006). For all waves, the math, reading, and behavior graphs rely on standardized scores, so a downward trend means not that the child's development was declining in an absolute sense (as it does for health), but that the child was losing ground compared to age peers.

We unexpectedly found a point of convergence in each of the outcomes for all four groups of children at about 9 months old, with no significant differences between children of teenage mothers and children of 25- to 29-year-old mothers. As the growing disparities in most instances at 24 and 52 months showed, their developmental disadvantage appeared later and, as we expected, accumulated over time.[6] Children of the youngest mothers had significantly more negative outcomes, losing developmental ground relative to peers across the three waves for each outcome and experiencing a decline in parent-reported health. The children of mothers aged 18 to 19 also had compromised cognitive development and health by age 4½ compared to the children of mothers aged 25-29, but their behavior scores converged at Wave 3 after a significant disparity at Wave 2.[7]

Table II confirms the significant differences between the 4½-year-old children of teen mothers and those of older mothers in multivariate analyses. Model 1 (the bolded row for each age group) shows that controlling only for age at assessment, children of at least one of the two age groups of teenage mothers were significantly disadvantaged on every measure compared to children with mothers aged 25-29. Children of the youngest mothers were consistently the most disadvantaged. For example, their reading scores were about two thirds of a weighted standard deviation lower than those of the reference group, compared to one third for children of mothers aged 18-19. Children of the youngest teenage mothers scored 0.22 standard deviations lower on behavior than the reference group, but children of older teenage mothers did not have significantly different behavior scores than the reference group. The youngest mothers were less than half as likely as mothers aged 25-29 to report that their child was in very good or excellent health, compared to three quarters as likely for mothers aged 18-19. In sum, the developmental disadvantage of children of teenage mothers played out across a variety of domains, supporting Hypothesis 1.

Hypothesis 2 stated that preexisting social disadvantage would partially explain the compromised developmental outcomes of children of young mothers. Several analyses considered this hypothesis from various angles. Table I divides mothers who were aged 20 or older at the study child's birth into two groups, those who had ever had a teenage birth and those who had not. The former group (called "previous teen mothers") is interesting because both they and current teenage mothers should have been subject to the selection of socially disadvantaged women into early childbearing. If preexisting social disadvantage matters most in determining the outcomes of teenage mothers' children, then we should find similar child outcomes for current and previous teenage mothers; instead, both groups' outcomes should be compromised compared to those of children with mothers who were never teen mothers. If maternal age matters most instead, then the outcomes of previous teenage mothers' children should be more positive than those of current teen mothers' children and similar to those of women who were never teenage mothers. In bivariate analyses reported in Table I, we found that current and previous teenage mothers did not differ significantly on any child outcome. Supplemental significance tests showed that

[6]Significant differences between teenage mothers' and older mothers' children arose by age 2 and persisted thereafter for cognitive and behavior scores (though behavior scores later converged for 18-19 and 25-29), but health differences between these groups did not appear until age 4.

[7]This change may possibly be attributed to the shift from interviewer-observed behavior scores at Wave 2 to parent-reported behavior scores at Wave 3.

children of current and previous teenage mothers exhibited significantly worse outcomes than children with mothers aged 20 or older at first birth on all measures. These findings support a preexisting disadvantage-based explanation for maternal age disparities in child development and health.

We expanded this line of reasoning in a multivariate analysis of a subsample of mothers who were not having their first birth in the ECLS-B study (not shown in tables). Here, we compared the associations with focal child outcomes of maternal age at *first* birth and maternal age at the study's *focal* birth. As described above, if the selection of socially disadvantaged girls into early childbearing is an important basis for their children's compromised developmental outcomes, then the effect of this disadvantage should work through maternal age at first birth more than through age at the focal birth. In that case, age at first birth should be significantly related to child outcomes, even when maternal age at the focal ELCS-B birth is controlled. Excluding all first births in this analysis was necessary because mothers' ages at first and current birth were the same for firstborn children. Results showed that age at first birth had a much stronger association with children's preschool outcomes than did age at current birth, supporting preexisting disadvantage-based explanations for developmental disparities associated with teen motherhood. Compared to those who had their first birth at 25-29, math scores were about 0.6 standard deviations lower and reading scores 0.4 standard deviations lower for children of mothers who had their first birth as a teen, and reported health was 40-50% less likely to be very good or excellent. For health status, when age at first birth was controlled, age at current birth was not significant. However, teen childbearing at current birth was still associated with math and reading scores that were 0.2-0.3 standard deviations lower than age 25-29. Neither prior nor current teen childbearing had a significant negative association with behavior.

Finally, multivariate analyses tested the effects of preexisting social disadvantage more directly by examining the extent to which SES-related background factors from before the pregnancy reduced the association of maternal age with various child outcomes. Model 3 in Table II included not only maternal age, child's age at assessment, and controls, but also three socioeconomic and two family background variables from before pregnancy. If the teen mother coefficients in Model 3 are smaller after introducing selection measures, then preexisting social disadvantage partially accounts for the association of maternal age with child outcomes. Note that we do not discuss health status because its significant associations with teen childbearing was eliminated by introducing controls in Model 2. For the youngest mothers, accounting for selection into early childbearing fully explained the association between maternal age and behavior scores. Reading and math scores were each reduced by including selection factors, but maternal age of 15-17 (compared to 25-29) was still associated with a 0.5-standard-deviation disparity in math scores and a 0.4-standard-deviation gap in reading scores. Selection factors explained a similar amount (15-20%) of the relationship between maternal age and math and reading scores for both age groups, with a remaining disparity in these scores of about one quarter of a standard deviation for children of 18- to 19-year-old mothers compared to 25-29. As noted above, after including controls, neither behavior nor health status was significantly different when comparing these two maternal age groups. Taken together, these findings show that preexisting social disadvantage is an important component of the relationship between teen childbearing and child health and development, supporting *Hypothesis 2*, but that several significant relationships remain to be explained.[8]

Hypothesis 3 stated that a lack of socioeconomic, material, and social resources in the households of teenage mothers and their children should partially mediate the negative relationship between teen childbearing and children's preschool outcomes (see Baron and Kenny, 1986 for a discussion of mediation). To demonstrate mediation, we must first assess

whether teenage mothers' households had lower levels of resources than other households. Table I shows that their Wave 2 resource levels were indeed strikingly lower. For example, nearly half (46 percent) of teenage mothers and their children lived in households with incomes below the federal poverty line, compared to 14 percent of mothers who were at least 20 at their first birth, and the difference in maternal education between these groups was 2.6 years. A second condition of mediation, assessing whether resources positively predicted children's outcomes, was also met (see Table III below).

To fulfill the final condition for documenting mediation, we assessed whether adding socioeconomic and other resources into multivariate models reduced the negative association between having a teenage mother and child outcomes. Table II, Model 4 added the measures of household resources at age 2 to the selection and control variables in Model 3.[9] For the 15- to 17-year-old mothers' children, the association of having a young mother with reading and math scores was further reduced by nearly 40 percent upon adding resource measures into the model, resulting in a disparity of 0.3 standard deviations compared to children of 25- to 29-year-old mothers. The remaining significant associations between having a very young mother and math and reading scores may be a function of processes directly related to maternal age, or they may encompass other unmeasured selection factors such as mothers' cognitive skills or neighborhood-level SES. For children of older teen mothers, resources available in the infant's household fully mediated the remaining association between maternal age and math and reading scores after selection factors and controls were accounted for (no other child outcomes remained significant at this point). Overall, the findings strongly supported *Hypothesis 3*.

We demonstrated the relative strength of associations of maternal age and resources with children's preschool math scores using hypothetical cases in Figure III, based on Table II, Model 4. Each bar represents the predicted math score for a child with a specified maternal age and a level of several key resources that were within the typical range for teenage mothers' households (see the figure for details). All other variables were held at their means or medians for the subsample of children with mothers aged 15-19. The figure compares hypothetical children with mothers aged 15-17, 18-19, and 25-29. Within each age group, the higher-resource case had a math score that was 5.1 points, or 0.7 standard deviations, higher than the lower-resource case. This difference in resources was associated with a much greater disparity in reading scores than was maternal age, which was linked to a 2.3-point difference between the youngest and oldest groups and just a 0.3-point difference between ages 18-19 and 25-29. Two particularly interesting conclusions can be drawn. First, the children of teenage mothers are by no means foreordained to have compromised development, as long as they have several basic resources. The child of a typical teenage mother aged 18-19 had a math score above the overall sample mean—provided that the mother had a modest set of resources at Wave 2, including a high school degree and a household income at 200% of the federal poverty line. Unfortunately, teenage mothers' households frequently had low levels of resources, and the children of the more disadvantaged hypothetical teenage mothers had math scores that were well below average. Second, this combination of resources had a much stronger association with children's

[8]We conducted supplemental analyses of paternal age. Teen fathers' children had significantly lower math and reading scores and a lower likelihood of being in very good health, but there was no relationship with behavior scores. In other words, the implications of having a teen father for children's preschool outcomes were similar to those of having an older teen mother, but the reasons for this disparity differed. Young fathers' children fared worse because their fathers most frequently partnered with teenage mothers and were much less likely than older fathers to live with them. Once maternal age and paternal coresidence were controlled, no outcomes were significantly associated with paternal age. Because paternal age associations with child outcomes were fully explained by these two factors, we have focused tests of our conceptual model solely on maternal age.

[9]To limit the number of variables in the model, several resources that did not significantly predict any of the four child outcomes were omitted: car ownership, the number of coresident adults not earning income, and coresidence with the biological father, grandparent(s), and other adult(s).

preschool math scores than did maternal age. The child of a hypothetical mother who was 17 years old at birth with a modest set of resources scored 0.4 standard deviations *higher* than the child of a 27-year-old mother who had lower resources.

Finally, *Hypothesis 4* expected that parenting quality would partially explain the negative relationship between teen childbearing and child outcomes. Table III presents estimates for reading and math scores (the two measures that remained significant in Table II, Model 3) from multivariate models based on approximately 5900 children with available parenting measures. Model 2 added the three parenting measures to a baseline model including maternal age, controls, and selection factors. Each parenting measure was significant except for the relationship between interviewer-observed parenting behaviors and math scores, showing that higher-quality parenting positively predicted math and reading scores. Introducing the parenting measures considerably reduced the size of the relationships between young maternal age and child outcomes, but none of the teen childbearing measures lost significance. Other conditions for partial mediation were also met.

Comparing the introduction of parenting measures in Model 2 to the introduction of resource measures in Model 3, we can see that parenting quality did not explain nearly as much of the relationships between teen childbearing and children's scores as household resources did. As in Table II, resources fully mediated the relationship between having an older teenage mother (compared to age 25-29) and children's math and reading scores. Model 4 included parenting and resource measures together, showing that they largely operated independently of each other in their associations with children's outcomes. In other words, with occasional exceptions, both resources and parenting measures remained significant with similar coefficient sizes when included in the same model. In sum, Hypothesis 4 received clear support, but parenting quality a less strong explanation than resources were for the relationship between young maternal age and math and reading scores.[10]

DISCUSSION

This study sought to document and explain the intergenerational transmission of social disadvantage from teenage mothers to their children during early childhood, an age that is increasingly recognized as critical for understanding the subsequent life course. Using the nationally representative Early Childhood Longitudinal Study-Birth Cohort, results supported our conceptual model that expected preexisting and ongoing social disadvantage and parenting practices to explain much or all of the relationship between teen childbearing and young children's health and development. Previous research has not documented the accumulation of developmental disparities across early childhood for children of teenage mothers, nor has it assessed these explanations together in a single model or used multifaceted measures of each explanatory factor.

Findings supported our first hypothesis that these children's outcomes would be compromised when compared to peers with older mothers. Children's health and development did not differ by maternal age for most of the available outcome measures at 9 months of age, but disparities began to emerge between the children of teenage and older mothers by 24 months and were well established for most outcomes at 4½. These gaps of up to two thirds of a standard deviation are consequential as children prepare for the transition to school, because cognitive skills, behavior, and health at the school transition are strongly predictive of educational and socioeconomic outcomes years later. We found that children of the youngest mothers (ages 15 to 17) exhibited the most problematic developmental

[10]One possible pathway through which teen childbearing may translate into compromised child outcomes is through low birth weight. We conducted supplemental analyses controlling for low birth weight. The hypothesized relationships changed very little.

outcomes, but children of older teenage mothers also had significantly compromised cognitive development and health when compared to children of mothers in their late twenties. These findings emphasize that the consequences of teen motherhood are more severe at the youngest ages, but substantial disparities stretch into legal adulthood.

One of our study's strengths was its ability to include four measures of child health and development from the same time point. Children's development is not a monolithic phenomenon; rather, the association of maternal age with children's outcomes varied greatly depending on the domain being considered. Even for the two cognitive outcomes (early math and reading), which one might have expected to operate similarly, maternal age, household resources, and parenting quality had different relationships with each outcome. These findings echo Levine et al. (2001), who found that maternal age predicted academic and behavioral outcomes through different processes.

Our final three hypotheses identified influences on the developmental gap between the children of teenage versus older mothers. Hypothesis 2 expected social disadvantage prior to the child's birth to explain much of the relationship between early childbearing and children's outcomes. Using a variety of analytical strategies, we found both direct and indirect support for the hypothesis. These results echo findings from past research on earlier cohorts (e.g., Geronimus et al., 1994; Levine et al., 2001; Turley, 2003). Hypothesis 3 stated that after preexisting social disadvantage was controlled, socioeconomic, social, and material resources available in the child's household after the birth would explain part of the remaining relationship between young maternal age and children's health and development. We found that resources substantially or completely eliminated developmental disadvantage among teen mothers' children in many domains. A modest set of resources, including household income and maternal education, turned out to be much more important for understanding the preschool reading and math scores of children of teenage mothers than having a teen mother was. Finally, Hypothesis 4 expected parenting quality to explain part of the relationship between teen motherhood and children's outcomes. This hypothesis received support: Parenting quality partially mediated this association, but it was much less influential than, and operated independently of, resources.

Even in models that included measures of preexisting disadvantage, controls, household resources, and parenting quality, children of the youngest mothers (ages 15-17) still had math and reading scores at age 4½ that were 0.2 to 0.3 standard deviations lower than those of children with mothers ages 25-29 (see Table III). These residual relationships could reflect background factors that influenced the selection of disadvantaged teens into early childbearing but were not accounted for in our analysis, or they could mean that young teenage mothers' age influenced their children's outcomes in other ways besides preexisting and ongoing social disadvantage and lower-quality parenting. But our model fully explained the associations of maternal age with behavior and parent-reported health for young teenage mothers and with every outcome for older teenage mothers. Does this mean that having an older teenage mother actually did not matter for children? This was the case for some ages and outcomes once selection factors were controlled. But for reading and math, having an older teenage mother mattered in part because of the lower-quality parenting children typically received, and especially because of the more limited resources in their households.

Our estimates of the causal effect of early childbearing would have been improved by comparing the children of siblings who have shared much of the same background before becoming mothers. Because the ECLS-B did not sample first cousins, this task is best left to other data sources. It would also be useful to know whether certain types of resources are particularly beneficial for teenage mothers' children compared to others. Our ongoing research is exploring this issue. Finally, in the future it will be important to understand the

processes through which resources are related to improvements in children's development and health.

Why were there no significant developmental disparities at 9 months old for children of teenage versus older mothers? This finding is particularly striking given that supplemental analyses documented compromised birth outcomes, such as moderately low birth weight, being small for gestational age, and preterm birth, for teenage mothers' children compared to children of older mothers. There may be three possible explanations for this lack of significance. First, the child assessments at that age may not be sensitive enough to variation in development. We consider this explanation unlikely because the ECLS-B cognitive and behavioral assessments were reputable and thoroughly tested. It is harder to adjudicate between the second and third potential explanations: Either the children's developmental differences at this age were random and unrelated to future developmental outcomes, or disparities based on social disadvantage, young maternal age, and compromised birth outcomes took longer than 9 months to accumulate. Regardless of the cause, by 2 years old children of teen mothers showed evidence of systematically compromised development.

Because the developmental differences we measured were relatively small throughout the preschool years and widened over time, the first years of life appear to be a good time for interventions to improve long-term outcomes. Since our data showed that teenage mothers' children together with later-born siblings represented the majority of all families who were living in poverty or whose mothers had not earned a high school degree, improving their early development could have wide-reaching ramifications for ameliorating socioeconomic disadvantage in U.S. society. With the important caveat that this study's observational data can establish temporal order but not causality, our finding that household resources predicted sharp reductions in the developmental disparities associated with young maternal age has encouraging potential implications for policy and research. Both the existing literature and many intervention programs for teen mothers have largely focused on "soft" factors that can be difficult for interventions to change, such as mothers' parenting practices and verbal aptitude and stimulating home environments. Since resources were substantially associated with positive developmental outcomes for teenage mothers' children, interventions that transfer specific types of resources into children's households may have potential for success. For example, our study suggests that it might be fruitful to use randomized intervention programs to explore the effects on children of supplementing income, providing low-cost child care, and supporting young mothers' continued schooling. Our research will work to identify particular resources that are associated with the greatest developmental benefits. Policymakers should take seriously the finding that ongoing social disadvantage is an important component of the compromised outcomes of young mothers' children.

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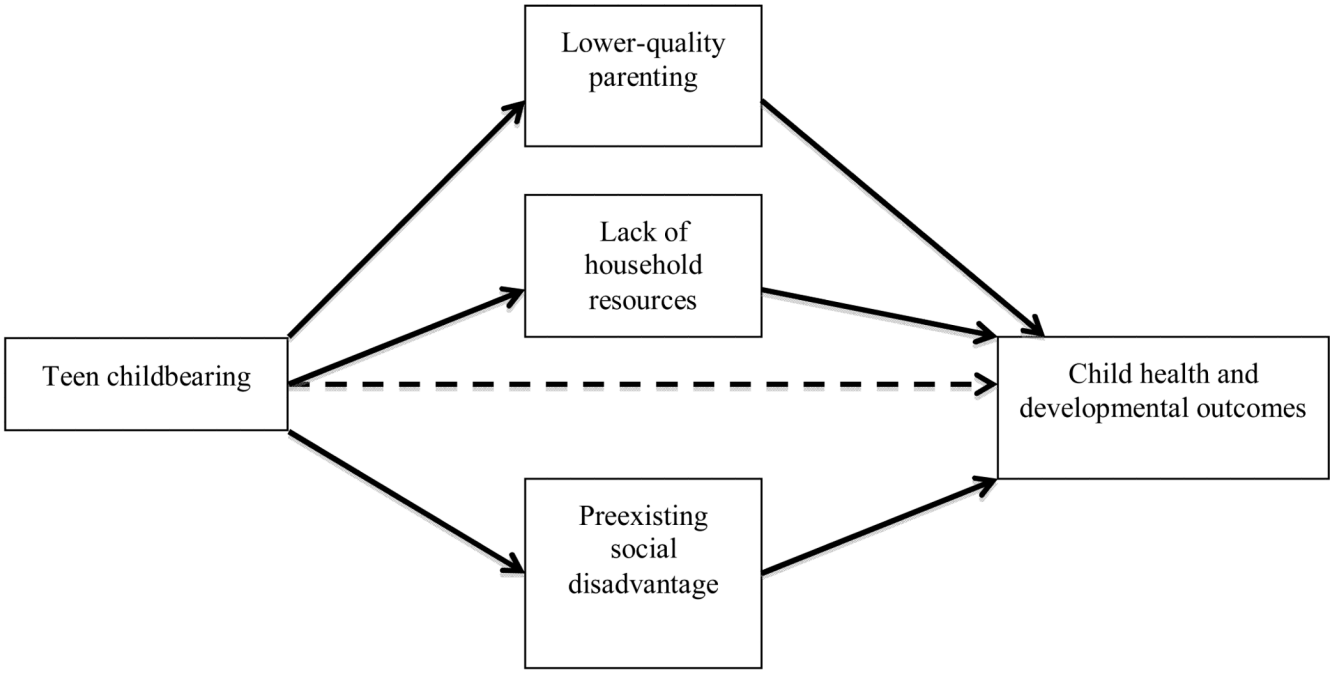

Figure I.
Conceptual Framework
Note: The dashed line represents a relationship we expect to be explained by the other relationships in the model.

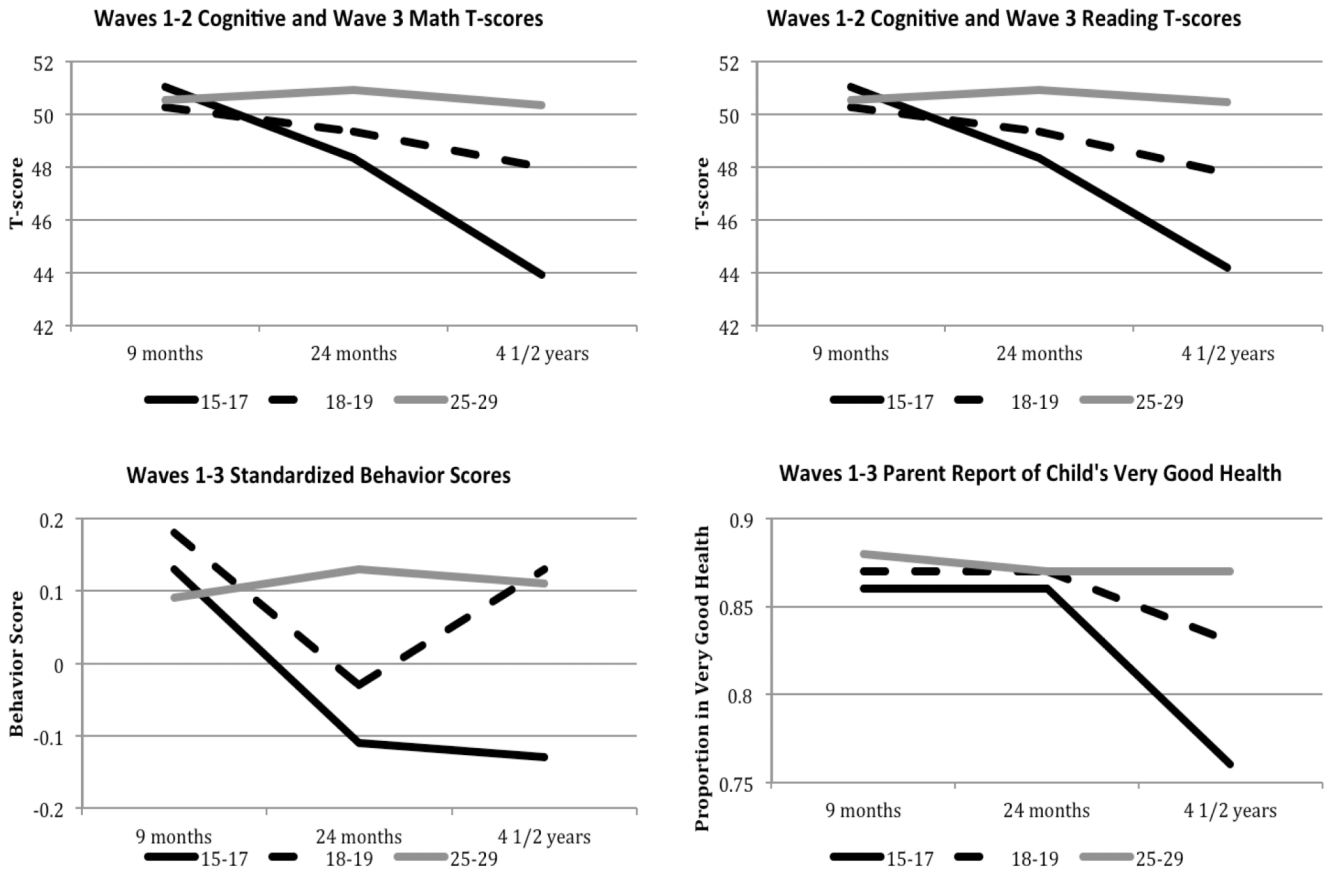

Figure II.
Child Outcomes Over Time, by Maternal Age (ECLS-B; N≈7000 math/reading, 7550 behavior, 8250 health)

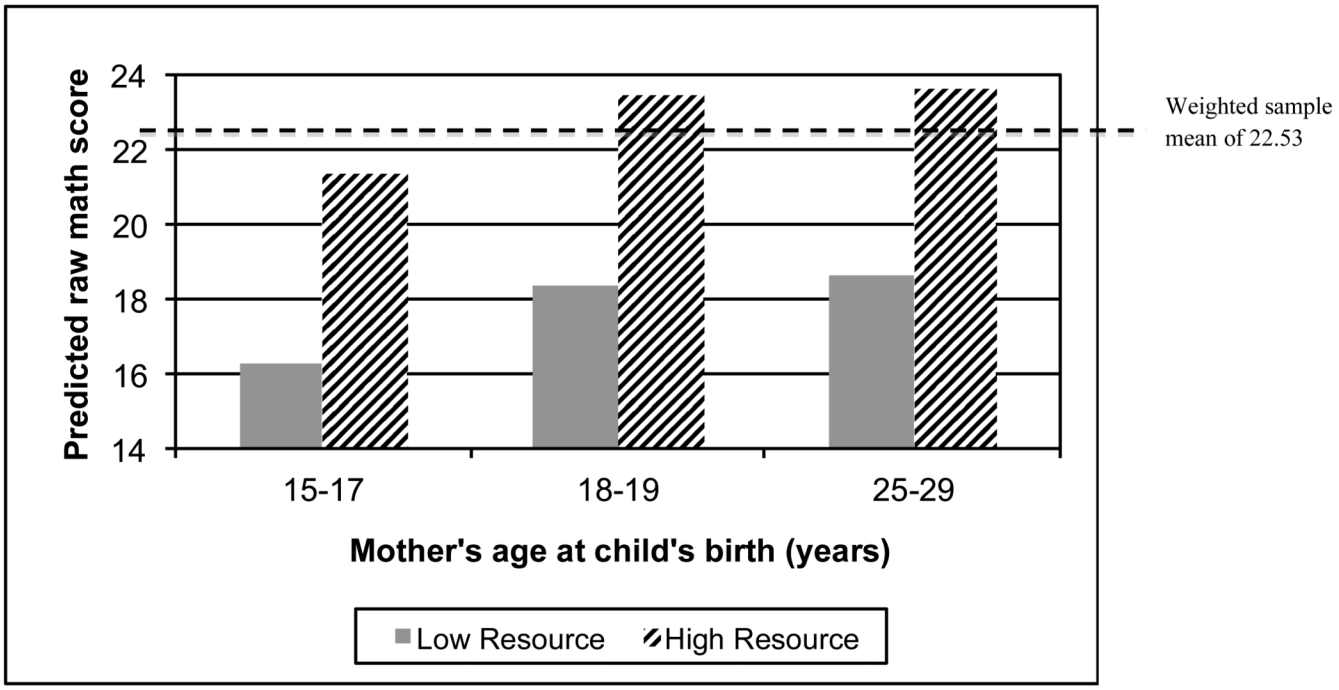

Figure III.

Predicted Preschool Math Scores, by Maternal Age and Available Resources

Notes: Source: Early Childhood Longitudinal Study-Birth Cohort, 2001-2005. N≈7650. Predictions use estimates from Table 2, Model 4. Analyses account for sample design effects. Dashed line is sample mean.

Lower-resource is coded as below poverty line, mother's education of 10 years, no health insurance, no bank account, 1 additional child in the household, socializes rarely with neighbors, and no child care at Wave 1. *Higher-resource* is coded as 200-299% of poverty line, mother's education of 12 years, privately insured, bank account, 0 additional children in the household, socializes weekly with neighbors, and some free or subsidized child care at Wave 1.

Predicted values are computed using 15- to 19-year-old mothers' weighted means/modes for all other variables.

Table I

Weighted Means for Resources at Wave 2 (24 Months) and Outcomes at Wave 3 (4½ Years)

Variable	Teen mom	Mom age ≥ 20	Prior teen mom	≥ 20 at 1st birth
CONTROL VARIABLES				
Child's age at assessment (centered, months)	0.36	−0.14 *	−0.001	−0.18
Child is female[b]	0.48	0.49	0.50	0.49
Birth order	0.24	1.11 ***	2.00 [a]	0 87 ***
Mother married at child's birth[b]	0.23	074 ***	0.53 [a]	0 79 ***
Household's primary language not English[b]	0.19	0.18	0.18	0.16 *
Child's race/ethnicity: Non-Hispanic White	0.39	0.56 ***	0.37	0.62 ***
Non-Hispanic African American	0.24	0.13 ***	0.23	0 11 ***
Hispanic	0.32	0 24 ***	0.31	0.21 ***
Asian/Pacific Islander	0.01	0.03 ***	0.01	0.03 ***
American Indian/Alaska Native	0.01	0.003 *	0.01	0.003 ***
Other/multiracial	0.03	0.04 *	0.07 [a]	0.04 **
Father's age at child's birth (years)	21.37	31.04 ***	28.66 [a]	31.53 ***
SELECTION VARIABLES				
Mom received welfare age 5 to 16[b]	0.19	0.10 ***	0.19	0.07 ***
Mom lived with both parents until 16[b]	0.40	0.61 ***	0.43	0.65 ***
Mother ever held back a grade[b]	0.25	0 14 ***	0.21	0.13 ***
Grandmother was <20 at mom's birth[b]	0.14	0.11	0.16	0.10 ***
Grandmother's education: ≥Bachelor's degree	0.04	0.15 ***	0.07 [a]	0.18 ***
< high school degree	0.44	0.33 ***	0.45	0.28 ***
High school degree	0.28	0.29	0.28	0.30
Some postsecondary	0.19	0.19	0.14 [a]	0.21 ***
WAVE 2 RESOURCES				
Household income % of poverty line: <100%	0.46	0.21 ***	0.43	0.14 ***
100-199%	0.33	0 23 ***	0.33	0.19 ***
200-299%	0.15	0.19 *	0.14	0.21 ***
300-399%	0.02	0 09 ***	0.05 a	0.11 ***
≥ 400%	0.04	0.28 ***	0.05	0.35 ***
Mother's educational attainment (0-20)	11.12	13.15 ***	11.31	13.71 ***
Household food security: Food secure	0.88	0.92 **	0.85	0.93 ***
Food insecure without hunger	0.11	0.07 **	0.12	0.05 ***
Food insecure with hunger	0.02	0.02	0.03 [a]	0.01 **

Variable	Teen mom	Mom age ≥ 20	Prior teen mom	≥ 20 at 1st birth
Child's health insurance source: Private only	0.15	0.58 ***	0.31 a	0.66 ***
Medicaid	0.70	0.31 ***	0.55 a	0.24 ***
Other government insurance	0.13	0.08 **	0.10	0.07
Not insured	0.06	0.04	0.06	0.04
Household has checking/savings account b	0.59	0.80 ***	0.63	0.85 ***
Household has stocks/funds b	0.1	0.45 ***	0.16 a	0.53 ***
Household owns car b	0.81	0 92 ***	0.84	0.94 ***
Housing status: Renter	0.46	0.31 ***	0.45	0.27 ***
Household owns home	0.16	0.56 ***	0.33 a	0.63 ***
Subsidized housing for mother	0.23	0 11 ***	0.20	0.08 ***
Free housing for mother	0.15	0.02 ***	0.02 a	0.02
Biological father in household b	0.49	0.81 ***	0.67 a	0.84 ***
Any grandparent coresident b	0.39	0.10 ***	0.12 a	0.09
Any other adult coresident b	0.22	0.10 ***	0.14 a	0.08 ***
Number of nonearning adults in household	1.10	0.67 ***	0.76 a	0.63 **
Number of other children in household	0.86	1.24 ***	2.01 a	1.05 ***
Household member has special needs b	0.09	0.08	0.14 a	0.08 ***
Socializing with friends/neighbors: Never	0.11	0.09	0.14	0.08 ***
< Once per month	0.13	0.22 ***	0.23 a	0.22
Once or twice per month	0.32	0.35	0.33	0.36
About once per week	0.23	0.23	0.21	0.24
Several times per week	0.21	0.10 ***	0.08 a	0.10
Mother's paid work status: Not working	0.58	0.43 ***	0.48 a	0.41 **
Working part time	0.12	0.15 *	0.11	0.17 ***
Working full time	0.31	0 42 ***	0.41 a	0.42
Mother's student status: Not in school	0.72	0 89 ***	0.87 a	0.90 *
Part-time student	0.13	0 07 ***	0.08 a	0.06
Full-time student	0.16	0 04 ***	0.05 a	0.04
Child care: None	0.51	0.51	0.56	0.49 **
All child care is free	0.22	0 11 ***	0.13 a	0.11
Some free or subsidized care	0.14	0.10	0.15	0.09 ***
Pays full child care cost	0.13	0.28 ***	0.17 a	0.31 ***
WAVE 2 PARENTING MEASURES 1				

Variable	Teen mom	Mom age ≥ 20	Prior teen mom	≥ 20 at 1st birth
Two Bags Task Score	3.97	4.45 ***	4.11 [a]	4.55 ***
Attachment: Secure	0.57	0.65 **	0.61	0.66
Ambivalent	0.09	0.08	0.09	0.07
Avoidant	0.15	0.16	0.16	0.15
Disorganized	0.18	0.12 ***	0.14	0.11 *
Observed positive parenting behaviors (0-1)	0.91	0.93 ***	0.90	0.94 ***
WAVE 3 CHILD OUTCOMES				
Math T-score	46.46	50.59 ***	46.52	51.63 ***
Reading T-score	46.42	50.57 ***	46.47	51.59 ***
Child Behavior Rating (standardized)	0.05	0.10	−0.04	0.14 ***
Parent report very good/excellent child health[b]	0.81	0.88 ***	0.82	0.89 ***

Notes: Source: Early Childhood Longitudinal Study-Birth Cohort, 2001-2005. N≈850 for teen mothers, 7400 for mothers aged ≥ 20, 1250 for prior teen mothers, and 5400 for mothers aged ≥ 20 at first birth.

Analyses account for sample design effects.

*p<.05

**p<.01

***p<.001; two-tailed design-based F tests comparing teens to adults or prior teen mothers to never teen mothers

[a]p<.05 comparing teen to previous teen mothers

[b]1=yes

[1]Rounded Ns for parenting measures: Teen (650), Adult (5650), Prior teen (950), Adult only (4250)

Table II

Coefficients from Multivariate Analyses of Child Outcomes at Wave 3 (Age 4), by Parental Age, Compared to Age 25-29

	Math [a] *(N≈7650)*	*Reading* [a] *(N≈7600)*	*Behavior* [a] *(N≈8250)*	*Very good health* [b] *(N≈8250)*
Range	5.6 to 41.5	5.4 to 34.7	−5.0 to 2.7	0 or 1
1. Mom's age 15-17	**−4 97*****	**−4 41*****	**−0.21***	**−0.80*****
2. Add controls	−4.33***	−3.63***	−0.18*	−0.50
3. Add selection	−3.70***	−3.04***	−0.15	−0.42
4. Add resources	−2.32***	−1.84***	−0.09	−0.22
1. Mom's age 18-19	**−2.26*****	**−2 27*****	**0.01**	**−0.30***
2. Add controls	−2.02***	−2.05***	0.01	−0.20
3. Add selection	−1.66***	−1.65***	0.03	−0.18
4. Add resources	−0.26	−0.49	0.10	0.03
R^2	0.34	0.30	0.10	N/A

Notes: Source: Early Childhood Longitudinal Study-Birth Cohort, 2001-2005.

"Controls" include control variables specified in the data section, as well as paternal age and coresidence.

R^2 is for models including maternal and paternal age, selection, controls, and resources.

Analyses account for sample design effects.

[a] Linear regression unstandardized coefficients

[b] Binary logistic regression coefficients (not odds ratios) Bolded models control for child's age at Wave 3. Subsequent models add specified variables to the previous row.

* p<.05

** p<.01

*** p<.001; two-tailed tests

Table III

Coefficients from Linear Regression Analyses of Wave 3 (Age 4%) Child Outcomes on Wave 2 (2 Years) Resources and Parenting Behaviors

Variable (Reference Category)	Math Score				Reading Score			
Model Number	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Maternal age (25-29 years old)								
15-17	−4 21***	−3.34***	−3.02***	−2.50**	−3.06***	-2.48***	−1.79***	−1.48***
18-19	−2.02**	−1.46*	−0.53	−0.28	−1.80**	-1.42*	−0.43	−0.29
Two Bags Task score		1.20***		0.83***		0.86***		0.54***
Parent-child attachment (secure)								
Disorganized		−1.62***		−1.57***		−0.35		−0.33
Insecure-ambivalent		−1.33***		−1.37***		-0.55		−0.68*
Insecure-avoidant		−0.66*		−0.58*		−0.65*		−0.57*
Observed positive parenting behaviors		2.13		1.54		2.70*		2.15*
Household income % of federal poverty line (≥400%)								
Under 100%			−1.83**	−1.63**			−1.55**	−1.39*
100-199%			−1.51***	−1.41***			−1.67***	−1.59***
200-299%			−1.22***	−1.27***			−1.78***	−1.79***
300-399%			−0.70	−0.68			−1.41**	−1.40**
Mom's educational attainment (years)			0.46***	0.41***			0.51***	0.48***
Child's health insurance (private)								
Medicaid			−0.61*	−0.59			−0.42	−0.42
Other government insurance			−0.33	−0.26			0.07	0.07
Not insured			−1.21*	−1.23*			−1.19	−1.23
Household has savings account[a]			0.71*	0.67			0.52*	0.52*
Household owns stocks/mutual funds[a]			0.81**	0.70*			0.79**	0.64*
Number of other children in household			−0.38*	−0.40*			−0.63***	−0 64***
Time with friends/neighbors (never)								

Variable (Reference Category)	Math Score				Reading Score			
Model Number	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
< Once per month			0.38	0.39			−0.04	−0.04
Once or twice per month			1.10**	1.03**			0.27	0.23
About once per week			1.03*	0.94*			0.36	0.34
Several times per week			0.79	0.71			-0.29	-0.32
Mother's paid work status (no work)								
Works full time			−0.19	−0.33			−0.54	−0.63
Works part time			−0.75**	−0.78**			−0.77*	−0.79**
Child care support (no child care)								
All child care is free			0.75*	0.91**			0.63	0.71
Some free or subsidized care			0.83*	0.89*			0.31	0.33
Pays full child care cost			0.31	0.36			0.09	0.10
Constant	24.75***	19.72***	17.16***	14.59***	15.05***	11.40***	8.01***	6.33***
Design-based F test	62.15***	83.31***	38.92***	59.41***	40.13***	35.02***	26.45***	29.13***
R-squared	0.27	0.30	0.33	0.35	0.22	0.24	0.29	0.29

Notes: Source: Early Childhood Longitudinal Study-Birth Cohort, 2001-2005. N≈5900 for each dependent variable.

Analyses account for sample design effects. Standard errors in parentheses.

All models control for all variables included in Table 2, Model 3. Models 3 and 4 also control for nonsignificant resources.

*p<.05

**p<.01

***p<.001; two-tailed tests

[a]1=yes.

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