Early Parenthood and Children's Preschool Development: The Role of Social Disadvantage and Resources*

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ABSTRACT

The educational disadvantage of children born to younger mothers has been well-established, but less is known about how and why this disadvantage takes root and grows in the preschool years. Using recent nationally representative data from the Early Childhood Longitudinal Study-Birth Cohort, we investigated the relationship between having a younger mother or father and children's preschool cognitive, behavioral, and health outcomes. We found that having either a teenage mom or dad was associated with children's compromised development across several domains, but the negative influence of having a teenage father disappeared once paternal coresidence and maternal age were controlled. Strong evidence supported our conceptual model proposing that social disadvantage before and after the child's birth accounts for most of the relationship between early motherhood and children's development. Financial, social, and material resources in the child's household partially or fully mediated each of the significant relationships between teenage childbearing and child outcomes. Our findings suggest that early childhood is an opportunity to provide resources that may be able to improve the developmental trajectories of children with young mothers.

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More than 1 in 10 births in the United States in 2006 was to a mother who was younger than age 20, and the teenage birth rate is now on the rise again after years of decline (Hamilton, Martin, and Ventura 2007). Teenage childbearing has long been considered an important social issue in our society (Furstenberg 2003), in part because of a concern among researchers and the public that young mothers and their children face curtailed future opportunities. Findings from a nationally representative survey of children born in 2001 showed that severe socioeconomic disadvantage and early childbearing are indeed inextricably linked (Mollborn and Dennis 2009). About half of all teenage mothers were living in poverty when their children were infants. Perhaps more surprisingly, 60 percent of all children living in poverty were born to a mother who was a teenager at either their birth or an older sibling's birth. Similarly, 61 percent of the mothers who had not completed a high school degree were currently or had once been teenage mothers. Clearly, early childbearing is an important issue for anyone working to understand broader social disadvantage in our society. Using recent, nationally representative longitudinal data, our study assesses the relationship between having a young parent and children's early development using a variety of measures, tests theoretical predictions about how social disadvantage explains this association, and suggests practical solutions to keep developmental disadvantage from taking root and growing.

Because little is known about the preschool period, research that investigates early childhood is important. There is also a pragmatic reason why such information is useful: If processes through which the children of teenage parents become developmentally disadvantaged and protective factors that close the developmental gap can be identified through national-level research, then interventions can be designed to try to reduce early developmental and health

differences and thus prevent them from accumulating over time. These interventions could potentially be particularly effective because they may be able to prevent differences in children's outcomes from taking hold in the first place, or they may at least have a smaller gap to close in eliminating the early developmental disadvantages of teenage parenthood than they would later in childhood and adolescence.

COMPROMISED DEVELOPMENT AMONG YOUNG PARENTS' CHILDREN

Most previous research has found that the children of teenage[1] mothers have substantially worse developmental outcomes in their preschool years in areas such as cognitive, language, physical, and social development than children of older mothers (Luster et al. 2000). The literature on the outcomes of teenage mothers' children 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 appear by the start of schooling and widen in middle childhood and adolescence (Brooks-Gunn and Furstenberg 1986; Jaffee et al. 2001), although others find that developmental differences associated with maternal age remain stable over time (Turley 2003). However, little is known about how this developmental gap emerges in the period prior to the transition to kindergarten or about whether a similar gap exists for children of teenage fathers.

Our study uses recent, nationally representative longitudinal data with relatively large subsamples of teenage mothers and fathers to document the development of young parents' children from birth through age 4. We examine whether there is a point in early childhood when young parental age is not associated with developmental differences, as well as whether any developmental gap between teenage parents' children and other kids widens throughout the preschool period. Because past research has documented an association between young maternal

age and child development, our *first hypothesis* states that children of teenage parents are expected to have compromised health and developmental outcomes when compared to children of older parents. This and other hypotheses are illustrated in Figure 1.

INSERT FIGURE 1 ABOUT HERE

To assess this hypothesis, we use more recent data than previous studies. Our data source is the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), a nationally representative survey of children born in 2001. We also make a new contribution to the literature by including both mothers and fathers. The association of having a teenage father with children's development has received much less attention than maternal age, but we are able to estimate both relationships. Furthermore, our analyses acknowledge that parental age may have a different relationship with child outcomes when teenage parents are very young (e.g., not yet legally adults) than when they are older. Hoffman, Foster, and Furstenberg (1993) found that the effect of early childbearing on women's outcomes was more severe for the youngest mothers, although Geronimus, Korenman, and Hillemeier (1994) did not find evidence that the effects of teenage motherhood on child outcomes varied by young mothers' age. The association of young parental age with children's development may also extend beyond the teenage years into the early twenties, as Levine et al. (2001) have found for mothers. We examine each of these ideas here.

SOCIAL DISADVANTAGE AND COMPROMISED DEVELOPMENT

While the existence of early developmental disparities by maternal age has been documented using less recent data sources, the causes of these differences are still debated. As Hardy et al. 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). Researchers have debated extensively whether

maternal age itself accounts for any of the developmental differences evidenced by young mothers' children, with differing conclusions (Coren, Barlow, and Stewart-Brown 2003; Geronimus and Korenman 1992; Hoffman et al. 1993; Levine et al. 2001; Moore and Snyder 1991; Turley 2003). But on one point these disparate voices seem to be in agreement: Social disadvantage, not maternal age, accounts for the better part of the compromised development observed among young 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 developing a theoretical basis for the role of social disadvantage in the relationship between teenage childbearing and children's health and development (see Figure 1). With its strong set of measures regarding social disadvantage and resources, the ECLS-B provides a useful test of our ideas.

Preexisting Social Disadvantage

We focus on two primary ways in which social disadvantage may account for the association between young maternal age and compromised child development. The first of these has spawned a considerable body of research and has been documented across a variety of empirical contexts. One important cause of negative outcomes for teenage parents and their children is the selection of socially disadvantaged youth into early parenthood: Low-income, low-achieving teenagers are more likely to become teenage parents than others, so any compromised development experienced by their children may be at least partially a result of these preexisting factors (Geronimus and Korenman 1992; Moore and Snyder 1991; Oxford and Spieker 2006). Their social disadvantage carries on to the next generation independently of any direct effect of parental age. Following past research, then, our *second hypothesis* states that

preexisting social disadvantage is expected to explain a large part of the compromised developmental outcomes of children of young parents (see Figure 1). In other words, we anticipate that much of the negative relationship between teenage childbearing and child outcomes is spurious.

Disagreement exists in the literature about the size of the relationship between maternal age and children's outcomes, net of selection factors. Many older studies found that the net association of teenage motherhood with at least some types of developmental outcomes after accounting for selection into early childbearing was still substantial (e.g., Hardy et al. 1997; Moore and Snyder 1991), while other studies, some making use of innovative comparison groups such as sisters, showed a much smaller or negligible net effect (Andreozzi et al. 2002; Black 1996; Brooks-Gunn and Furstenberg 1986; Frodi et al. 1990; Geronimus and Korenman 1993; Pope et al. 1993). More recently, Turley (2003) found evidence that maternal age was usually not related to child outcomes after selection was controlled. In contrast, Levine et al. (2001) reported that selection explained most of the differences in academic outcomes, but that young maternal age negatively influenced several behavioral outcomes.

Social Disadvantage as a Consequence of Early Parenthood

Past research has documented the role of social disadvantage in the selection of teenagers into early parenthood, but less attention has been paid to the part that social disadvantage may play in explaining any remaining association between young maternal age and child development. We assert that the experience of becoming an adolescent parent may further compound social disadvantage beyond the initial social disadvantage caused by family background and other preexisting factors. Substantial evidence has shown that teenage parents and their children suffer from a grave lack of resources such as child care, housing, and income

(Furstenberg 1976; Mollborn 2007). Adolescent parents' resource needs increase drastically after childbirth, but they are typically unable to provide the kinds of resources themselves that older parents can. For example, "older mothers are more likely to have more adequate resources (more are married, have a history of employment, are higher than the federal poverty level, and less likely to be on welfare) than younger ones" (Hardy et al. 1997:808). Unless other individuals or institutions step in with support, their children will have unmet resource needs.

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 between resources and child outcomes are expected to work indirectly through other processes. 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).

The first author's previous work has shown that material resources available after the child's birth explained much of the negative association between early childbearing and adolescent mothers' and fathers' educational attainment (Mollborn 2007). Hardy and colleagues (1997) and Levine and colleagues (2001) speculated that resources might mediate the relationship between maternal age and *children's* outcomes, but to our knowledge this hypothesis has not been systematically evaluated. Of course, the resources that are available before versus after becoming a parent are powerfully linked: Family socioeconomic resources available before parenthood strongly influence the amount of material resources available to a teenage parent after the birth.

Our study's *third hypothesis* states that a lack of available resources in the households of teenage parents and their children should at least partially account for why having a young mother compromises children's early development (see Figure 1). In other words, we expect household resources to mediate much of the relationship between young motherhood and child outcomes. Income may be the most important material resource available to teenage parents because it can buy many other critical resources, although increased income is associated with greater gains in child outcomes among the poor than among the wealthy (Korenman, Miller, and Sjaastad 1995). Following researchers who emphasize that other social and material resources beyond money are important for understanding children's development (e.g., Gershoff et al. 2007; Mayer 1997), we take a multifaceted approach by examining a variety of other material resources besides income that are likely to be associated with improved early development. The ECLS-B provides rich data on a multitude of resource measures. For example, we include other socioeconomic resources besides income such as mother's education, home ownership, multiple measures of wealth, food security, and health insurance. Social support includes other adults living in the household who can contribute income or child care, as well as sources of social interaction from outside the home. We also examine factors that may increase the resource needs of the household, such as additional children and household members with special needs.

Our conceptualization of the dual role of social disadvantage, both as a selection factor and as a consequence of early childbearing, expands and complicates its importance for understanding the consequences of teenage childbearing. Social disadvantage not only sets the process of teenage parenthood in motion, but it is also a further result of this process. We expect this conceptual model to provide a fuller understanding of the ways in which young parental age influences children's outcomes. Indeed, Figure 1 shows that when the dual role of social

disadvantage has been accounted for, we do not expect young parental age to be associated with children's preschool health and development.

METHOD

Data

The Early Childhood Longitudinal Study-Birth Cohort (ECLS-B) follows a sample of about 14,000 children born in 2001 from infancy through the start of kindergarten (U.S. Department of Education 2007). Currently, three waves of data have been released, covering the first four years of life. It is the first nationally representative survey in the U.S. to follow children in this early developmental period using parent interviews and direct child assessments. The size and representativeness of the sample and its documentation of the first five years of life, together with the thorough and well-tested child assessments, make this an excellent data source for studying social influences on early child development. The ECLS-B also includes some of the largest sample sizes of teenage mothers and fathers available in comprehensive national surveys, making it particularly appealing for studying these subpopulations.

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 birth mothers were younger than 15 years old when the child was born were excluded in response to state confidentiality and sensitivity concerns, so the findings from this study are not representative of children who have very young teenage mothers.

This study uses the first three waves of data, when the children were about 9 months, 24 months, and 52 months old (the third wave was conducted in the fall before most of the children would start kindergarten). 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 and probability weights that make findings representative of children born in the U.S. in 2001. We restricted the sample to children with completed parent interviews and child assessments at all three waves and whose biological mothers were the primary parent participating in the interview at all three waves, resulting in about 8400 eligible cases. [2] After listwise deleting missing data for some variables and including indicators for people missing information on other variables, our analysis samples ranged from approximately 7600 (90% of eligible cases) to 8200 (98% of eligible cases), depending on the response rate for each child outcome of interest.[3]

Measures

Child preschool outcomes. We examined six developmental and health outcomes at Wave 3 (about age 4), drawn from face-to-face child assessments and parent interviews (see Snow et al. 2007 for more information about these measures). Table 1 presents descriptive information for these and all other variables. Three outcomes focus on broad aspects of early development. Children's *literacy scores* were assessed using a 35-item test covering areas such as phonological awareness, letter sound knowledge, letter recognition, print conventions, and word recognition. *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. 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." These 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.

Three other measures are more directly related to health. *Child health status* was recoded as a dichotomous variable from the primary parent's report, grouping very good or excellent versus good, fair, or poor.[4] The *acute illness* measure indicates whether the child was hospitalized for asthma, respiratory illness, gastrointestinal illness, or some "other" reason, or had ear tubes inserted between Waves 1 and 3. The dichotomous *injury* variable indicates whether the child visited a doctor, clinic, or ER for an injury between Waves 1 and 3.

INSERT TABLE 1 ABOUT HERE

Parental 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 al. 2001). Moore, Morrison, and Greene (1997) and Turley (2003) compared these two ways of measuring maternal age, and we do the same here for specific theoretical reasons.

Past research has also made assumptions about the effects of maternal age being linear (Turley 2003), or either linear or quadratic (Hoffman et al. 1993). We do not expect assumptions of linearity to be realistic. For example, the difference for a child's health and development between having a 16-year-old and a 21-year-old mother is likely to be greater than the difference between having a 30-year-old and a 35-year-old mother, yet a continuous measure of maternal age assumes them to be the same. Therefore, we did not impose any linear or nonlinear assumptions about the shape of the relationship between parental age and child outcomes.

Instead, we divided *maternal age at the study child's birth* into the following categories: 15-17, 18-19, 20-24, 25-29 (reference category), 30-34, 35-39, and 40 years or older. This strategy allowed the effect of maternal age to vary across categories without imposing a specific functional form, as introducing a quadratic term would do. The teenage mothers were divided into two age categories so that we could test whether having an extremely young mother was more detrimental to children's outcomes than having an older teenage mother, but sample sizes did not permit further breakdown of these groups.

The first two categories were collapsed for *maternal age at first birth* and *paternal age* because of small numbers and an upper category of age 50 or more was added for paternal age, but the others were the same. In the case of missing or inconsistent age reports across waves, we used available birth dates and compared maternal or paternal age to the child's age at assessment in each wave to recover cases. Due to the substantial numbers of cases with no information about maternal age at first birth (which was drawn from a supplemental paper-based survey completed after the parent interview) and paternal age, we created "age missing" categories to retain approximately 500 and 200 cases, respectively, in the analysis samples. The ECLS-B data include substantial subsamples of teenage mothers and fathers compared to most other national data sources, with about 850 teenage mothers (one third of these aged 15-17 and two thirds aged 18-19) and 350 teenage fathers (one quarter aged 15-17 and three quarters aged 18-19) participating at all three waves.

Resource variables in infancy. All resource variables were measured at Wave 1, when the children were about 9 months old.[5] The first group of variables represents socioeconomic resources. Wave 1 *household income* is presented as a percentage of the 2001 U.S. Department of Health and Human Services poverty guidelines, which allows for adjustment by the number of

people in the household. We used household size and Wave 1 household income, for which 9% of cases were imputed by ECLS-B using hot deck imputation methodology, to create 5 categories: under 100% of the poverty line, 100-199%, 200-299%, 300-399%, and 400% of the poverty line or greater (reference group). *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 and logical adjustments made when there were inconsistencies in a respondent's education across waves. Household *food security* was constructed by ECLS-B and comprised of three categories: food secure (reference group), food insecure without hunger, and food insecure with hunger. The child's *health insurance status* was separated into 4 categories: no insurance, anyone on Medicaid, anyone on other forms of government insurance besides Medicaid, and private insurance only (reference group). Additionally, we included a number of measures to assess *wealth*, including binary variables indicating whether anyone in the household owned a car, had stock holdings, or had any type of checking or savings account. Finally, the family's *housing* situation was coded into 4 categories: homeowner, received housing subsidies, received free housing, and other (such as renting; reference group).

A second group of variables represents social support, measuring the presence of *additional people in the household* who may contribute resources or be a draw on the household's resources, as well as forms of *social support outside the home*. The biological father's coresidence at Wave 1 was included as a dichotomous variable. A variable counted the number of people in the household aged 18 or older who did not contribute income to the household, and another counted the number of people under age 18 residing in the household. Additionally, we included dichotomous variables indicating whether any grandparent or any

other person over 18, excluding parents or the partner of a parent, lived in the household. We created a binary indicator of whether there was anyone in the household with a special need or disability. Frequency of socialization with neighbors was coded into 5 categories: more than weekly, weekly, monthly, less than monthly, or never (reference group). Finally, a binary variable was included to indicate whether the mother participated in any kind of community service activity.

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. *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 subsidies for care (whether formal or informal), and parent(s) paying full price for the child's care. The mother's involvement in *paid work* and *school* was divided into three categories for each: full time, part time, or no involvement.

Selection factors. The ECLS-B survey asked about several of the mother's background factors that have been shown to influence selection into teenage childbearing. These included whether the mother lived in a household that received welfare assistance between the ages of 5 and 16 and whether the mother lived with both of her parents until the age of 16. Additionally, the child's maternal grandmother's education was coded into 5 categories: less than a high school diploma, high school diploma, some college, college bachelor's degree or more (reference group), and grandmother's education missing, the last of which allowed for the retention of about 300 cases in the analysis sample. We do not anticipate that this set of measures will fully account for selection into early parenthood because important factors (e.g., cognitive and

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, sex, and race/ethnicity (constructed by ECLS-B and coded into Hispanic/Latino and non-Hispanic Black, White, Native American/Alaska Native, Asian/Pacific Islander, and multiple categories), the child's 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 (English versus other).

Analysis Plan

Our study uses a variety of weighted descriptive and multivariate analyses to address each of the three hypotheses in turn, estimating the overall effect of having a teenage mother or father on children's preschool health and development and assessing the extent to which preexisting social disadvantage and available household resources after the birth explain this relationship. We first present descriptive analyses illustrating children's trajectories of developmental and health outcomes from infancy to age 4 based on maternal age. Further descriptive analyses compare current (at the study child's birth) and previous teenage mothers with mothers who were at least 20 at their first birth in order to examine the role of preexisting disadvantage in understanding the link between young maternal age and child outcomes. Some of our multivariate analyses also incorporate a comparison between current and previous teenage mothers, but the main analyses focus on the relationships between having a teenage mother or father (with parental age measured at the study child's birth) and children's health and development. Including various sets of variables in models with parental age allows us to assess different explanations for the developmental differences we identify. Finally, we use

hypothetical respondents to illustrate the relative explanatory power of maternal age and resources available after the child's birth for understanding child outcomes.

There have been two common methodological approaches to estimating the relationship between maternal age and child outcomes. Some researchers have used nonrepresentative subsamples comparing sisters or conducting other types of fixed effects analyses in order to reduce bias arising from selection into teenage childbearing (e.g., Geronimus et al. 1994; Turley 2003). Using the data available from the ECLS-B survey, we instead included the full national sample and controlled for as many socioeconomic background factors from before the pregnancy as possible in our multivariate analyses. While our longitudinal data allowed us to establish time order because maternal age and household resources were measured long before child outcomes, the observational nature of the data did not permit us to determine causality. Rather, we report associations among variables. This approach includes a wider range of respondents but is likely to overstate the negative association between young maternal age and children's outcomes (Geronimus et al. 1994). This presents a conservative test of our hypothesis that socioeconomic and other types of resources can explain the relationship between having a young mother and children's health and development, because the larger association will be harder to mediate fully. If we find that maternal age matters for children's outcomes after socioeconomic disadvantage and resources are controlled, then this remaining relationship may be due to age, preexisting factors influencing selection into early parenthood, or some combination of the two.

RESULTS

Our *Hypothesis 1* stated that having a young mother or father would be associated with children's compromised early health and developmental outcomes. Figure 2 assesses the hypothesis visually for maternal age by mapping trajectories of four key child outcomes from 9

months to 4 years, using all three waves of assessment and comparing children with mothers aged 15-17, 18-19, 20-24, and 25 or older (these older age groups were collapsed in order to simplify the graphs). We included the 20-24 age group because some research suggests that these mothers, while not technically teens, evidence some compromised child outcomes compared to older mothers (Levine et al. 2001). Note that only one outcome, child health status, was measured the same way in all three waves, so we used different but corresponding measures at the first two waves for math, literacy, and behavior. The literacy 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 more information on both scales). For all waves, the math, literacy, and behavior graphs rely on T-scores or standardized scores, so a downward trend in these graphs does not mean that the child was getting worse in an absolute sense (as it does for the health status graph), but rather that the child's development was losing ground relative to peers of the same age.

INSERT FIGURE 2 ABOUT HERE

For each of the four outcomes, we found a point of convergence in the outcomes of all four groups of children at Wave 1 (about 9 months old), with no significant differences between children with teenage and the reference group of 25- to 29-year-old mothers. As the growing disparities in Waves 2 and 3 showed, their developmental disadvantage appeared later and accumulated over time.[6] Children of the youngest mothers clearly had more negative outcomes than those from any other group, losing developmental ground relative to their peers across the three waves and experiencing a decline in health as reported by the parent. Although only the 18- to 19-year-old mothers were technically in their teens, both their children and the 20- to 24-year-old mothers' children had compromised development compared to the children of mothers aged

25 and up. As past findings have implied (Levine et al. 2001), this suggests that the association of early motherhood with child outcomes is not a threshold with a clear cutoff at the end of the teenage years. Rather, early motherhood can be thought of as a continuum in its relationship with child development. The youngest mothers have the most negative associations, but maternal ages stretching into the mid-twenties are still related to compromised child outcomes. The rest of our analyses focus primarily on the two groups of teenage mothers, but our main table includes results for 20- to 24-year-old mothers' children as well.

Table 2 confirms the significant differences between the children of teenage mothers and older mothers for Wave 3 outcomes in multivariate analyses, as well as including two additional health outcomes and estimating the effect of paternal age on child health and development. The bolded columns in the table show that with only the child's age at assessment controlled, children of at least one of the two age groups of teenage mothers were significantly disadvantaged on every measure compared to the reference group (children with mothers aged 25-29), except for a lack of association between teenage childbearing and the relatively random event of injury. Children of the youngest mothers were consistently much more disadvantaged than those in the next-youngest group. For example, with only assessment age controlled, the difference between their literacy scores and those of the reference group (children with mothers aged 25-29) equaled 15% of the observed range of scores in the sample, compared to 8% of the entire range for children of mothers aged 18-19. Children of the youngest teenage mothers scored 0.21 standard deviations lower on the behavior scale than the reference group, but children of older teenage mothers did not have significantly different behavior scores than the reference group. We return to this table below to discuss additional models in the context of our other hypotheses.

The bolded column in Table 2 shows that children with teenage fathers had lower math and literacy scores and a lower likelihood of being in very good health, but there was no overall effect of having a teen father on behavior scores, acute illnesses, or injuries. We found clear evidence in Table 2 that young dads' children did worse because (as supplemental analyses confirmed) teenage dads most frequently partnered with teenage moms and were much less likely than older fathers to live with their children. Once maternal age and paternal coresidence were controlled, none of the child outcomes were negatively related to paternal age. Because paternal age associations with child outcomes could be fully explained by these two factors, we focused the tests of our two remaining hypotheses on maternal and not paternal age.

Our overall assessment of *Hypothesis 1* is that the developmental disadvantage of children of teenage mothers played out across a variety of domains as expected. Having a teenage father was frequently associated with developmental disadvantage as well, but maternal age and paternal coresidence explained these associations completely.

INSERT TABLE 2 ABOUT HERE

Hypothesis 2 stated that preexisting social disadvantage should explain a large part of the compromised developmental outcomes of children of young parents. Several types of analysis considered this hypothesis from various angles. First, we took a descriptive approach. In Table 1, we divided 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 moms") is interesting because we expect that they experienced similar social disadvantage to current teenage mothers because the selection of socially disadvantaged women into childbearing occurred for both groups. If preexisting social disadvantage is the dominant factor for understanding the outcomes of teenage mothers' children as hypothesized, then we should

find that child outcomes are not significantly different for current compared to previous teenage mothers, but both groups' outcomes should be compromised compared to those of children with mothers who were never teen moms. In bivariate analyses reported in Table 1, we indeed found that current and previous teenage mothers were not significantly different for any child outcome. Additionally, as expected, supplemental significance tests show that children of both current and previous teenage mothers exhibited significantly worse outcomes when compared to children with mothers aged 20 or older at first birth on all measures, except injury and (for current teenage mothers only) behavior. These findings provide descriptive support for Hypothesis 2.

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, reported in Figure 3. Here, we compared the associations with child outcomes of maternal age at *first* birth and maternal age at the study's *focal* birth. We reasoned that 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 solely through maternal age at first birth and not 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 first births in this analysis was necessary for disentangling the effects of age at first birth from those of age at current birth because mothers' ages at first and current birth were the same for firstborn children.

INSERT FIGURE 3 ABOUT HERE

Figure 3 displays coefficients that were significant in the expected direction, so only coefficients for literacy and math scores and health status are included because young maternal age did not have a negative association with behavior or a positive association with the

likelihood of acute illness or injury. The figure shows that across the board, age at first birth had a much stronger association with children's preschool outcomes than age at current birth. For health status, when age at first birth was controlled, age at current birth was not significant. However, age at current birth was still associated with about a two-point lower math and literacy scores for teenage mothers. Each of these findings suggests that preexisting social disadvantage influences children's outcomes, supporting Hypothesis 2.

Finally, in a more classic approach, additional multivariate analyses examined the extent to which SES-related background factors from before the pregnancy reduced the association of maternal age with various child outcomes. The bolded columns in Table 2 demonstrated the unadjusted association of having a teenage mother with various developmental and health outcomes, with only the child's age at assessment controlled (see discussion above). The subsequent "add selection" models for each of the three maternal age groups included our three selection factors: whether the mother grew up in a household that received welfare, whether she grew up living with both of her parents, and her mother's educational attainment. If the coefficient for the latter is smaller than for the former, then preexisting social disadvantage accounts for part of the association of maternal age with child outcomes.

As expected, we found that the size of all of the significant bolded relationships between maternal age and the child outcomes was reduced substantially when we controlled for preexisting social disadvantage. For the youngest mothers aged 15 to 17, accounting for selection into early childbearing eliminated the significance of the associations between maternal age and three of the five outcomes that were significant in unadjusted models: behavior scores, health status, and acute illness. Only two significant relationships remained, for literacy and math scores, and these were each reduced by one third to one half by including selection factors. These

coefficients were similarly reduced for older (18- and 19-year-old) teenage mothers and mothers in their early twenties. Additionally, the relationship between having an older teenage mother and the child's health status and the relationship between having a mother in her early twenties and behavior were no longer significant once selection factors were controlled. These findings imply that preexisting social disadvantage is a very important component of the relationship between maternal age and children's health and development. Taken together with our other results from this section, we find that preexisting social disadvantage accounts for much of the observed relationship between maternal age and child outcomes, providing support for *Hypothesis 2*.

Our *Hypothesis 3* stated that a lack of available resources in the households of teenage parents and their children should partially account for why having a young mother compromises children's early development. To assess this hypothesis, we needed to test a mediating relationship (see Baron and Kenny 1986 for a discussion of criteria to be met to claim mediation). In other words, did available resources mediate the negative relationship between having a teenage mother and children's preschool outcomes? We focused on teenage mothers here because the negative association between teenage fatherhood and child development had already been explained by maternal age and paternal coresidence.

For resources to mediate the effect of having a teenage mother on child outcomes as laid out in Figure 1, we must first ask whether teenage mothers' households actually had lower levels of resources than other households (Baron and Kenny 1986). Table 1 shows that teenage mothers' households typically had much lower levels of resources than older mothers' households. For example, nearly half (47%) of teenage mothers and their children lived in household with incomes below the federal poverty line, compared to just 10% of mothers who

were at least 20 at their first birth. The average difference in mothers' educational attainment between these two groups was nearly three years of schooling, and just 15% of teenage mothers' households owned their home compared to 59% of moms who were at least 20 at their first birth. These and other findings from the table support the idea that a lack of socioeconomic and other resources was a striking characteristic of the households of teenage mothers as compared to the households of older mothers.

To document mediation, we must also ask whether available resources were positively associated with children's outcomes (Baron and Kenny 1986). Supplemental bivariate analyses using the full set of resource measures found that each category of resources was significantly related to one or more of the following child outcomes: math, literacy, behavior, and health status. However, when all resources were included in a single multivariate model together with maternal and paternal age, selection factors, and controls, some types of resources were no longer significant. Table 3 presents only the significant resource measures from these models and focuses on math and literacy scores, the only two outcomes with which young maternal age was associated after selection factors and controls were included in Table 2.

INSERT TABLE 3 ABOUT HERE

Several resource types were significantly related to children's development in expected ways. Three types of resources, household income, mother's education, and (as a resource drain) the number of additional children in the household, predicted both literacy and math scores. Living in poverty compared to the reference category (an income of at least 400% of the poverty line) was a more important factor for children's scores than having a mother aged 15-17 compared to the reference category of 25-29, further strengthening the disadvantage argument. Food insecurity with hunger was negatively related to literacy scores compared to food security,

and having more non-earning adults in the home was associated with an increase in literacy scores, perhaps because these adults had more time to spend with the child. Several additional factors were related to children's preschool math scores: not being insured compared to private insurance and having an adult other than a parent or grandparent and having someone with special needs in the household all decreased children's math scores. The mother's involvement in community service, having free or subsidized child care compared to no child care, and a household member's financial investments such as stocks or mutual funds were all protective for preschool math scores.

To fulfill the final condition of mediation, we must investigate whether adding socioeconomic and other resources into multivariate models reduced or eliminated the significant negative association between having a teenage mother and child outcomes (Baron and Kenny 1986). Table 2 displays models that included controls and selection factors (mostly involving the mother's socioeconomic disadvantage experienced before the birth), followed by additional "add resources" models that further included measures of resources in infancy. For both groups of teenage mothers, all but two of the child outcomes that were initially significantly different from the reference group (25- to 29-year-old mothers' children) lost their significance once control variables and mothers' background factors were included. These outcomes were health status for both groups of teenage mothers, as well as behavior and acute illness for the younger group. Two other dependent variables, literacy and math scores, were substantially reduced by adding controls and selection factors (see discussion above), but these mothers' children still had a significant disadvantage compared to the reference group. For the 15- to 17-year-old mothers' children, the association of having a young mother with each outcome was further reduced by about half upon adding resource measures into the model, indicating that resources partially

mediated the effect of the youngest category of maternal age. Once resources were included, the negative coefficient for having a very young mother was reduced by 66% for literacy and 59% for math compared to the "total" effect with only the child's assessment age controlled. The remaining significant associations between having a very young mother and math and literacy scores might be a function of biological or developmental processes directly related to maternal age, or they might encompass yet more social disadvantage. Because we could not net out other background factors that likely influence selection into teenage childbearing (e.g., academic performance or neighborhood-level SES) using fixed-effects models or explicit survey measures, preexisting social disadvantage could also account for all or part of the remaining significant relationships between very young maternal age and child outcomes.

Resources had even greater explanatory power for the group of older teenage mothers. For children of 18- or 19-year-old mothers, resources available in the infant's household fully mediated the remaining association between maternal age and children's preschool math and literacy scores after selection factors and controls had been accounted for (no other child outcomes remained significant at this point). After resources were controlled, no developmental differences remained for the children of 18- or 19-year-old mothers compared to the reference group (children of 25- to 29-year-old mothers). In other words, the combination of preexisting and ongoing social disadvantage fully accounted for each of the observed relationships between having an older teenage mother and children's health and development at age 4.

Overall, our findings supported *Hypothesis 3* through partial or full mediation. After accounting for preexisting disadvantage and controls, household resources available after the child's birth were mostly or completely successful (depending on the age category of the teenage mother) in explaining why young maternal age compromised children's preschool development.

An illustration of these relationships highlights several interesting issues. We demonstrate that relative associations of maternal age and resources with children's preschool literacy scores using hypothetical cases in Figure 4, based on models from Table 3. Each bar illustrates the predicted literacy score for a child whose mother's age and household's resource levels varied. 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 (the reference category). We can see that their literacy scores increased as maternal age rose. Within each age group, one hypothetical case had low resource levels, defined as low maternal education, household income below the poverty line, food insecurity with hunger, no non-earning adults, and two additional children in the household. The other hypothetical case had high resource levels, operationalized as higher maternal education and household income (though well within the typical range of the subsample of teenage mothers), food security, two non-earning adults, and no additional children in the household. Within each of the age groups, the high-resource case had a literacy score that was about 6 points, or 19% of the observed range of scores in the sample, higher than the low-resource case. This difference in resources was associated with a much greater disparity in literacy scores than maternal age, which was only linked to a 1.5-point difference between the youngest and oldest of the three age groups.

INSERT FIGURE 4 ABOUT HERE

Two particularly interesting conclusions can be drawn from these hypothetical illustrations. First, the children of teenage mothers are by no means foreordained to have compromised development, as long as they have some basic resources. The high-resource child of a teenage mother aged 18-19 had a literacy score on par with the overall sample mean when

the otherwise typical teenage mother had a modest set of available resources including an associate's degree and a household income at 200% of the federal poverty line. Rather, it was the children of the more disadvantaged teenage mothers who had literacy scores that were well below average. Unfortunately, however, teenage mothers' actual levels of education and household income much more frequently fit the low-resource profile than the high-resource one, so their children's development was typically compromised. Second, resources had much stronger associations with children's preschool literacy than maternal age. The child of a 15-year-old mother with the modest set of "high" resources outlined above ended up scoring 4 points, or 14% of the observed range of scores in the sample, higher than the child of a 25-year-old mother who had "low" resources.

DISCUSSION

Using recent national data from the Early Childhood Longitudinal Study-Birth Cohort, our results reaffirmed and clarified the role of social disadvantage in understanding the health and development of children of teenage parents. Our conceptual framework, which expected preexisting social disadvantage and resources available in the child's household to explain much of the relationship between early childbearing and children's outcomes, was borne out by the results. Findings supported our first hypothesis that these children's outcomes would be compromised when compared to their peers with older parents. Children's health and development did not differ by maternal age for most of the available outcome measures at 9 months of age, but a disparity began to emerge between the children of teenage and older mothers by 24 months and was well-established for most outcomes at age 4. Previous research has shown that by the time children of teenage mothers make the transition to school, they are

typically developmentally disadvantaged compared to their peers (Brooks-Gunn and Furstenberg 1986; Jaffee et al. 2001), and our analyses supported this finding.

Why were there no significant developmental disparities at 9 months old for children of teenage versus older mothers? We can think of three possible explanations. First, the child assessments at that age may not be sensitive enough to variation in their development. We consider this explanation unlikely because the cognitive and behavioral assessments used at this age were reputable and thoroughly tested. It is harder to adjudicate between the second and third potential explanations: Either children's developmental differences at this age were random and unrelated to future developmental outcomes, or the effects of social disadvantage and young maternal age took longer than 9 months to accumulate. Whatever the explanation, by 2 years old children showed evidence of systematically compromised development associated with young maternal age.

The discussion above categorized children as having teenage or older mothers, but the actual findings indicated a more nuanced situation. We found that children of the youngest mothers (ages 15 to 17) exhibited the worst developmental outcomes, yet children of older teenage mothers and even those of mothers in their early twenties also had significantly compromised development on many fronts when compared to children of mothers in their late twenties. These findings emphasize that early parenthood should not be treated as monolithic, but rather as a gradual process associated with more severe risks at the youngest ages and milder disparities stretching well into legal adulthood (Hoffman et al. 1993; Levine et al. 2001).

It is also tempting to think of children's development as a monolithic phenomenon, but in actuality the relationship of maternal age with children's outcomes varied greatly depending on the measure being considered. One of our study's strengths was its ability to include three

measures of child health and three developmental measures from the same time point. The differences we identified in the relationship between young maternal age and various measures of child outcomes echoes Levine et al. (2001), who found that maternal age was associated with academic and behavioral outcomes through different processes.

While the outcomes of teenage mothers' children have been documented, there has been less research on the relationship between having a teenage father and children's health and development. We were able to estimate this relationship and found that having a teenage father (compared to the reference category of 25-29 years old) was associated with compromised math and literacy scores and worse parent-reported health status at age 4. Fathers' coresidence with the child and mothers' age completely explained the association of having a teenage father with these outcomes. These findings demonstrate that it is important to consider young fatherhood as well as young motherhood when seeking to understand children's outcomes, but the two are closely linked. Future research on the interplay between paternal and maternal age is needed when investigating children's development.

Our second and third hypotheses identified influences on the establishment and growth of the developmental gap between the children of teenage versus older parents. The second hypothesis 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 consistent support for the hypothesis. These results echo findings from past research using less recent data (e.g., Geronimus et al. 1994; Levine et al. 2001; Turley 2003).

The third hypothesis stated that after preexisting social disadvantage was controlled, financial, social, and material resources available to the child's household after the birth would explain most of the remaining relationship between young maternal age and children's health

and development. As expected, we found that material resources substantially or completely buffered developmental disadvantage among teen parents' children in many domains. Past research has not been done systematically on this topic to our knowledge. A variety of available resources, but in particular the two classic socioeconomic factors of household income and maternal education, turned out to be much more important for understanding the preschool literacy and math scores of children of teenage mothers than maternal age itself.

Even after controlling for household resources, preexisting disadvantage, and controls, children of the youngest mothers (ages 15-17) still had lower math and literacy scores at age 4 than those with mothers ages 25-29 (see Table 3). These relationships could remain because many background factors influencing selection of disadvantaged teens into early childbearing were not accounted for by our necessarily simple selection model, or they could mean that very young mothers' age influenced their children's outcomes beyond its associations with social disadvantage and low resource levels. For example, Chen et al. (2007) have presented findings suggesting that young maternal age may lead to unfavorable birth outcomes due to biological factors, although there have been few direct tests of the possible pathways and no consensus exists as to whether young age effects cease at a certain threshold. Like others, we cannot provide such tests with our data. Alternatively, because teenagers are still developing psychologically and may not have the maturity that older parents have, there may be disparities in their parenting styles and skills, home environments, and emotional resources that have developmental impacts (Furstenberg, Brooks-Gunn, and Chase-Lansdale 1989). It is important to realize that the relationship between age and maturity varies across individuals and cultures (Geronimus et al. 1994), so there is variation in the parenting practices and home environments provided by teenage mothers (Luster et al. 2000). Regardless of the source of the remaining

relationship between very young maternal age and these two child outcomes, our more striking finding was that our model fully explained the associations of maternal age with all other outcomes for very young teenage mothers and with every outcome for older teenage mothers (ages 18-19).

Does this mean that having a teenage mother did not actually matter for children? We found that this was the case for some outcomes, but for others, having a teenage mother mattered largely or entirely through the limited resources that were available to her household. Furthermore, our findings also demonstrated that children of previous teenage mothers exhibited unfavorable outcomes, and thus, the disadvantage experienced by teenage mothers rarely ceased at age 20. These findings have interesting implications from a policy standpoint, as we discuss below.

While this study provides important information about the roles social disadvantage and resources play in the relationship between parental age and children's preschool outcomes, 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 prior to becoming parents. Because the ECLS-B did not intentionally 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 especially protective for teenage parents' children compared to older parents' children. Our future research will explore this issue. Finally, in the future it will be important to understand the processes through which resources end up improving children's development and health. Previous research focusing on specific types of resources suggests, for example, that providing food security, health insurance, and income supports and encouraging mothers' continued schooling may be

promising pathways to consider (Guo and Harris 2000; Jackson et al. 2000; Kleinman et al. 1998; Lave et al. 1998). Our ongoing quantitative and qualitative work will address this question.

Because the developmental differences we measured only emerged at age 2 and were relatively small throughout the preschool years, children's first four years appear to be an ideal time for interventions to improve the long-term life outcomes of teenage parents' children. Since our data suggest that these children (together with teenage mothers' subsequent children) represent the majority of all families who are living in poverty and whose mothers have not earned a high school degree (Mollborn and Dennis 2009), improving their early development could have wide-reaching ramifications for ameliorating socioeconomic disadvantage in our society.

With the important caveat that this study's observational data can firmly establish time order but not causality, our finding that material resources were associated with sharp reductions in the developmental disparities associated with young maternal age has optimistic potential implications for policy and research. Both the existing literature and many of the intervention programs that have been designed to aid the development of teenage mothers' children have largely focused on individual-level factors that can be quite difficult for interventions to influence, such as mothers' parenting behaviors, verbal aptitude, and stimulating home environments. Since material resources were substantially associated with positive developmental outcomes for teenage mothers' children, it is possible that interventions through transfers of specific types of resources into children's households may have potential for success. For example, our study suggests that providing income supplementation and food security and supporting mothers' continued schooling appear to be promising policy routes that are worth exploring further with randomized intervention programs. Our continued research will work to

identify particular resources that are associated with the greatest benefits for the development of teenage parents' children. Policy should take seriously the finding that social disadvantage is an important component of the compromised outcomes of teenage parents' children.

NOTES

[1] In this study, we broadly define teenage parents as those who had children before turning 20, but our more detailed analyses find that the social processes governing young parenthood are actually more a continuum than a threshold.

[2] Because of confidentiality requirements associated with the ECLS-B, all Ns are rounded to the nearest 50. Supplemental analyses show that teenage mothers were more likely than other mothers to drop out of the study at Wave 2 or 3.

[3] About 8% of responses were missing for the math and literacy outcomes that were based on lengthy child assessments, while response rates were higher for outcomes based on simple parent reports, such as child health status. Listwise deleted cases were not more or less likely to be teenage mothers than cases included in our analysis samples, and the math, literacy, and behavior scores for included and listwise deleted cases were not significantly different at $p<.05$.

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

[5] We also conducted analyses using resource measures from Wave 2 (age 2) and measures that captured change in resources between Waves 1 and 2, but neither of these models improved the proportion of variance explained in child outcomes by an appreciable amount. Therefore, we decided to measure resources at the earliest available time point so that most of the child's development would have occurred after this measurement.

[6] Significant differences between children with teenage versus 25- to 29-year-old mothers arose by age 2 (Wave 2) and persisted thereafter for cognitive and behavior scores, but health differences between these groups did not manifest themselves until age 4 (Wave 3).

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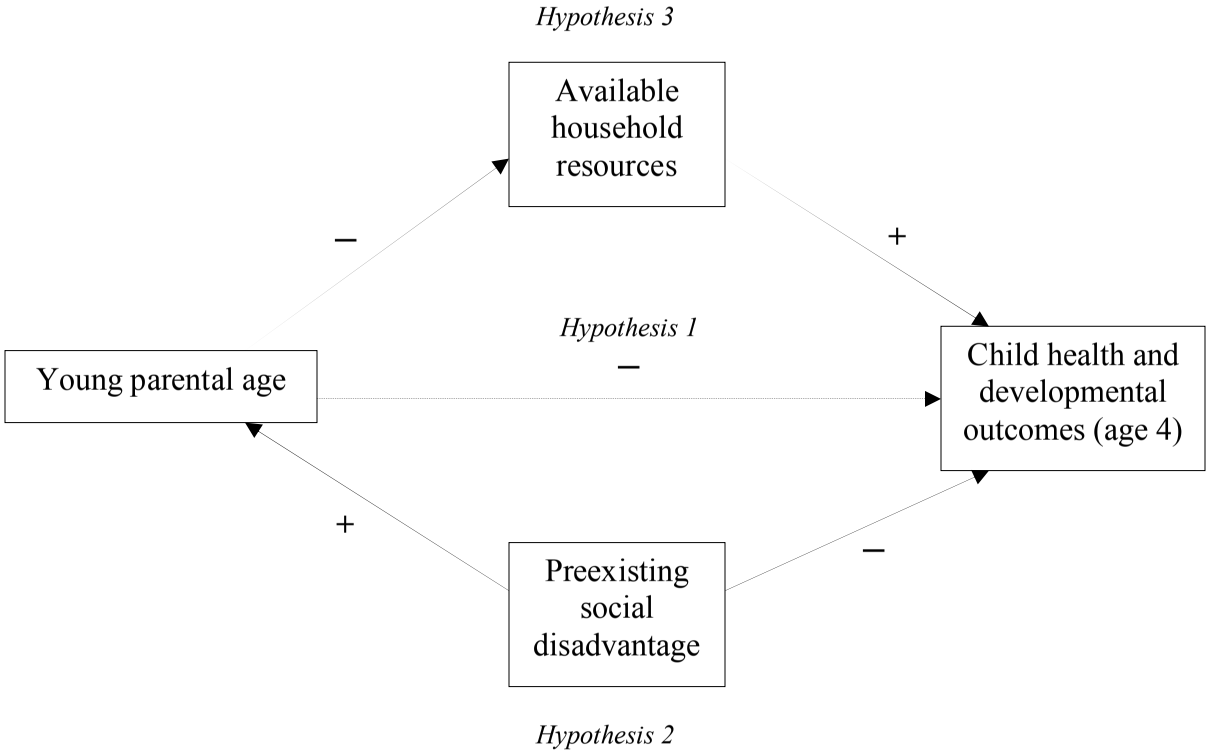
Figure 1. Conceptual Framework



Note: Dashed line represents a relationship that is expected to be explained by the relationships represented by solid lines.

Figure 2. Trajectories of Child Outcomes from Infancy through Preschool, by Maternal Age

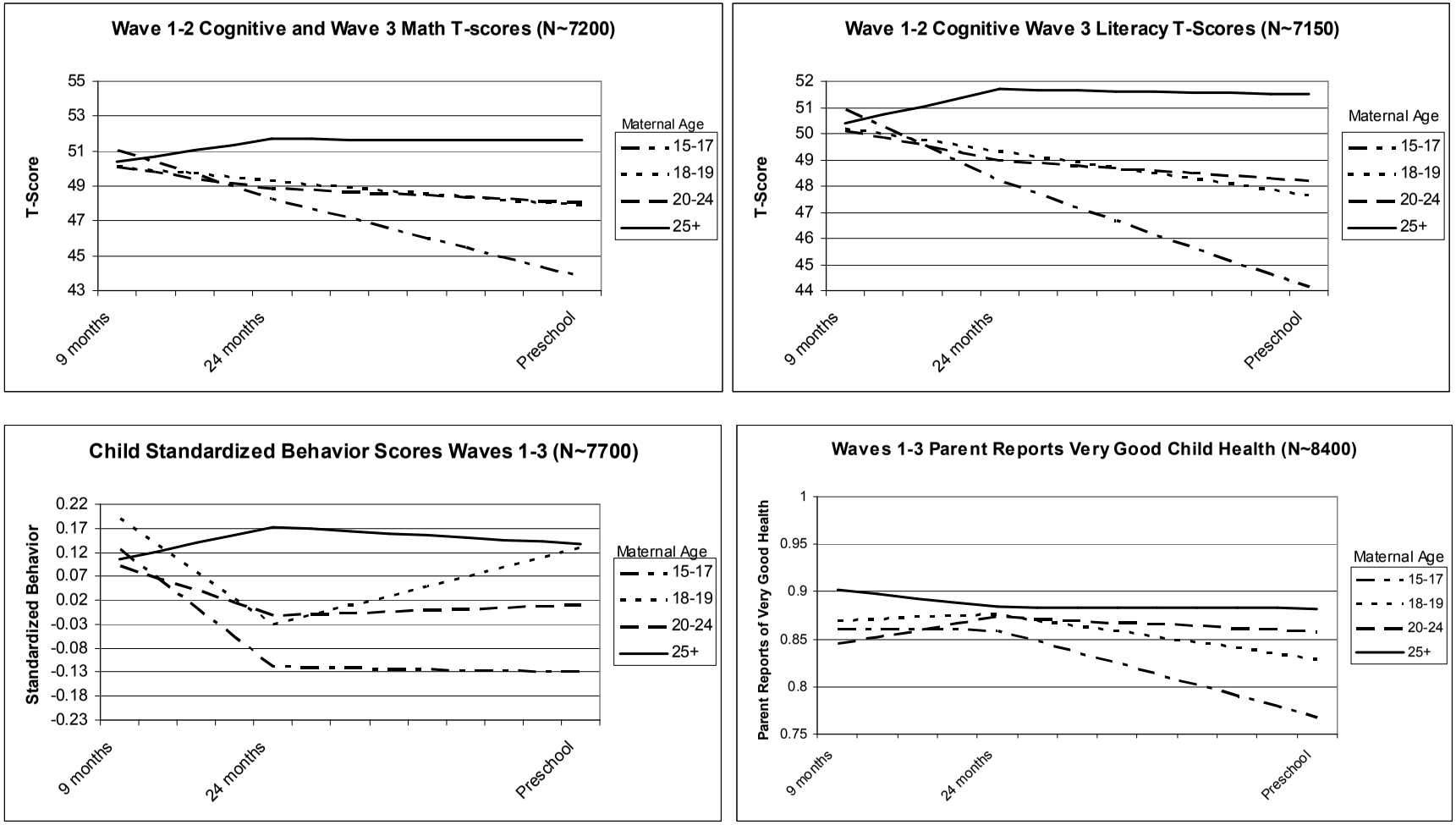
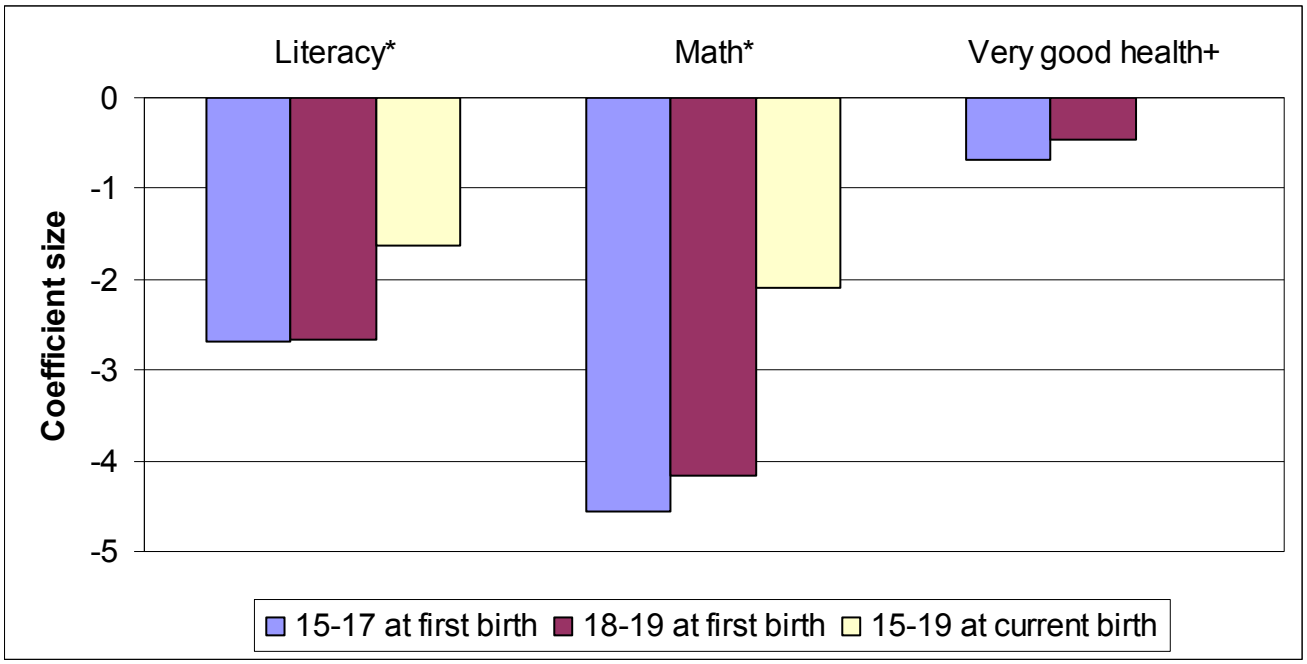
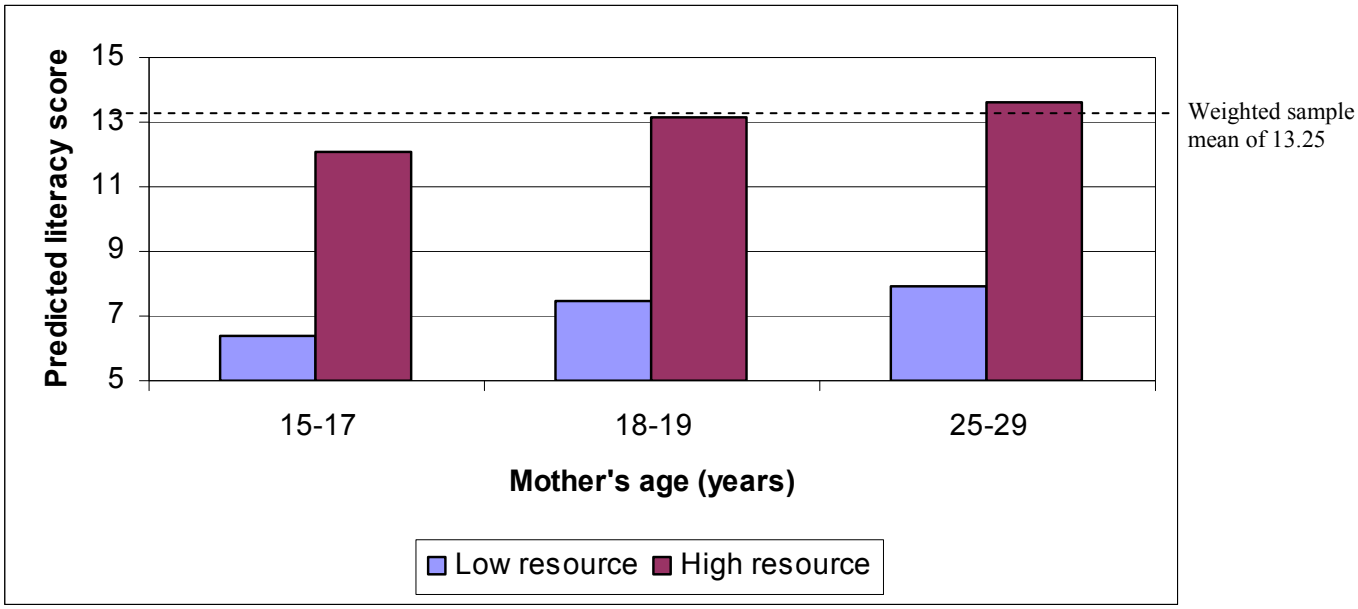


Figure 3. Coefficients from Multivariate Analyses of Preschool Child Outcomes, by Maternal Age at First and Current Birth (compared to 25-29 years old)



Notes: Source: Early Childhood Longitudinal Study-Birth Cohort, 2001-2005.
N~4700 for literacy and math and 5050 for health status.
*Linear regression unstandardized coefficients + Binary logistic regression coefficients
Analyses account for sample design effects. All analyses control for child's Wave 3 assessment age.
Analyses exclude first births, so maternal age at the first birth and the current birth is always different.
Only coefficients that are significant at the $p<.05$ level are included in the figure.

Figure 4. Predicted Preschool Literacy Scores, by Maternal Age and Available Resources



Notes: Source: Early Childhood Longitudinal Study-Birth Cohort, 2001-2005. N~7600.
Predictions use estimates from Table 3. Analyses account for sample design effects. Dashed line is sample mean.
Low resources is coded as below poverty line, mother's education of 10 years, food insecure with hunger, 0 non-earning adults, and 2 children in the household at Wave 1. *High resources* is coded as 200-299% of poverty line, mother's education of 14 years, food secure, 2 non-earning adults, and 0 children in the household at Wave 1.
Predicted values are computed using 15- to 19-year-old mothers' weighted means/modes for all other variables.

Table 1. Weighted Means for Resources at Wave 1 (9 Months) and Outcomes at Wave 3 (4 Years) for Children of Teenage, Previous Teenage, and Other Mothers

Variable	Teen mom (n~850)	Mom age ≥ 20 (n~7550)	Sig	Previous teen mom (n~1300)	Sig	≥ 20 at 1st birth (n~5500)	Sig
Father's age at child's birth (years)	21.38	31.04	***	28.65	[a]	31.52	***
Biological father in household at W1	0.49	0.83	***	0.73	[a]	0.86	***
WAVE 1 RESOURCES							
Household income % of federal poverty line							
Under 100% of poverty line	0.47	0.15	***	0.32	[a]	0.1	***
100-199%	0.33	0.19	***	0.34		0.15	***
200-299%	0.14	0.21	***	0.22	[a]	0.2	
300-399%	0.05	0.23	***	0.11	[a]	0.26	***
≥ 400%	0.005	0.23	***	0.02	[a]	0.28	***
Mom's educational attainment (0-20)	10.81	13.03	***	11.19	[a]	13.61	***
Household food security							
Food Secure	0.85	0.88	*	0.79	[a]	0.91	***
Food insecure without hunger	0.11	0.09		0.17	[a]	0.07	***
Food insecure with hunger	0.04	0.02	*	0.03		0.02	
Child's health insurance source							
Private health insurance (only)	0.09	0.55	***	0.28	[a]	0.63	***
Medicaid	0.74	0.33	***	0.59	[a]	0.27	***
Other government insurance	0.10	0.07		0.08		0.06	
Not insured	0.07	0.04	*	0.06		0.03	*
Household has savings/stocks/funds	0.58	0.78	***	0.58		0.84	***
Household owns home	0.15	0.53	***	0.31	[a]	0.59	***
Free or subsidized housing	0.42	0.14	***	0.24	[a]	0.11	***
Any grandparent coresident	0.49	0.11	***	0.13	[a]	0.11	
Any other adult coresident	0.25	0.10	***	0.14	[a]	0.09	***
Number of non-earning adults in household	0.69	0.54	***	0.57	[a]	0.53	
Number of other children in household	0.85	1.14	***	1.94	[a]	0.95	***
Mother's paid work status							
Not working	0.61	0.45	***	0.52	[a]	0.43	***
Working part time	0.12	0.15		0.1		0.17	***
Working full time	0.27	0.40	***	0.39	[a]	0.4	
Mother's student status							
Not in school	0.72	0.91	***	0.88	[a]	0.91	*
Part-time student	0.10	0.06	**	0.06	[a]	0.06	
Full-time student	0.18	0.03	***	0.05	[a]	0.03	**
WAVE 3 CHILD OUTCOMES							
Literacy T-score	46.37	50.55	***	46.42		51.59	***
Math T-score	46.36	50.56	***	46.55		51.6	***
Child Behavior Rating	0.05	0.10		-0.05		0.14	***
Parent reports very good child health	0.81	0.88	***	0.82		0.89	***
Any acute episode since wave 1	0.22	0.18	**	0.21		0.17	*
Any injury reported since wave 1	0.33	0.34		0.31		0.36	*

Notes: Source: Early Childhood Longitudinal Study-Birth Cohort, 2001-2005.
Analyses account for sample design effects.
* p<.05 ** p<.01 *** p<.001; two-tailed design-based F tests [a] p<.05 comparing teen to previous teen mothers

Table 2. Coefficients from Multivariate Analyses of Child Outcomes at Wave 3 (Age 4), by Parental Age

	Math[a] (N~7600)	Literacy[a] (N~7600)	Behavior[a] (N~8200)	Very good health[b] (N~8200)	Acute illness[b] (N~8200)	Injury[b] (N~8200)
Range	5.6 to 41.5	5.4 to 34.7	-5.0 to 2.7	0 or 1	0 or 1	0 or 1
Mom's age 15-17	**-4.98*** **	**-4.42*** **	**-0.21***	**-0.76*** **	**0.49***	**-0.01**
Add selection	-3.25***	-2.24***	-0.12	-0.48	0.33	-0.03
Add controls	-3.75***	-3.05***	-0.15	-0.43	0.31	-0.06
Add resources	-2.02***	-1.51***	-0.07	-0.35	0.30	-0.01
Mom's age 18-19	**-2.29*** **	**-2.29*** **	**0.00**	**-0.35***	**0.01**	**-0.03**
Add selection	-1.07*	-0.84*	0.05	-0.14	-0.24	-0.08
Add controls	-1.64***	-1.62***	0.03	-0.19	-0.25	-0.12
Add resources	-0.16	-0.44	0.10	-0.06	-0.29	-0.02
Mom's age 20-24	**-1.75*** **	**-1.72*** **	**-0.09***	**-0.12**	**0.05**	**0.10**
Add selection	-0.80*	-0.75*	-0.04	0.02	-0.16	0.05
Add controls	-1.00**	-1.11***	-0.05	-0.01	-0.19	0.03
Add resources	-0.21	-0.44	0.00	0.08	-0.26*	0.06
Dad's age 15-19	**-2.34*** **	**-2.76*** **	**-0.08**	**-0.46***	**-0.10**	**0.04**
Add coresident	-1.12*	-1.82***	-0.03	-0.29	-0.23	0.08
Add mom's age	0.72	-0.43	0.02	0.03	-0.39	0.13
R^2	0.34	0.29	0.09	N/A	N/A	N/A

Notes: Source: Early Childhood Longitudinal Study-Birth Cohort, 2001-2005.
[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.
"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.
* p<.05 ** p<.01 *** p<.001; two-tailed tests

Table 3. Coefficients from Linear Regression Analyses of Wave 3 (Age 4) Child Outcomes on Wave 1 (9 Months) Resources

Variable (Reference Category)	Literacy Score		Math Score	
Maternal age (25-29 years old)				
15-17	-1.51**	(0.50)	-2.02**	(0.65)
18-19	-0.44	(0.43)	-0.16	(0.48)
Paternal age (25-29 years old)				
15-19	-0.29	(0.47)	1.09*	(0.55)
Household income % of federal poverty line (≥ 400%)				
Under 100%	-2.09***	(0.43)	-2.60***	(0.46)
100-199%	-1.94***	(0.36)	-1.93***	(0.37)
200-299%	-1.70***	(0.37)	-1.37***	(0.36)
300-399%	-1.23***	(0.34)	-1.09***	(0.32)
Mom's educational attainment (years)	0.49***	(0.05)	0.46***	(0.05)
Household food security (food secure)				
Food insecure without hunger[a]	-0.20	(0.30)	-0.04	(0.33)
Food insecure with hunger[a]	-1.05*	(0.42)	-0.80	(0.57)
Child's health insurance (private)				
Medicaid	-0.43	(0.29)	-0.53	(0.30)
Other government insurance	-0.20	(0.39)	-0.36	(0.40)
Not insured	-0.42	(0.50)	-1.17*	(0.55)
Household owns stocks/mutual funds[a]	0.40	(0.26)	0.64*	(0.26)
Stocks/mutual funds info missing[a]	-1.00	(0.88)	-0.35	(0.98)
Non-grandparent adult in household[a]	-0.39	(0.32)	-0.87*	(0.35)
Number of non-earning adults in home	0.50**	(0.18)	0.37	(0.19)
Number of other children in household	-0.66***	((0.11)	-0.38**	(0.13)
Household member has special needs[a]	-0.52	(0.35)	-0.77*	(0.36)
Parent does community service[a]	0.22	(0.22)	0.50*	(0.21)
Child care support (no child care)				
All child care is free	0.21	(0.28)	0.84**	(0.28)
Some free or subsidized care	0.29	(0.38)	0.84*	(0.39)
Pays full child care cost	-0.18	(0.30)	0.22	(0.29)
Constant	7.77***	(0.98)	16.87***	(1.00)
Design-based F test (df)	35.09	(66,7513)	42.29	(66,7544)
R-squared	0.29		0.34	

Notes: Source: Early Childhood Longitudinal Study-Birth Cohort, 2001-2005. N~7600.
Analyses account for sample design effects. Standard errors in parentheses.
All analyses control for assessment age, father's coresidence, race/ethnicity, child gender and birth order, mother's welfare history and family structure, grandmother's education, marital status at birth, household primary language, and nonsignificant resource measures.
* p<.05 ** p<.01 *** p<.001; two-tailed tests [a] 1=yes